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# Errata

## Title & Document Type:

## Manual Part Number:

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## HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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# Programmer's Guide

## HP 8590 E-Series and L-Series Spectrum Analyzers and HP 8591C Cable TV Analyzer




**HP Part No. 08590-90235 Supersedes: 5962-5023**
**Printed in USA June 1995**

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The Calibration Guide shipped with your instrument contains the regulatory information.

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## Assistance

*Product maintenance agreements and other customer assistance agreements are available for Hewlett-Rzckard products. For any assistance, contact your nearest Hewlett-Rzckard Sales and Service Office.*

## Safety Notes

The following safety notes are used throughout this manual. Familiarize yourself with each of the notes and its meaning before operating this instrument.

| | |
|---|---|
| Caution | Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, would result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met. |

| | |
|---|---|
| Warning | **Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.** |

| | |
|---|---|
| **Instruction Manual**  | The **instruction documentation** symbol. The product is marked with this symbol when it is necessary for the user to refer to the instruction in the manual. |



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## General Safety Considerations

| | |
|---|---|
| Caution | Before switching on this instrument, make sure that the line voltage selector switch is set to the voltage of the power supply and the correct fuse is installed. |
| Warning | **This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous. Intentional interruption is prohibited.** |
| Warning | **The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.** |
| Warning | **The power cord is connected to internal capacitors that may remain live for 10 seconds after disconnecting the plug from its power supply.** |
| Warning | **These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.** |



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## How to Use This Guide

This guide uses the following conventions:

| | |
|---|---|
| Front-Panel Key | This represents a key physically located on the instrument. |
| Softkey | This indicates a “softkey,” a key whose label is determined by the instrument’s firmware. |
| Screen Text | This indicates text displayed on the instrument’s screen. |



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## HP 8590 D-Series and E-Series Spectrum Analyzer Documentation Description

In addition to the programmer's guide, the following guides are shipped with your spectrum analyzer:

The Calibration Guide for your Spectrum Analyzer

- Tells you how to test your spectrum analyzer to determine if the spectrum analyzer meets its specifications.

*HP 8590 E-Series and L-Series Spectrum Analyzer User's Guide*

- Tells you how to make measurements with your spectrum analyzer.
- Describes the spectrum analyzer features.
- Tells you what to do in case of a failure.

*HP 8590 E-Series and L.-Series Spectrum Analyzer Quick Reference Guide*

- Describes how to make a simple measurement with your spectrum analyzer.
- Briefly describes the spectrum analyzer functions.
- Lists all the programming commands.

## HP 8591C Cable TV Analyzer Documentation Description

In addition to the programmer's guide, the following guides are shipped with your cable TV analyzer:

*HP 8590 E-Series Spectrum Analyzers and HP 8591 C Cable TV Analyzer Calibration Guide*

- Tells you how to test your spectrum analyzer to determine if the spectrum analyzer meets its specifications.

*HP 8591C Cable TV Analyzer User's Guides*

*Cable TV Measurements*
- Tells you how to make cable TV measurements with your analyzer.
- Describes the cable TV analyzer mode features.

*Spectrum Analyzer Reference*
- Tells you how to make measurements using the spectrum analyzer mode.
- Describes the spectrum analyzer mode features.
- Tells you what to do in case of a failure.

*HP 8591C Cable TV Analyzer Getting Started and Quick Reference* Guide

- Describes how to make a simple measurement with your spectrum analyzer.
- Briefly describes the cable TV and spectrum analyzer functions.
- Provides a quick reference for cable TV and spectrum analyzer softkeys.



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# 1

# Preparing for Use

## What You'll Learn in This Chapter

This chapter tells you how to connect a computer to your spectrum analyzer via the Hewlett-Packard Interface Bus (HP-IB) or the RS-232 Interface and how to connect a printer or a plotter. The remainder of the chapter covers procedures to follow if a problem is encountered.

### Connecting Your Spectrum Analyzer to a Computer

The spectrum analyzer works with many popular computers. However, the steps required to connect your spectrum analyzer to a specific computer depend on the computer you are using. Before turning to the interconnection instructions for your computer, please read the following general information.

### Configuring Your Computer System

Every computer system has a specific configuration. Your system configuration might include a printer, external disk drive, or plotter. Whenever you add another piece of equipment (for example, your spectrum analyzer), you may need to reconfigure your computer system so that the computer knows where and how to send information to the newly added device.

Some computers do not require configuring when a spectrum analyzer is connected; others require a simple modification. The most common modification is changing the configuration information stored on the computer's operating system disk. A few computers require the insertion of an add-on board, or "card." Refer to your computer documentation if your system needs these modifications.

All of the test programs for HP-IB and RS-232 interfaces are written using the BASIC language of the computer under consideration. If you have never entered or run a BASIC program, refer to your computer documentation.



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## Connecting the Computer to the Spectrum Analyzer

### For the HP-IB Interface

Refer to Appendix B for a detailed description of the HP-IB interface.

Appendix B contains instructions for connecting the spectrum analyzer's HP-IB interface to either an HP 9000 Series 200, or a Series 300 computer, or to an HP Vectra PC equipped with an HP 82300B BASIC Language Processor. If your computer is not listed, but it supports an HP-IB interface, there is a good possibility that it can be connected to the spectrum analyzer. Consult your computer documentation to determine how to connect external devices on the bus.

### For the BS-232 Interface

Refer to Appendix C for a detailed description of the RS-232 interface.

Appendix C contains instructions for connecting the spectrum analyzer's RS-232 interface to an HP Vectra PC or IBM PC/AT or compatible computers. If your computer is not listed, but it supports a standard RS-232 interface, there is a good possibility that the spectrum analyzer may be connected to the computer. Consult your computer documentation to determine how to connect external devices to your computer's RS-232 connector.

There are two types of RS-232 devices: data terminal equipment (DTE) and data communication equipment (DCE). Types of DTE devices include display terminals. DCE equipment includes modems and, generally, other computer RS-232 devices. The spectrum analyzer RS-232 port is the DTE-type. Connections from the computer (DCE) to the spectrum analyzer (DTE) are shown in Appendix C.

## The **Test** Program

To test the system configuration, a simple test program is provided for each computer listed. After you have connected your computer and spectrum analyzer, you should enter and run the test program on your computer to make sure the computer is sending instructions to the spectrum analyzer through the interface cable. If the interface is working and the program is entered correctly, a statement is displayed on the computer screen.

| | |
|---|---|
| Note | The listed computer and spectrum analyzer equipment includes the minimum components necessary to establish communication between your spectrum analyzer and computer. If you are using application software, check with your software supplier for specific computer hardware and memory requirements. |

| | |
|---|---|
| Note | Using an interface cable other than the one listed with your computer's interconnection instructions may prevent proper communication between the spectrum analyzer and computer. |

Pressing CONFIG removes the spectrum analyzer from remote mode and enables front-panel control.



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# HP-IB Connections for the HP 9000 Series 200 Technical Computers

## Equipment

- HP 9816, 9826, or 9836 Series 200 technical computer
- HP 8590 Series spectrum analyzer with Option 041
- HP 10833 (or equivalent) HP-IB cable

## Interconnection Instructions

Connect the spectrum analyzer to the computer using the HP-IB cable. Figure l-l shows an HP 9836 computer connected to the spectrum analyzer.

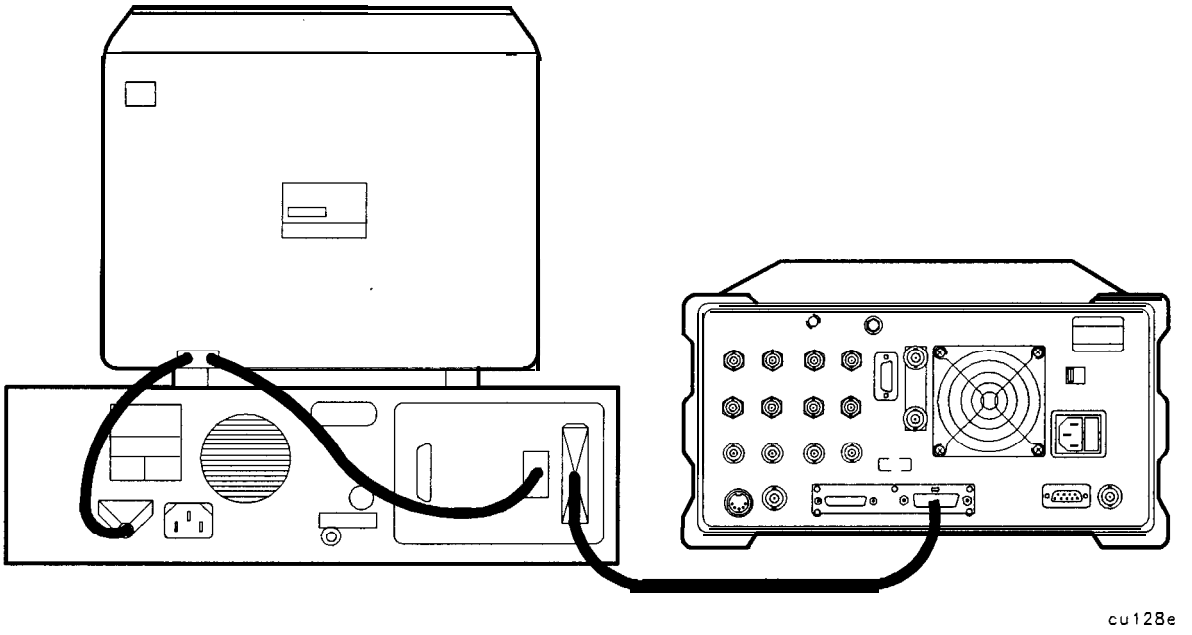



**Figure l-l. Connecting the HP 9000 Series 200 Computer to the Spectrum Analyzer**



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## Test Program

To test the connection between the computer and the spectrum analyzer, turn on your spectrum analyzer and follow the instructions below.

1. Your HP 9000 Series 200 computer may have either a soft-loaded or built-in language system. If your language system is built-in, remove any disks from the drives and turn on the computer.
2. If your language is soft-loaded, install the BASIC language disk into the proper drive. Turn the computer power on. After a few seconds, the `BASIC READY` message appears; the computer is now ready for use.

   For further information on loading BASIC on your system, consult your BASIC manual.
3. Check the HP-IB address of the spectrum analyzer: press (CONFIG), More 1 of 3 , **ANALYZER** ADDRESS . The usual address for the spectrum analyzer is 18. If necessary, reset the address of the spectrum analyzer: press (CONFIG), Mare 2 of 3 , **ANALYZER** ADDRESS , 18, (Hz) (or enter the appropriate address).
4. Enter the following program, then press (RUN) on the computer. If you need help entering and running the program, refer to your computer and software documentation.

The program shows that the computer is able to send instructions to, and read information from, the spectrum analyzer.

```
10 PRINTER IS 1
20  Analyzer=718
30 CLEAR Analyzer
40 OUTPUT Analyzer;"IP;SNGLS;"
50 OUTPUT Analyzer;"CF 300MZ;TS;"
60 OUTPUT Analyzer;"CF?;"
70 ENTER Analyzer;A
80 PRINT "CENTER FREQUENCY = ";A;"Hz";
90 END
```

The program tells the spectrum analyzer to perform an instrument preset and enter single-sweep mode. Next, the program sets the center frequency to 300 MHz and takes a sweep.

The program then queries the center frequency value and tells the computer to display `CENTERFREQUENCY= 3.0E+8 Hz.`

If the computer does not display the center frequency, refer to “If There is a Problem” at the end of this chapter.



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# HP-IB Connections for the HP 9000 Series 300 Technical Computers

## Equipment

- HP 98580A, 98581A, 98582A, or 98583A Series 300 technical computer
- HP 8590 Series spectrum analyzer with Option 041
- HP 10833 (or equivalent) HP-IB cable

## Interconnection Instructions

Connect the spectrum analyzer to the computer using the HP-IB cable as shown in Figure l-2.

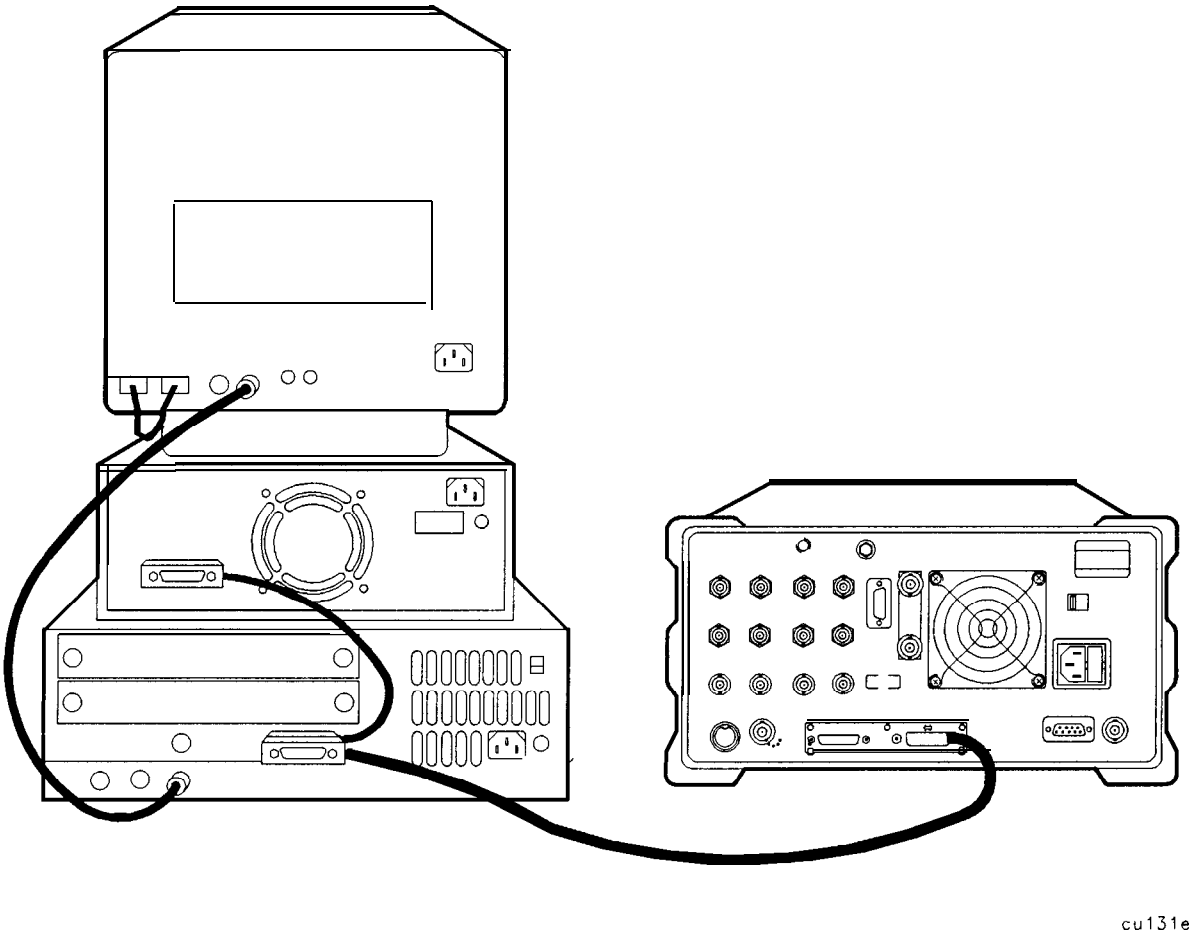



**Figure 1-2. Connecting the HP 9000 Series 300 Computer to the Spectrum Analyzer**



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## Test Program

To test the connection between the computer and the spectrum analyzer, turn on your spectrum analyzer and follow the instructions below.

1. Your HP 9000 Series 300 computer may have either a soft-loaded or built-in language system. If your language system is built-in, remove any disks from the drives and turn on the computer.
2. If your language is soft-loaded, install the BASIC language disk into the proper drive. Turn the computer power on. After a few seconds, the BASIC READY message appears; the computer is now ready for use.

   For further information on loading BASIC on your system, consult your BASIC manual.
3. Check the HP-IB address of the spectrum analyzer: press (CONFIG), More 1 of 3 , ANALYZER ADDRESS . The usual address for the spectrum analyzer is 18. If necessary, reset the address of the spectrum analyzer: press (CONFIG), More 1 of 3 , ANALYZER ADDRESS , (Hz) (or enter the appropriate address).
4. Enter the following program, then press (RUN) on the computer. If you need help entering and running the program, refer to your computer and software documentation.

The program shows that the computer is able to send instructions to, and read information from, the spectrum analyzer.

```
10 PRINTER IS 1
20  Analyzer=718
30  CLEAR  Analyzer
40  OUTPUT Analyzer ; "IP ; SNGLS ;"
50 OUTPUT Analyzer ; "CF 300MZ ; TS ;"
60 OUTPUT Analyzer ;"CF? ;"
70 ENTER Analyzer ;A
80 PRINT "CENTER FREQUENCY = ";A; "Hz" ;
90 END
```

The program tells the spectrum analyzer to perform an instrument preset and enter single-sweep mode. Next, the program sets the center frequency to 300 MHz and takes a sweep.

```
CENTERFREQUENCY=3.0E+8 Hz.
```

If the computer does not display the center frequency, refer to "If There is a Problem" at the end of this chapter.



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## HP-IB Connections for the HP Vectra Personal Computer

### Equipment

- HP Vectra personal computer, with option HP 82300B, the HP BASIC Language Processor
- HP 8590 Series spectrum analyzer with Option 041
- HP 10833 (or equivalent) HP-IB cable

### Interconnection Instructions

Connect the spectrum analyzer to the computer using the HP-IB cable as shown in Figure l-3.

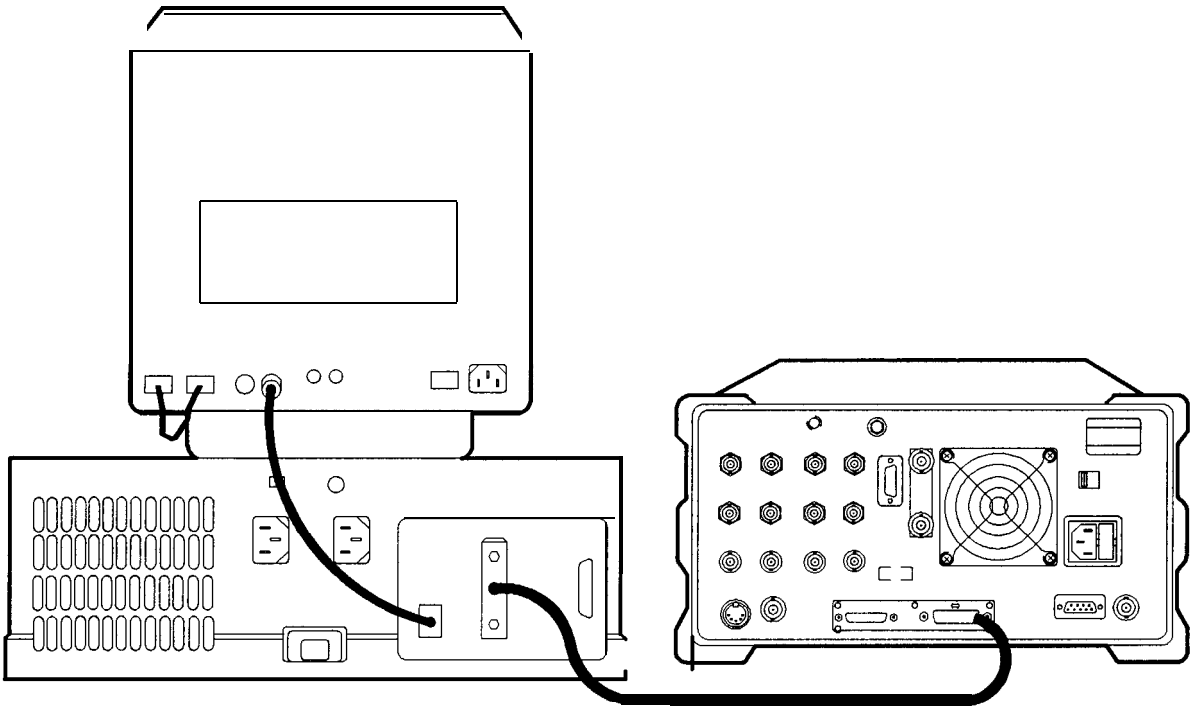



**Figure 1-3. Connecting the HP Vectra Personal Computer to the Spectrum Analyzer**



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## Test Program

To test the connection between the computer and the spectrum analyzer, turn on your spectrum analyzer and follow the instructions below.

1. Refer to the HP 82300 Language Processor documentation to install the language processor board in your computer and load the BASIC programming language into your computer.
2. Check the HP-IB address of the spectrum analyzer: press (CONFIG), More 1 of 3 , ANALYZER ADDRESS . The usual address for the spectrum analyzer is 18. If necessary, reset the address of the spectrum analyzer: press (CONFIG), Mare 1 of 3 , ANALYZER ADDRESS , 18 (Hz) (or enter the appropriate address).
3. Enter the following program, then press (F10) on the computer. If you need help entering and running the program, refer to your computer and software documentation.

The program shows that the computer is able to send instructions to, and read information from, the spectrum analyzer.

```
10 PRINTER IS 1
20  Analyzer=718
30  CLEAR  Analyzer
40  OUTPUT Analyzer;"IP;SNGLS;"
50 OUTPUT Analyzer;"CF 300MZ;TS;"
60 OUTPUT Analyzer;"CF?;"
70  ENTER  Analyzer;A
80 PRINT "CENTER FREQUENCY = ";A;"Hz";
90  END
```

The program tells the spectrum analyzer to perform an instrument preset and enter single-sweep mode. Next, the program sets the center frequency to 300 MHz and takes a sweep. The program then queries the center frequency value and tells the computer to display CENTERFREQUENCY=3.0E+8 Hz.

If the computer does not display the center frequency, refer to “If There is a Problem” at the end of this chapter.



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## RS-232 Connections for the HP Vectra or IBM PC/AT Personal Computer

### Equipment

- HP Vectra or IBM PC/AT personal computer
- HP 8590 Series spectrum analyzer with Option 043
- 9-pin 25-pin 25-pin
- HP 24542U 9-pin to 9-pin RS-232 cable for computers with a 9-pin female RS-232 port

**Note** Refer to Appendix C for information on wiring cables.

### Interconnection Instructions

1. Connect the spectrum analyzer to the computer using the RS-232 cable as shown in Figure l-4.

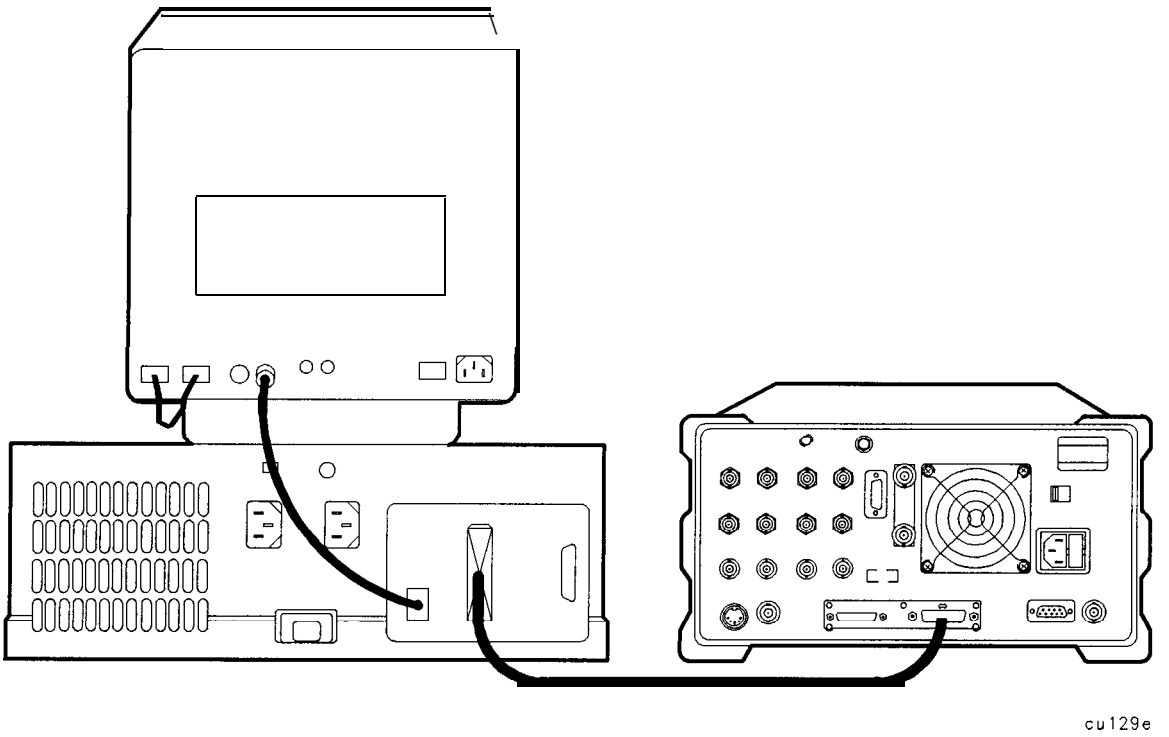



**Figure 1-4. Connecting the Personal Computer to the Spectrum Analyzer**

2. Turn on the spectrum analyzer and the computer.



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## Test Program

The program shown below is written to work with computers using BASICA (version 2.0 or later) or GW BASIC. To test the interconnection, first load the BASIC language for your computer and specify a communications buffer of 4096 bytes. Use the following command:

```
BASICA/C:4096
```

Set the spectrum analyzer baud rate to 9600, to match the baud rate set up for the computer port in the test program. In line 20, the "9600" indicates 9600 baud for the computer port. Press the following keys to set the baud rate: CONFIG, More 1 of 3 , BAUD RATE , 9600, (Hz).

Enter the following test program. The program shows that the computer is able to send instructions to, and read information from, the spectrum analyzer.

```
10 'File = TESTPGM
20 OPEN "COM1:9600,N,8,1" AS #1
30 PRINT #1,"IP;"
40 PRINT #1,"SNGLS;"
50 PRINT #1,"CF 300MZ;TS;"
60 PRINT #1,"CF?;"
70 INPUT #1,CENTER
80 PRINT,"CENTER FREQ = ";CENTER;"Hz"
90 END
```

When you have entered the program, type:

```
SAVE "TESTPGM"
```

When you are ready to run the program, turn on the spectrum analyzer and run your program.

The program tells the spectrum analyzer to perform an instrument preset and enter single sweep mode. Next, the program sets the center frequency to 300 MHz and takes a sweep. The program then queries the center frequency value and tells the computer to display CENTERFREQUENCY= 3.0E+8 Hz.

If the computer does not display the center frequency, refer to "If There is a Problem" at the end of this chapter.



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## Printing or Plotting

You may wish to obtain a permanent record of data displayed on the spectrum analyzer screen. This can be done using the COPY key of the spectrum analyzer, and a printer or plotter.

**Note** The HP 7470A plotter does not support 2 plots per page. If you use an HP 7470A plotter with an HP 8590 Series spectrum analyzer, you can select one plot per page or four plots per page, but not 2 plots per page.

### Printing Using an HP-IB Interface

#### Equipment

- HP 8590 Series spectrum analyzer equipped with Option 041
- HP 10833 (or equivalent) HP-IB cable
- Printer with HP-IB Interface, choose one of the following:
  - HP 2225 ThinkJet
  - HP 3630A PaintJet
  - HP 500 Series* DeskJet
  - HP 310* Portable DeskJet
  - HP LaserJet
  - MX-80 Epson
  - LQ-570 Epson

* Some models support color printing

#### Interconnection and Printing Instructions

1. Turn off the printer and the spectrum analyzer.
2. Connect the printer to the spectrum analyzer using the HP-IB cable. The HP ThinkJet printer's mode switches must be set correctly for use with the spectrum analyzer. Refer to Table l-l for the correct settings.

**Table l-l. Setting of HP ThinkJet Printer Mode Switches**

| Switch Number | Setting | Comments |
|---|---|---|
| 1 | down | Printer performs a carriage return only. |
| 2 | down | Printer performs a line feed only. |
| 3 | up | Sets the printer to skip paper perforations |
| 4 | down | Sets the printer for a paper length of 11 inches. |
| 5 | down | Sets the printer to HP MODE. |
| 6 | up | Sets the printer to USASCII. |
| 7 | down | |
| 8 | down | |



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| Note | Because HP-IB cables can be connected together, more than one instrument can communicate on the HP-IB. This means that both a printer and a plotter can be connected to the spectrum analyzer (using two HP-IB cables). Each device must have its own HP-IB address. |
|---|---|

| Note | Because the spectrum analyzer cannot print with two controllers (the computer and the spectrum analyzer) connected, the computer must be disconnected from the HP-IB. In most cases, it is sufficient to simply turn the computer OFF. |
|---|---|

3. Turn on the spectrum analyzer and printer.
4. On the spectrum analyzer, press (CONFIG), Print Conf **ig** , **Prn** Port **Config** , **PRN** PORT **HPIB** PAR (so that HPIB is underlined).
5. The printer usually resides at the first device address. To enter address 1 for the printer, press **PRINTER** ADDRESS , 1, (Hz).
6. Select the configuration for your printer by pressing the appropriate key. Note that the **softkey** is activated when the key title is underlined.

| | |
|---|---|
| Set **Colr** Printer | Press this key to print in color if the spectrum analyzer is connected to a Hewlett-Packard color printer, then select the appropriate printer.<br><br>Selecting any Hewlett-Packard printer results in three printouts per page prior to formfeeding the page.<br><br>One printout per page can be achieved by manually formfeeding each printout. |
| **Set B&W Printer** | Press this key to print in black and white, then press one of the following keys to select the appropriate printer mode.<br><br>. Press HP **B&W** PRINTER if the spectrum analyzer is connected to a Hewlett-Packard printer.<br><br>Selecting any Hewlett-Packard printer results in three printouts per page prior to formfeeding the page.<br><br>One printout per page can be achieved by manually formfeeding each printout.<br><br>. Press **HP B&W DJ540** if the spectrum analyzer is connected to a Hewlett-Packard DeskJet 540 printer. |



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. Press **EP MX80** SML **LRG** if the spectrum analyzer is connected to a MX-80 Epson or other compatible 9-pin print-head printer.

Pressing this key to underline SML will print two printouts to a softkey labels if desired. See step 7

Pressing this key to underline LRG will print only one printout to a softkey

. Press **EP LQ570** SML **LRG** if the spectrum analyzer is connected to a LQ-570 Epson or other compatible 24-pin print-head printer.

Pressing this key to underline SML will print two printouts to a page and will print softkey labels if desired. See step 7

Pressing this key to underline LRG will print only one printout to a page and will not print the softkey labels.

softkey labels to be printed with the spectrum analyzer display printout, press PRT **MENU** ON OFF so that ON is underlined. Note that this function does not work when **EP MX80 SML LRG** or El? **LQ570 SML LRG** are pressed to underline LRG.

8. Press Previous Menu, **COPY** DEV PRMT PLT (PRNT should be underlined), then (COPY).



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**Note** The HP 7470A plotter does not support 2 plots per page. If you use an HP 7470A plotter with an HP 8590 Series spectrum analyzer, you can select one plot per page or four plots per page, but not 2 plots per page.

## Equipment

- HP 8590 Series spectrum analyzer with Option 041.
- HP 10833 (or equivalent) HP-IB cable.
- Any of the following plotters:
  - HP 7440A ColorPro plotter with HP-IB
  - HP 7445A plotter with HP-IB
  - HP 7550A/B plotter with HP-IB

## Interconnection and Plotting Instructions

1. Turn off the plotter and the spectrum analyzer.
2. Connect the plotter to **the** spectrum analyzer using the HP-IB cable.

**Note** Because HP-IB cables can be connected together, more than one instrument can communicate on the HP-IB. This means that both a printer and a plotter can be connected to the spectrum analyzer (using two HP-IB cables). Each device must have its own HP-IB address.

**Note** Because the spectrum analyzer cannot plot with two controllers (the computer and the spectrum analyzer) connected, the computer must be disconnected from the HP-IB.

3. Turn on the spectrum analyzer and the plotter.
4. On the spectrum analyzer, press CONFIG, Plot Conf ig , Plt Port Config , PLT PORT HPIB PAR **(so that** HPIB is underlined).
5. The plotter usually resides at the fifth device address. To set the plotter address, press PLOTTER ADDRESS , 5, (Hz), to enter the address 5 for the plotter.



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6. With PLTS/PG 1 2 4 , you can choose a full-page, half-page, or quarter-page plot. Press PLTS/PG 1 2 4 to underline the number of plots per page desired.

7. If two or four plots per page are chosen, a function is displayed that allows you to select the location on the paper for the plotter output. If two plots per page are selected, then PLT [] LOC _ _ function is displayed. If four plots per page are selected, then PLT [] _ LOC _ _ is displayed. Press the softkey until the rectangular marker is in the desired section of the softkey label. The upper and lower sections of the softkey label graphically represent where on the page the plotter output will be located.

Note

For a multi-pen plotter, the pens of the plotter draw the different components of the screen as follows:

| Pen Number | Description |
|---|---|
| 1 | Draws the annotation and graticule. |
| 2 | Draws trace A. |
| 3 | Draws trace B. |
| 4 | Draws trace C and the display line. |
| 5 | Draws user-generated graphics and the lower-limit line. |
| 6 | Draws the upper-limit line. |

8. Press Previous Menu, COPY DEV PRNT PLT (PLT should be underlined), then COPY.

Note

Once the address of the printer and plotter have been entered, the spectrum

There is no need to reenter them when the spectrum analyzer is turned off and on.



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## Printing Using an RS-232 Interface

### Equipment

- HP 8590 Series spectrum analyzer with Option 043.
- One of the following cables:
  - HP 245426 9-pin to 25-pin RS-232 cable
  - HP 24542U 9-pin (f) to 9-pin (f) RS-232 cable
  - •I HP C2932A 9-pin (f) to 9-pin (m) RS-232 cable (for use with LaserJet 4P and 4Plus)
- Printer with RS-232 Interface, choose one of the following:
  - •I HP 500 Series* DeskJet
  - HP 2225 ThinkJet
  - HP 3630A PaintJet
  - MX-80 Epson
  - LQ-570 Epson
  - HP LaserJet

* Some models support color printing

### Interconnection and Printing Instructions

1. Turn off the spectrum analyzer and the printer.

---

**Note** The RS-232 interface allows only one device (either the printer or the plotter) to be connected to the spectrum analyzer. Refer to the Appendix C for more information on RS-232 protocol and cable wiring.

---

2. Connect the printer using an RS-232 cable.
3. Turn on the spectrum analyzer and printer.
4. Press (CONFIG), Print Config , Pm Port Config , PRN PORT SER PAR (so that SER is underlined).
5. To set the baud rate to 9600 baud, press BAUD RATE, 9600, (Hz). To set the baud rate to 1200 baud, press: BAUD RATE, 1200, (Hz).

---

**Note** Some of the programs in this manual utilize 1200 baud. If your system uses the RS-232 handshake lines, you can use 9600 baud for all of the programs.

---

6. Press (CONFIG), Print Config .



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7. Select the configuration for your printer by pressing the appropriate key. Note that the softkey is activated when the key title is underlined.

Set Colr Printer — Press this key to print in color if the spectrum analyzer is connected to a Hewlett-Packard color printer, then select the appropriate printer.

Selecting any Hewlett-Packard printer results in three printouts per page prior to formfeeding the page.

One printout per page can be achieved by manually formfeeding each printout.

Set B&W Printer — Press this key to print in black and white, then press one of the following keys to select the appropriate printer mode.

. Press HP B&W PRINTER if the spectrum analyzer is connected to a Hewlett-Packard printer.

Selecting any Hewlett-Packard printer results in three printouts per page prior to formfeeding the page.

One printout per page can be achieved by manually formfeeding each printout.

. Press HP B&W DJ540 if the spectrum analyzer is connected to a Hewlett-Packard DeskJet 540 printer.

. Press EP MX80 SML LRG if the spectrum analyzer is connected to a MX-80 Epson or other compatible 9-pin print-head printer.

Pressing this key to underline SML will print two printouts to a page and will print softkey labels if desired. See step 8.

Pressing this key to underline LRG will print only one printout to a page and will not print the softkey labels.

. Press EP LQ570 SML LRG if the spectrum analyzer is connected to a LQ-570 Epson or other compatible 24-pin print-head printer.

Pressing this key to underline SML will print two printouts to a page and will print softkey labels if desired. See step 8.

Pressing this key to underline LRG will print only one printout to a page and will not print the softkey labels.

8. If you want the softkey labels to be printed with the spectrum analyzer display printout, press PRT MENU ON OFF so that ON is underlined. Note that this function does not work when EP MX80 LRG or EP LQ570 LRG is pressed.

9. Press Previous Menu, COPY DEV PRNT PLT (PRNT should be underlined), then COPY.



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## Plotting Using an RS-232 Interface

### Equipment

- HP 8590 Series spectrum analyzer with Option 043.
- HP 245426 9-25 pin RS-232 cable
- HP C2932A 9-9 pin RS-232 cable (for use with LaserJet 4P and 4Plus)
- Any of the following Plotters:
  - HP 7440A ColorPro plotter with an RS-232 interface.
  - HP 7445A plotter with an RS-232 interface.
  - HP 7550A/B plotter with an RS-232 interface.

### Interconnection and Plotting Instructions

1. Turn off the spectrum analyzer.

---

**Note** The RS-232 interface allows only one device (either the printer or the plotter) to be connected to the spectrum analyzer. Refer to the Programmer's Guide for more information on RS-232 protocol and cable wiring.

---

2. Connect the plotter using an RS-232 cable.
3. Turn on the spectrum analyzer and the plotter.
4. Press CONFIG, Plot **Config**, **Plt** Port **Config**, PLT PORT **SER** PAR (so that SER is underlined).
5. lb set the baud rate to 1200 baud, press: **BAUD** RATE, 1200, [Hz).
6. Press CONFIG, Plot **Config**. You can choose a full-page, half-page, or quarter-page plot with the **PLTS/PG** 1 2 4 softkey. Press **PLTS/PG** 1 2 4 to underline the number of plots per page desired.
7. If two or four plots per page are chosen, a function is displayed that allows you to select the location on the paper of the plotter output. If two plots per page are selected, then **PLT** [] **PLT** [] _ **LOC** _ _ function is displayed. If four plots per page are selected, then **LOC** _ _ is displayed. Press the **softkey** until the rectangular marker is in the desired section of the **softkey** label. The upper and lower sections of the **softkey** label graphically represent where on the page the plotter output will be located.



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Note

For a multi-pen plotter, the pens of the plotter draw the different components of the screen as follows:

| Pen Number | Description |
|---|---|
| 1 | Draws the annotation and graticule. |
| 2 | Draws trace A. |
| 3 | Draws trace B. |
| 4 | Draws trace C and the display line. |
| 5 | Draws user-generated graphics and the lower-limit line. |
| 6 | Draws the upper-limit line. |

8. Press Previous Menu, COPY DEV PRNT PLT (so that PLT is underlined), then COPY.

## Printing after Plotting or Plotting after Printing

Pressing COPY without changing COPY DEV PRNT PLT produces the function last entered (a print or a plot).

. To print after doing a plot, press CONFIG, COPY DEV PRNT PLT (so that PRNT is underlined), then COPY.

. To plot after printing, press CONFIG, COPY DEV PRNT PLT (so that PLT is underlined), and COPY.



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## Printing Using a Parallel Interface

### Equipment

- HP 8590 Series spectrum analyzer equipped with Option 041 or 043.
- HP C2950A parallel printer cable.
- Printer with parallel interface, choose one of the following:
  - HP 310* Portable DeskJet
  - HP 3630A PaintJet
  - HP 500 Series* DeskJet
  - •1 HP LaserJet
  - LQ-570 Epson
  - MX-80 Epson

* Some models support color printing

## Interconnection and Printing Instructions

1. Turn off the printer and the spectrum analyzer.
2. Connect the printer to the spectrum analyzer using the parallel printer cable.
3. Turn on the spectrum analyzer and printer.
4. On the spectrum analyzer, press CONFIG, Print Config , Pm Port Config , PRN PORT HPIB PAR (for Option 041, so that PAR is underlined) or PRN PORT SER PAR (for Option 043, so that PAR is underlined).
5. Select the configuration for your printer by pressing the appropriate key. Note that the softkey is activated when the key title is underlined.

   Set Colr Printer — Press this key to print in color if the spectrum analyzer is connected to a Hewlett-Packard color printer, then select the appropriate printer.

   Selecting any Hewlett-Packard printer results in three printouts per page prior to formfeeding the page.

   One printout per page can be achieved by manually formfeeding each printout.



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Set B&W Printer

Press this key to print in black and white, then press one of the following keys to select the appropriate printer mode.

. Press HP B&W PRINTER if the spectrum analyzer is connected to a Hewlett-Packard printer.

Selecting any Hewlett-Packard printer results in three printouts per page prior to formfeeding the page.

One printout per page can be achieved by manually formfeeding each printout.

- Press HP B&W DJ540 if the spectrum analyzer is connected to a Hewlett-Packard DeskJet 540 printer.

. Press EP MX80 SML LRG if the spectrum analyzer is connected to a MX-80 Epson or other compatible 9-pin print-head printer.

Pressing this key to underline SML will print two printouts to a page and will print softkey labels if desired. See step 7

Pressing this key to underline LRG will print only one printout to a page and will not print the softkey labels.

- Press EP LQ570 SML LRG if the spectrum analyzer is connected to a LQ-570 Epson or other compatible 24-pin print-head printer.

Pressing this key to underline SML will print two printouts to a page and will print softkey labels if desired. See step 7

Pressing this key to underline LRG will print only one printout to a page and will not print the softkey labels.

6. If you want the softkey labels to be printed with the spectrum analyzer display printout, press PRT MENU ON OFF so that ON is underlined. Note that this function does not work when EP MX80 SML LRG or EP LQ570 SML LRG are pressed to underline LRG.

7. Press Previous Menu, COPY DEV PRNT PLT (PRNT should be underlined), then COPY.



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## Plotting to an HP LaserJet Printer

### Equipment

- HP 8590 Series spectrum analyzer with RS-232 or Parallel Interface
- HP 245426 9-pin to 25-pin RS-232 cable
- HP C2932A 9-pin (f) to 9-pin (m) RS-232 cable (for use with LaserJet 4P and 4Plus)
- HP C2950A parallel printer cable
- Any of the following HP LaserJets:
  - HP LaserJet III
  - HP LaserJet IIIP
  - •I HP LaserJet 4
  - HP LaserJet 4L
  - HP LaserJet 4P
  - HP LaserJet 4Plus

## Interconnection and Plotting Instructions

1. Turn off the spectrum analyzer.

| Note | The RS-232 or parallel interface allow only one device (either the printer or the plotter) to be connected to the spectrum analyzer. Refer to the Programmer's Guide for more information on protocol and cable wiring. |
|---|---|

2. Connect the HP LaserJet to the analyzer.
3. Turn on the analyzer and the HP LaserJet printer.
4. Press CONFIG.
5. Press COPY DEV PRNT PLT so that PLT is underlined.
6. Press CONFIG, Plot Config . You can choose a full-page, half-page, or quarter-page plot with the PLTS/PG 1 2 4 softkey. Press PLTS/PG 1 2 4 to underline the number of plots per page desired.
7. If two or four plots per page are chosen, a function is displayed that allows you to select the location on the paper of the plotter output. If two plots per page are selected, then PLT [] LOC _ _ function is displayed. If four plots per page are selected, then PLT [] _ LOC _ _ is displayed. Press the softkey until the rectangular marker is in the desired section of the softkey label. The upper and lower sections of the softkey label graphically represent where on the page the plotter output will be located.
8. Press PLT->LJT ON OFF so that ON is underlined.
9. Then press COPY.



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## Printing after Plotting or Plotting after Printing

Pressing COPY without changing COPY DEV PRNT PLT produces the function last entered (a print or a plot).

- To print after doing a plot, press CONFIG, COPY DEV PRNT PLT (so that PRNT is underlined), then COPY.
- To plot after printing, press CONFIG, COPY DEV PRNT PLT (so that PLT is underlined), and COPY.



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## If There Is a Problem

This section offers suggestions to help get your computer and spectrum analyzer working as a system. The test programs provided in this chapter let you know if the connection between the computer and the spectrum analyzer interconnection is working properly.

If the test program does not run, try the following suggestions:

1. You may need to modify the program syntax to work with your computer. Refer to your BASIC manual for correct syntax.
2. The program must be executed correctly. Refer to your computer manual for information about program execution.
3. Check your program for errors.

If the test program runs on the computer, but the spectrum analyzer does not respond, try the following suggestions:

1. Make sure the spectrum analyzer is turned on. If the spectrum analyzer has power, the green indicator light above the line switch is on.
2. Make sure the interface cable is connected securely. Check the interface cable for defects. Make sure the correct cable is used.
3. If you are using an HP-IB interface, the spectrum analyzer must be set to the correct address setting. Press CONFIG, More 1 of 3 , ANALYZER **ADDRESS** .
4. If you are using the RS-232 interface, check the spectrum analyzer baud rate. Refer to Appendix C for information about setting the baud rate on the spectrum analyzer.
5. If a program in user memory is suspected of causing problems, use CONFIG, More 1 of 3 , Dispose User **Mem** , ERASE DLP MEM , ERASE DLP MEM . (ERASE DLP MEM requires a double key press.) ERASE DLP **MEM** erases all user programs, variables, personalities (which are usually in the form of downloadable programs), and user-defined traces that are in spectrum analyzer memory.
6. If you wish to reset the spectrum analyzer configuration to the state it was in when it was originally shipped from the factory, use DEFAULT **CONFIG** . To access **DEFAULT CONFIG** , press CONFIG, More 1 of 3, DEFAULT **CONFIG** , DEFAULT **CONFIG** . (DEFAULT **CONFIG** requires a double key press.)

If you suspect your computer is causing the problems, check it by running a program that you know works. If your system still has problems, contact the sales and service office nearest you. Your salesperson will either be able to help solve the problem or refer you to someone who can.



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# 2

# Writing a Program

## What You'll Learn in This Chapter

This chapter introduces spectrum analyzer programming. The first section of this chapter, "Writing Your First Program," helps you write your first spectrum analyzer program and introduces programming fundamentals. The second section, "Getting Information from the Spectrum Analyzer," shows how to get data out of the spectrum analyzer. A summary at the end of this chapter reviews the programming guidelines introduced.

If the computer is not connected to the spectrum analyzer, follow the instructions in Chapter 1, "Preparing for Use."

A general knowledge of the BASIC programming language and the spectrum analyzer is recommended before reading this chapter. Refer to your software documentation manuals for more information about BASIC. For reference, Chapter 5 of this manual provides spectrum analyzer commands in alphabetical order.

| Note | All programming examples in this chapter for the HP-IB interface are written in HP BASIC 4.0, using an HP 9000 Series 200 computer. For the RS-232 interface, examples are written in GW BASIC, using an HP Vectra personal computer or compatible controller. |
|---|---|



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## Writing Your First Program

When the spectrum analyzer has been connected to a computer via HP-IB or RS-232 interface, the computer can be used to send instructions to the spectrum analyzer. These instructions tell the spectrum analyzer such things as frequency span, resolution bandwidth, and sweep mode. If a properly selected sequence of instructions is sent to the spectrum analyzer, a measurement is made. Sequences of coded instructions are called programs.

### Composing the. Program

Most spectrum analyzer programs contain several common statements, or "commands," that address the spectrum analyzer, preset it, and select its sweep mode. As an example, we will write a short program that executes only these common commands.

The following programs are for the HP-IB and the RS-232 interfaces. Note the quotation marks that contain spectrum analyzer commands in each line. Also note the semicolons at the end of each line, inserted at the end of each set of spectrum analyzer commands within the quotation marks. Using semicolons makes programs easier to read, prevents command misinterpretation, and is recommended by IEEE Standard 728.

**Note** In commands where quotation marks occur, the computer recognizes data as character data and not BASIC programming language commands.

### Program Example for the HP-IB Interface

```
05  !File:  "IBPROG1"

20  CLEAR  Analyzer
30 OUTPUT Analyzer;"IP;"
40 OUTPUT Analyzer;"SNGLS;TS;"
50 LOCAL 7
60 END
```

Line 10 of our program assigns a variable called "Analyzer" to our spectrum analyzer at address 718. This instruction is followed by the HP BASIC CLEAR command, which resets the spectrum analyzer on the HP-IB. With these two program lines, we have set up a clear communication path between the computer and the spectrum analyzer.

Line 30 introduces the instrument preset (IP) command, which corresponds to the PRESET key on the spectrum analyzer. The IP command sets all of the analog parameters of the spectrum

**Note** All **softkey** functions on the spectrum analyzer have corresponding programming commands. As you continue programming, you will learn the command names that correspond to the front-panel keys and softkeys.

Line 40 activates the single-sweep mode. Most remotely controlled measurements require control of the sweep. Once SNGLS has activated the single-sweep mode, take sweep (TS) starts and completes one full sweep. TS maintains absolute control over the sweep, which is necessary for accurate computer data transfer and reduced program execution time.

Before we end the program, we return the spectrum analyzer to front-panel control with line 50, LOCAL 7. The LOCAL command corresponds to the CONFIG (LOCAL) key on the front panel of the spectrum analyzer. (LOCAL 7 commands everything on the bus to go to local mode.)



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Finally, in line 60, we end the program with the END command. (If you forget to include the END command, the computer will give an error message.)

Enter the program lines, press (RUN) on the computer, and watch the spectrum analyzer display as it completes each instruction.

## Program Example for the RS-232 Interface

```
10 'File = 232PROGl
20 OPEN "COM1: 9600,N,8,1" AS #1
30 PRINT #1,"IP;"
40 PRINT #1,"SNGLS;TS;"
50 END
```

Line 20 of the program opens the RS-232 COM1: line, identifies it as #1, and sets the RS-232 parameters as follows:

```
9600 baud
no parity
8 bits/character
1 stop bit
```

Line 30 of the program introduces the instrument preset (IP) command, which corresponds to the (PRESET) key on the spectrum analyzer. The IP command sets all of the analog parameters of the spectrum analyzer to known values and provides a good starting point for every measurement.

**Note** All softkey functions on the spectrum analyzer have corresponding programming commands. As you continue programming, you will learn the command names that correspond to the front-panel keys and softkeys.

Line 40 activates the single-sweep mode. Most remotely controlled measurements require control of the sweep. Once SNGLS has activated the single-sweep mode, take sweep (TS) starts and completes one full sweep. The TS command maintains absolute control over the sweep, which is necessary for accurate computer data transfer and reduced program execution time. Finally, in line 50, end the program with the END command.

Make sure that the spectrum analyzer baud rate is 9600 via the BAUD RATE softkey. Enter the program lines, then press (RUN) on the computer. Watch the spectrum analyzer display as it completes each instruction.

**Note** When using an HP 9000 Series 200 or 300 computer, END commands are necessary. Refer to your BASIC manual to determine END statement requirements for your specific computer.



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## Modifying the Program

Remote operation of the spectrum analyzer is similar to manual operation. Remote measurements are executed by commands that correspond to front-panel keys and softkeys.

The first chapter in the spectrum analyzer operating manual shows you how to make a simple measurement using the calibration signal. We can add instructions to our program so that it will make the same measurement. (Because the manual process closely resembles that of the program, you may want to review the chapter entitled "Making a Measurement" in the *HP 8590 E-Series and L.-S&es Spectrum Analyzers User's Guide.)*

By inserting a few lines into the initial program, we can set functions such as the center frequency and span, and we can activate a marker to find a signal's frequency and amplitude.

### Program Example for the HP-IB Interface

First, we set the center frequency to 300 MHz. The CF command corresponds to the center frequency function, CENTER FREQ . (All spectrum analyzer commands, such as CF, are described in Chapter 5.)

Insert the following program line between lines 40 and 50:

```
41 OUTPUT Analyzer;"CF 300MZ;"
```

Next, we set the span to 200 MHz with the SP command. Add the following program line:

```
42 OUTPUT . Analyzer;"SP 200MZ;"
```

Because we are controlling the sweep, we must update the spectrum analyzer display screen with the following program line:

```
43 OUTPUT Analyzer;"TS;"
```

When the program is executed, the spectrum analyzer takes one full sweep before executing line 41. Line 41 changes the center frequency to 300 MHz, and line 42 changes the span to 200 MHz.

Enter the following program line to place a marker at the highest peak on the trace with a MKPK HI command:

```
44 OUTPUT Analyzer:"MKPK HI;"
```

The completed program is shown below:

```
05  !File: "IBPROG2"
10 Analyzer=718
20 CLEAR Analyzer
30 OUTPUTAnalyzer;"IP;"
40 OUTPUTAnalyzer;"SNGLS;TS;"
41 OUTPUT Analyzer;"CF 300MZ;"
42 OUTPUT Analyzer;"SP 200MZ;"
43 OUTPUTAnalyzer;"TS;"
44 OUTPUT Analyzer;"MKPK HI;"
50 LOCAL 7
60 END
```

Run the program to make the measurement. Watch the spectrum analyzer display as it completes each instruction. Notice that the program executes the instructions faster than is possible from the front panel.



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When a certain measurement is repeated often, a computer program can save time. In addition, the computer is less likely to make an error than an operator manually entering the same instructions from the front panel.

## Program Example for the RS-232 Interface

First, we set the center frequency to 300 MHz. The CF command corresponds to the center frequency function, **CENTER FREQ** . (All spectrum analyzer commands, such as CF, are described in Chapter 5.)

Insert the following program lines between lines 40 and 50 of the previous program.

```
41 PRINT #1,"CF 300MZ;"
```

Next, set the span to 200 MHz with the SP command. Add the following program line:

```
42 PRINT #1,"SP 200MZ;"
```

Because we are controlling the sweep, we must update the spectrum analyzer display with the following program line:

```
43 PRINT #1,"TS;"
```

When the program is executed, the spectrum analyzer takes one full sweep before executing line 41. Line 41 changes the center frequency to 300 MHz. Line 42 changes the span to 200 MHz.

Enter the following program line to place a marker at the highest peak on the trace:

```
44 PRINT #1,"MKPK HI;"
```

The completed program is shown below:

```
10 'File = 232PROG2
20 OPEN "COM1:9600,N,8,1" AS #1
30 PRINT #1,"IP;"
40 PRINT #1,"SNGLS;TS;"
41 PRINT #1,"CF 300MZ;"
42 PRINT #1,"SP 200MZ;"
43 PRINT #1,"TS;"
44 PRINT #1,"MKPK HI;"
50 END
```

Run the program to make the measurement. Watch the spectrum analyzer display as it completes each instruction. When a certain measurement is repeated often, a computer program can save time. Also, the computer is much less likely to make an error than an operator manually entering the same instructions from the front panel.



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## Enhancing the Program with Variables

In the last program, specific center frequency and span values were set. By modifying the program, we can cause different values to be set each time the program is run.

### Program Example for the HP-IB Interface

In the following program, the exclamation point (!) allows the words that follow to be ignored by the computer. Thus, they serve as comments in the program.

```
10   !FILE: "VAR10"
20 REAL C_freq,S_pan !define the variables
30 Analyzer=718
40 CLEAR Analyzer
50 OUTPUT Analyzer;"IP;SNGLS;TS;"
60   !ask for the desired center frequency:
70   INPUT "CENTER FREQUENCY (MHz)?",C-f req
80    !ask for the desired span:
90 INPUT "SPAN(MHz)?",S_pan
100  !send the center frequency and span to the
110  !analyzer and take a sweep to update the
120  !analyzer screen:
130 OUTPUT Analyzer;"CF";C_freq;"MZ;"
140 OUTPUT Analyzer;"SP";S_pan;"MZ ;"
150 OUTPUT Analyzer ;"TS;"
160  !find the signal peak with peak search:
170 OUTPUT Analyzer ;"MKPK HI ;"
180 LOCAL 7
190 END
```

Three modifications are made to the previous program so it includes center frequency and span variables. First, using the HP BASIC REAL command, we define two variables, C-freq and S-pan. The frequency and span parameters are stored in these variables. (Refer to line 20.)

Second, using the HP BASIC INPUT command, we prompt the user to enter the desired center frequency and span. The center frequency and span values are entered on the computer; because the measurement units will be entered by the program, the user does not enter them. (See lines 70 to 140.)

Third, we modify the output parameter statements so that the values stored in C_freq and S-pan are sent to the spectrum analyzer. (See lines 130 to 140.)

A sweep is taken after the parameters are sent to the spectrum analyzer, to ensure that the spectrum analyzer screen is updated before the marker is placed on the highest signal peak.



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## Program Example for the RS-232 Interface

In the following program, the apostrophe (') allows the words that follow to be ignored by the computer. Thus, they serve as comments in the program.

```
10 'File = 232PROG3
20 OPEN "COM1:9600,N,8,1" AS #1
30 PRINT #1,"IP;"
40 PRINT #1,"SNGLS;TS;"
50 'Ask for the center frequency and span
60 PRINT "INPUT THE CENTER FREQUENCY (MZ) ";
70 INPUT CENTER
80 PRINT "INPUT THE SPAN (MZ) ";
90 INPUT SPAN
100 'Send center freq and span to spectrum analyzer
110 'take a sweep to update screen
120 PRINT #1,"CF ";CENTER;"MZ;"
130 PRINT #1,"SP ";SPAN;"MZ;"
140 PRINT #1,"TS;"
150 'find the signal peak with peak search
160 PRINT #1,"MKPK HI;"
170 END
```

Three modifications are made to the previous program in order to include center frequency and span variables. First, we use two variables, CENTER and SPAN, to store the frequency and span parameters.

Second, using the BASIC INPUT command, we ask the computer operator to enter the desired center frequency and span. (See lines 70 and 90 in previous program example). Next, we modify the output parameter statements so that the values stored in the CENTER and SPAN variables are sent to the spectrum analyzer. (See lines 120 and 130.) A sweep is taken after the parameters are sent to the spectrum analyzer, to ensure that the spectrum analyzer screen is updated before the marker is placed on the highest signal peak.



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## Getting Information from the Spectrum Analyzer

The first part of this chapter demonstrated techniques for setting spectrum analyzer parameters. This section demonstrates a technique for getting information out of the spectrum analyzer.

For example, in the second program of this chapter, we placed a marker at the highest peak of a trace and the value of the marker could be read in the upper right-hand corner of the spectrum analyzer display. In the following program, we will add some commands that will read the marker's frequency and amplitude value and return those values to the computer.

### Program Example for the HP-IB Interface

```
10   ! FILE :"MKR"
20  REAL  A_mpmarker,F_reqmarker !define variables
30  Analyzer=718
40 OUTPUT Analyzer;"IP;"
50   !set the output format of the spectrum analyzer for
60   !real numbers:
70 OUTPUT Analyzer;"TDF P;"
80   ! set the spectrum analyzer parameters:
90 OUTPUT Analyzer;"SNGLS;"
100 OUTPUT Analyzer;"CF 300MZ ;"
110 OUTPUT Analyzer ;"SP 200MZ ;"
120 OUTPUT Analyzer;"TS;"
130 OUTPUT Analyzer;"MKPK HI ;"
140   !ask the spectrum analyzer for the marker's
150   !amplitude value:
160 OUTPUT Analyzer ;"MKA?;"
170   !send the amplitude value to the computer:
180 ENTER Analyzer;A_mpmarker
190   !ask the spectrum analyzer for the marker's
200   !frequency value:
210  OUTPUT Analyzer; "MKF?;"
220   !send the frequency value to the computer:
230 ENTER Analyzer;F_reqmarker
240   !print the amplitude and frequency:
250 PRINT "THE SIGNAL PEAK IS ";A_mpmarker ;
260 PRINT "dBm AT "; F_reqmarker/1.E+6;" MHz"
270   !set the spectrum analyzer to continuous sweep mode:
280 OUTPUT Analyzer; "CONTS;"
290 LOCAL 7
300  END
```

First, using the HP BASIC REAL command, we define two variables, A_mpmarker and F-reqmarker. The amplitude and frequency values of the marker are stored in these variables. (See line 20.)

Second, we set the output format of the spectrum analyzer for real numbers with the spectrum analyzer's trace data format (TDF) command. (See line 70.) As in our original program, we set the center frequency and span values. A sweep is taken and the marker is placed on the trace.

Next, we ask the spectrum analyzer for the amplitude value of the marker. We have the spectrum analyzer send the marker amplitude value to the computer. Note that there can be only one spectrum analyzer query per programming line. We also ask the spectrum analyzer for the frequency value of the marker, and we have the spectrum analyzer send the marker frequency value to the computer. (See lines 100 through 230.)



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Finally, we print the values on the computer screen:

```
"THE SIGNAL PEAK IS . . . dBm AT . . . MHz"
```

Before we end the program, we return the spectrum analyzer to continuous-sweep mode and local control.

## Program Example for the RS-232 Interface

```
10 'File = 232PROG4
20 OPEN "COM1:9600,N,8,1" AS #1
30 PRINT #1,"IP;"
40 'Set the output format of the spectrum analyzer for
50 'real numbers
60 PRINT #1,"TDF P;"
70 'set the spectrum analyzer's parameters
80 PRINT #1,"SNGLS;"
90 PRINT #1,"CF 300MZ;"
100 PRINT #1,"SP 200MZ;"
110 PRINT #1,"TS;"
120 PRINT #1,"MKPK HI;"
130 'ask the spectrum analyzer for the marker's
140 'amplitude value
150 PRINT #1,"MKA?;"
160 'get the amplitude from the spectrum analyzer
170 INPUT #l,AMPMARKER
180 'ask the spectrum analyzer for the marker's frequency value
190 PRINT #1,"MKF?;"
200 'get the frequency value from the spectrum analyzer
210 INPUT #l,FREQMARKER
220 'print the amplitude and frequency
230 PRINT "THE SIGNAL PEAK IS ";AMPMARKER;
240 PRINT " dbm AT ";FREQMARKER/1000000!;" MZ"
250 'set the spectrum analyzer to continuous sweep mode
260 PRINT #1,"CONTS;"
270 END
```

First, set the output format of the spectrum analyzer to real numbers with the spectrum analyzer's trace data format (TDF) command (line 60).

As in the original program, the center frequency and span values are set and a sweep is taken. Next, the marker is placed on the trace.

Two additional variables are used for AMPMARKER and FREQMARKER. The amplitude and frequency values of the marker are stored in these variables (lines 170 and 210). The program requests the amplitude and frequency values of the marker (lines 150 and 190). Note that there can be only one spectrum analyzer query per programming line.

Finally, the amplitude and frequency values are displayed on the computer screen:

```
"THE SIGNAL PEAK IS . . . dBM AT . . . MZ"
```



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## Programming Guidelines

1. Perform the measurement manually, keeping track of the sequence of functions used.
2. In the written program, execute an instrument preset (IP) and set single-sweep mode (SNGLS) before setting other spectrum analyzer functions.
3. Use variables for function values. List variables at the beginning of the program,
4. Activate spectrum analyzer functions in logical order. Place quotation marks around spectrum analyzer commands. Separate commands with semicolons.
5. After setting spectrum analyzer functions, execute a take sweep (TS) command before reading data or activating markers.
6. The spectrum analyzer can return only one value per programming line. Do not have more than one query per programming line.
7. Use the exclamation point (!) to include comment lines when using HP BASIC. Use the apostrophe (') or REM to create comment lines when using GW BASIC. (The use of the exclamation point and the apostrophe to create comment lines are dependent on the

   your system.)



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# 3

# Programming Topics

## What You'll Learn in This Chapter

This chapter contains the following advanced programming techniques and topics.

- An example of moving and saving trace data from the spectrum analyzer into the computer.
- An example of how spectrum analyzer states are saved with the computer, then returned to the spectrum analyzer.
- An example of reading trace data from a computer disk.
- An example of saving and recalling instrument states.
- An example of returning the spectrum analyzer to its former state.
- An example of remotely measuring harmonic distortion.
- A summary of using different formats for trace data transfers.

Many of the programming suggestions discussed in Chapter 2, "Writing a Program," have been incorporated into the programs in this chapter.

---

Note  Ail programming examples for the HP-IB interface in this chapter are written in HP BASIC 4.0. For the RS-232 interface, examples are written in GW BASIC.

---

A general knowledge of the BASIC programming language is recommended before reading this chapter. (Refer to your software documentation manuals.) Chapter 5 of this manual, "Programming Commands," defines spectrum analyzer commands alphabetically.



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## Controlling Trace Data with a Computer

Using sample programs, this section shows you how to read trace data and store the data with your computer.

### Reading Trace Data

The following program, which has been annotated with comments, reads a trace from the spectrum analyzer and stores the trace data in a variable.

### Program Example for the HP-IB Interface

```
10 !FILE: "IBPROG5"
20  !create a 401 point trace array:
30 REAL Trace_a(1:401)
40  Analyzer=718
50 OUTPUT Analyzer;"IP;"
60  !set the output format of the spectrum analyzer for
70  !real numbers:
80 OUTPUT Analyzer ;"TDF P ;"
90  !set the spectrum analyzer parameters:
100 OUTPUT Analyzer; "SNGLS;"
110  OUTPUT Analyzer ;"CF 300MZ ;"
120 OUTPUT Analyzer ;"SP 200MZ ;"
130 OUTPUT Analyzer ;"TS ;"
140 OUTPUT Analyzer; "MKPK HI ; "
150  !move peak to center of spectrum analyzer screen:
160  OUTPUT Analyzer ;"MKCF;"
170 OUTPUT Analyzer ;"TS ;"
180  !ask the spectrum analyzer for trace data:
190 OUTPUT Analyzer ;"TRA?;"
200  !send the trace data to the computer:
210 ENTER Analyzer;Trace_a(*)
220 OUTPUT Analyzer ;"CONTS;"
230 LOCAL 7
240 END
```

Trace data can be read with the computer by making three changes to the program created in Chapter 2. First, we modify the program to create a 401-point trace array, called Trace-a, in which the trace data will be stored. Second, the program uses the TRA command to request trace A data. (The MKA and MKF commands from the previous program have been deleted.) Third, the spectrum analyzer sends trace A data to the variable, Trace-a.



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## Program Example for the RS-232 Interface

```
10 'File = 232PROG5
20 OPEN "COM1:9600,N,8,1" AS #1
30 'create a 401-point trace array
40 DIM TRCA(401)
50 PRINT #1,"IP;"
60 'set output format of spectrum analyzer for real numbers
70 PRINT #1,"TDF P;"
80 'set spectrum analyzer parameters
90 PRINT #1,"SNGLS;"
100 PRINT #1,"CF 300MZ;"
110 PRINT #1,"SP 200MZ;"
120 PRINT #1,"TS;"
130 PRINT #1,"MKPK:",
140 'move peak to center of spectrum analyzer screen
150 PRINT #1,"MKCF;"
160 PRINT #1,"TS;MF;",
170 'ask spectrum analyzer for trace data
180 PRINT #1,"TRA?;"
190 'retrieve trace data from spectrum analyzer
200 FOR I=1 TO 401
210 INPUT #1,TRCA(I)
220 NEXT I
230 'set continuous-sweep mode
240 PRINT #1,"CONTS;"
250 END
```

Trace data can be read with the computer by making three changes to the program created in Chapter 2. First, we modify the program to create a 401-point trace array, called TRCA in which trace data will be stored (line 40). Second, the program uses the TRA command to request trace A data (line 180). (The MKA and MKF commands in the original program have been deleted.) Third, we will have the spectrum analyzer send the trace A data into the TRCA variable (line 210).



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## Saving Trace Data

The trace data in the previous program can be stored on a computer disk by making three program modifications.

```
10  !FILE: "IBPROG6"
20  !create a 401 point trace array:
30 REAL Trace_a(1:401)
40  Analyzer=718
50 OUTPUT Analyzer;"IP;"
60   !set the output format of the spectrum analyzer for
70  !real numbers:
80 OUTPUT Analyzer;"TDF P;"
90   !set the spectrum analyzer parameters:
100 OUTPUT Analyzer;"SNGLS;"
110 OUTPUT Analyzer;"CF 300MZ;"
120 OUTPUT Analyzer;"SP 200MZ;"
130 OUTPUT Analyzer;"TS;"
140 OUTPUT Analyzer;"MKPK HI;"
150  !move peak to center of spectrum analyzer screen:
160 OUTPUT Analyzer;"MKCF;"
170 OUTPUT Analyzer;"TS;"
180   !ask the spectrum analyzer for trace data:
190 OUTPUT Analyzer;"TRA?;"
200  !send the trace data to the computer:
210 ENTER Analyzer;Trace_a(*)
220  !create file to store trace
230  !file is 13 records long:
240 CREATE BDAT "DATA_A",13
250  !assign path for the file:
260 ASSIGN @File TO "DATA-A"
270  !send trace data to the file:
280 OUTPUT @File;Trace_a(*)
290 OUTPUT Analyzer;"CONTS;"
300 LOCAL 7
310  !close file:
320 ASSIGN @File TO *
330 END
```

First, using the CREATE command, we create an empty file on the disk for storing the trace. The file is 13 records long. (To determine the number of records, the 401-point trace is multiplied by 8 bytes per point, the storage required for real numbers, then divided by 256 bytes per record. The result is rounded to the next largest integer.)

Next, we assign an input and an output path to the file DATA-A. Then, we send the trace data to the file. (See lines 260 through 280.) Finally, in line 320, we close the file.

---

Note — If a program containing the CREATE command is run twice, the computer will report an error the second time because the file already exists. To prevent this error, place an exclamation mark before the CREATE command to "comment out" the line after the first run. (See line 240.)

---



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## Program Example for the RS-232 Interface

```
10 'File = 232PROG6
20 OPEN "COM1:9600,N,8,1" AS #1
30 'create a 401-point trace array
40 DIM TRCA(401)
50 PRINT #1,"IP;"
60 'set output format of spectrum analyzer for real numbers
70 PRINT #1,"TDF P;"
80 'set spectrum analyzer parameters
90 PRINT #1,"SNGLS;"
100 PRINT #1,"CF 300MZ;"
110 PRINT #1,"SP 200MZ;"
120 PRINT #1,"TS;"
130 PRINT #1,"MKPK;"
140 'move peak to center of spectrum analyzer screen
150 PRINT #1,"MKCF;"
160 PRINT #1,"TS;"
170 'ask spectrum analyzer for trace data
180 PRINT #1 "TRA?;"
190 'input the trace data to the BASIC program
200 FOR I=1 TO 401
210 INPUT #1,TRCA(I) 'data input in dBm
220 NEXT I
230 'create file to store trace on disk
240 OPEN "TRACEA" FOR OUTPUT AS #2
250 'print the trace data to the disk
260 FOR I=1 TO 401
270 PRINT #2,TRCA(I)
280 NEXT I
290 'put spectrum analyzer into continuous-sweep mode
300 PRINT #1,"CONTS;"
310 END
```

Using the OPEN command, we create an empty file on the disk for storing the trace and assign an input and an output path to the file TRACEA. Then we send the trace data to the file. (See lines 260 through 280.)

Lines 20 through 220 of 232PROG6 are identical to the previous program, 232PROG5.



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## Reading Trace Data from a Computer Disk

If we want to return trace data to the spectrum analyzer for later viewing, we must work the "saving" process in reverse. The following program reads a trace previously stored on a computer disk and stores the trace in an array variable.

### Program Example for the HP-IB Interface

```
10  !FILE: "IBPROG7"
20  !create a 401-point trace array:
30 REAL Trace_a(1:401)
40  !assign path to the file with the
50  !trace in it:
60 ASSIGN @File TO "DATA-A"
70  !enter trace into variable Trace-a:
80 ENTER @File;Trace_a(*)
90  !close file:
100 ASSIGN @File TO *
110 END
```

First, in line 30, the program creates a 401-point trace array. Then, in line 60, the program assigns a path to the trace file. Finally, in line 80, the program sends the trace data to the variable Trace_a( *).

### Program Example for the RS-232 Interface

```
10 'File = 232PROG7
20 OPEN "COM1:9600,N,8,1" AS #1
30 'create a 401-point trace array
40 DIM TRCA(401)
50 'assign number to file with trace data in it
60 OPEN "TRACEA" FOR INPUT AS #2
70 'enter the trace into the array
80 FOR I=1 TO 401
90 INPUT #2,TRCA(I)
100 NEXT I
110 CLOSE
120 END
```

First, in line 40, the program creates a 401-point trace array. Then, in lines 60 through 100, the program reads the disk file TRACEA and stores data in the array variable TRCA.



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## Saving and Recalling Instrument States

The spectrum analyzer's control settings (or its "state") can be saved with a computer and retrieved later to streamline test sequences or repeat manual measurements. Control settings can be stored in one of eight state registers in the spectrum analyzer, in computer memory, or on a computer disk.

The first program in this section demonstrates techniques for saving an instrument state, along with its current trace A data. The second program demonstrates how the state information and the trace data is read from the computer and returned to the spectrum analyzer.

If you wish to save states in the spectrum analyzer, see the descriptions of the save state (SAVES) and recall state (RCLS) commands in Chapter 5.

### Saving the Spectrum Analyzer's State

The following two programs read and store a trace from the spectrum analyzer.



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## Program Example for the HP-IB Interface

```
10  !FILE: "IBPROG8"
20  !define 202 character string:
30 DIM Learn_string$[202]
40  !create 401-point array to store trace:
50 INTEGER Trace_a(1:401)
60  Analyzer=718
70   !set output format for two byte integers:
80 OUTPUT Analyzer;"TDF B;"
90   !ask spectrum analyzer for trace data:
100 OUTPUT Analyzer;"TRA?;"
110  !send trace to the computer:
120 ENTER Analyzer USING "#,W";Trace_a(*)
130   !get learnstring from spectrum analyzer:
140 OUTPUT Analyzer;"OL;"
150 ENTER Analyzer USING "#,202A";Learn_string$
160  !create file to store trace:
170  CREATE  BDAT  "STATE",4
180  !assign path to the file:
190 ASSIGN @File TO "STATE"
200  !send trace to the file:
210 OUTPUT @File;Learn_string$,Trace_a(*)
220  !return output format to default mode:
230 OUTPUT Analyzer;"TDF P;"
240  !close file:
250 ASSIGN @File TO *
260 END
```



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The HP-IB version stores the trace in the variable called Trace-a(*). The state of the spectrum analyzer is stored in the variable Learn-string& These two variables are then saved in a file called STATE. Finally, the file is stored on a disk.

Using the data stored in STATE, the spectrum analyzer settings can be reset according to the saved state. Then, using the stored trace data, trace data can be viewed on the spectrum analyzer display.

Line 30 gives the dimensions of the learn string using the HP BASIC DIM command. Learn strings for the spectrum analyzer require 202 bytes of storage space. Also see the output learn string (OL) command.

Line 70 uses TDF B to format the output in binary. Binary provides the fastest data transfer and requires the least amount of memory to store data. Each data point is transferred in binary as two 8-bit bytes. The data points are in the internal representation of measurement data. (See "Different Formats for Trace Data Transfers" at the end of this chapter for more information about trace data formats.)

When the trace and state data are sent from the spectrum analyzer to the computer, they must be formatted. Lines 120 and 150 format trace data with the HP BASIC USING command. In the formatting statement, "#" indicates that the statement is terminated when the last ENTER item is terminated. EOI (end-or-identify) and LF (line feed) are item terminators, and early termination will result in an inaccurate learn string. "W" specifies word format. "202A" indicates the size of the learn string.

Line 170 creates a file called STATE that is 4 records long. (lb determine the number of records for the computer in our example, the 401-point trace is multiplied by 2 bytes per point and the 202-byte learn string is added to give 1004 bytes total. This total is divided by 256 bytes per record, resulting in 4 records.)

---

**Note** If the program containing the CREATE command is run twice, the computer will report an error the second time because the file already exists. lb prevent this, place an exclamation mark before the CREATE command to "comment out" line 170 after the program has been executed.

---



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## Program Example for the RS-232 Interface

```
10 'File = 232PROG8
20 OPEN "COM1:9600,N,8,1" AS #1
30 'Define 202-character string
40 DIM LEARN$(202)
50 'Create 802-character string to store trace data
60 DIM TR1$(200),TR2$(200),TR3$(200)
70 DIM TR4$(200),TR5$(2),TR6$(200)
80 'ask spectrum analyzer for trace data in binary format
90 PRINT #1,"TDF B; TRA?;"
100 'enter trace data from spectrum analyzer
110 TR1$=INPUT(200,#1) 'first 200 characters
120 TR2$=INPUT(200,#1) 'second 200 characters
130 TR3$=INPUT(200,#1) 'third 200 characters
140 TR4$=INPUT(200,#1) 'fourth 200 characters
150 TR5$=INPUT(2,#1)  'last two characters
160 'ask for learn string from spectrum analyzer
170 PRINT #1,"OL;"
180 'get learn string from spectrum analyzer
190 LEARN$=INPUT$(202,#1)
200 'create file to store trace on disk
210 OPEN "TRACEA" FOR OUTPUT AS #2
220 'change ASCII data to integers for disk storage
230 'because ASCII 26 will put EOF on disk
240 DEFINT X,Y,I 'integer variables
250 DIM X1(202),Y1(802) 'arrays for the data
260 'first format the learn string
270 FOR I= 1 TO 202
280 'get ASCII character from string
290 L2$=MID$(LEARN$,I,1)
300 'make integer of ASCII value 0-255
310 X1(I)=ASC(L2$)
320 NEXT I
330 'format the data strings
340 T5=1 'set counter
350 TR6$=TR1$ 'set string to be converted
360 GOSUB 620 'do the conversion
370 T5=201 'set counter
380 TR6$=TR2$ 'set string to be converted
390 GOSUB 620 'do conversion
400 T5=401
410 TR6$=TR3$
420 GOSUB 620
```



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```
430 T5=601
440 TR6$=TR4$
450 GOSUB 620
460 'convert last two characters
470 L2$=MID$(TR5$,1,1)
480 Y1(801)=ASC(L2$)
490 L2$=MID$(TR5$,2,1)
500 Y(802)=ASC(L2$)
510 'data is now formatted, write to disk
520 FOR I=1 TO 202
530 PRINT #2,X1(I)
540 NEXT I
550 FOR I=1 TO 802
560 PRINT #2,Y1(I)
570 NEXT I
580 'close the data file
590 CLOSE
600 GOT0 680
610 'subroutine for converting data:
620 FOR I=1 TO 200
630 L2$=MID$(TR6$,I,1) 'get ASCII character
640 Y1(T5)=ASC(L2$)    'set value in array
650 T5=T5+1
660 NEXT I
670 RETURN    'done with conversion
680 END
```

The previous program reads a trace from the spectrum analyzer, then stores it in the variable called TRCA. The state of the spectrum analyzer is stored in the variable LEARN$. These two variables are then saved in a file called TRACEA. Finally, the file is stored on a disk.

Using the data stored in TRCA, the spectrum analyzer settings can be reset according to the saved state. Then, using the stored trace data, trace data can be viewed on the spectrum analyzer display.

Line 40 gives the dimensions of the learn string using the GW BASIC DIM command. Learn strings for the spectrum analyzer require 202 bytes of storage space. Refer to the output learn string (OL) command description in Chapter 5 for more information.

Line 90 uses TDF B to format the output in binary. Binary provides the fastest data transfer and requires the least amount of memory to store data. Each data point is transferred in binary as two 8-bit bytes. The data points are in the internal representation of measurement data. (See “Different Formats for Trace Data Transfers” at the end of this chapter for more information about trace data formats.)

When the trace and state data is sent from the spectrum analyzer to the computer, it must be formatted. Lines 270 through 320 format the trace data.



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## Returning the Spectrum Analyzer to its Former State

The following programs read a trace stored in a file and load it into a variable.

### Program Example for the HP-IB Interface

```
10  !FILE: "IBPROG9"
20  !define 202 character string:
30 DIM Learn_string$[202]
40  !create 401 point array to store trace:
50 INTEGER Trace_a(1:401)
60  Analyzer=718
70  !assign path to the file:
80 ASSIGN @File TO "STATE"
90  !get values for Learn-string$
100  !and Trace-a(*) from disk:
110 ENTER @File;Learn_string$,Trace_a(*)
120  !send learnstring to spectrum analyzer:
130 OUTPUT Analyzer;"IP DONE;"
140  ENTER Analyzer
150 OUTPUT Analyzer;Learn_string$
160  !set single sweep mode:
170 OUTPUT Analyzer;"SNGLS;"
180  !prepare spectrum analyzer for a trace from
190  !the computer:
200 OUTPUT Analyzer;"TRA #A";
210  !send trace to the spectrum analyzer
220 OUTPUT Analyzer USING "#,W";802,Trace_a(*)
230  !view trace to see it was sent:
240 OUTPUT Analyzer;"VIEW TRA;"
250  !close file:
260 ASSIGN @File TO *
270 END
```

The HP-IB program reads a trace stored in the file STATE, then loads it into the variable **Trace_a(*)**.

First, the settings of the spectrum analyzer that were stored in the variable **LEARN$** are recalled. The spectrum analyzer state is changed to the same state as when the trace was stored. Then previously stored trace data is returned to the spectrum analyzer and the trace is viewed on the spectrum analyzer screen. Finally, line 220 uses the HP BASIC USING command to format the trace data.



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## Program Example for the RS-232 Interface

```
10 'File = 232PROG9
20 OPEN "COM1:9600,N,8,1" AS #1
30 DEFINT X,Y,I 'integer variable
40 'define 202-character string
50 DIM LEARN$(202),X1(202)
60 'create an 802-character string to store disk data
70 DIM TR1$(200),TR2$(200),TR3$(200),TR4$(200)
80 DIM TR5$(2),TR6$(200),Y1(802)
90 'open disk file "TRACEA"
100 OPEN "TRACEA" FOR INPUT AS #2
110 'enter learn array from disk
120 FOR I=1 TO 202
130 INPUT #2,X1(I)  'get integer variable from disk
140 NEXT I
150 'enter trace data from disk
160 FOR I=1 TO 802
170 INPUT #2,Y1(I)
180 NEXT I
190 'close the disk file
200 CLOSE #2
210 'format the integer data into strings
220 'for the spectrum analyzer. See 232PROG8 for explanation
230 LEARN$=""  'null out the learn string
240 FOR I=1 TO 202  'format learn string first
250 LEARN$=LEARN$+CHR$(X1(I))
260 NEXT I
270 'format the trace data
280 I2=1  'set the counter
290 GOSUB 500 'do the conversion
300 TR1$=TR6$  'set the string
310 I2=201
320 GOSUB 500  'do the conversion
330 TR2$=TR6$
340 I2=401
```



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```
350 GOSUB 500
360 TR3$=TR6$
370 I2=601
380 GOSUB 500
390 TR4$=TR6$
400 'format last two characters
410 TR5$=""
420 TR5$=TR5$+CHR$(Y1(801))+CHR$(Y1(802))
430 'write to spectrum analyzer
440 PRINT #l,LEARN$
450 'output trace data
460 PRINT #1,"IB";TR1$;TR2$;TR3$;TR4$;TR5$;
470 PRINT #1,"VIEW TRB;"
480 GOT0 560 'end program
490 'subroutine for converting integer data to ASCII
500 TR6$=""  'set the string to a null value
510 FOR I=1 TO 200
520 TR6$=TR6$+CHR$(Y1(I2))
530 I2=I2+1
540 NEXT I
550 RETURN 'done with conversion
560 END
```

The RS-232 program, 232PROG9, reads a trace stored in the file TRACEA and loads it into the variable TRCA. This program assumes that trace data is stored on the disk from the previous program example, 232PROG8.

First, the settings of the spectrum analyzer that were stored in the variable LEARN$ are recalled. The spectrum analyzer state is changed to the same state as when the trace was stored. Then previously stored trace data is returned to the spectrum analyzer and the trace is viewed on the spectrum analyzer screen.



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## Measuring Harmonic Distortion

The harmonic distortion program presented here illustrates how the spectrum analyzer can be directed by a computer to make a complete measurement. Measuring the percent of total harmonic distortion is tedious when performed manually: it involves tuning to the fundamental and to each harmonic of interest, recording the amplitude of each signal, converting these amplitudes to linear units (volts), and calculating the result using a formula. The following program measures percent of total harmonic distortion automatically, quickly, and accurately.

The program operates as if we were making the measurement manually.

Note — This program is designed to measure harmonics of a signal that is greater than 20 MHz.

### Program Example for the HP-IB Interface

```
10  !FILE: "THD_TEST"
20 ASSIGN @Sa TO 718      ! assign IO path to spectrum analyzer
30 Variables:             ! define variables:
40 REAL Fundamental,Fund_amptd_v,Fund_amptd_dbm
50 REAL Prcnt_distort,Sum_sqr
60 INTEGER Max-harmonic,I,Number
70   !allow user to change the number of harmonics:
80  Max_harmonic=4
90 ALLOCATE REAL Harmonic_v(2:Max_harmonic)
100 ALLOCATE REAL Harmonic_dbc(2:Max_harmonic)
110 GOSUB Clearscreen    ! clear the alpha screen
120   !ask for the frequency of the fundamental:
130 OUTPUT CRT USING"4/,10X,K,3/";"***HARMONIC  DISTORTION***"
140 OUTPUT CRT USING "10X,K";"CONNECT SOURCE TO INPUT"
150  OUTPUT CRT USING "10X,K";"ENTER FUNDAMENTAL FREQUENCY IN MHz"
160 OUTPUT CRT USING "10X,K"; "WHEN READY, PRESS ENTER "
170 INPUT Fundamental
180 GOSUB Clearscreen ! clear the alpha screen
190 Fundamental:       ! write message on screen:
200 DISP "MEASURING FUNDAMENTAL"
210   !preset the spectrum analyzer, set single sweep mode, and
220   !take sweep:
230 OUTPUT @Sa;"IP; SNGLS; TS;"
240   !tune the spectrum analyzer to the fundamental freq and set
250    ! 20 MHz span:
260 OUTPUT @Sa;"CF";Fundamental;"MZ;"
270 OUTPUT @Sa;"SP 20MZ; TS;"
280   !put a marker on signal peak, move marker to
290   !reference level:
300 OUTPUT @Sa;"MKPK HI; MKRL; TS;"
310   !find signal peak, activate signal track, and
320   !narrow span:
```



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```
330 OUTPUT @Sa;"MKPK HI; TS;"
340 OUTPUT @Sa;"MKTRACK ON; SP IOOKZ; TS;"
350  !turn off signal track:
360 OUTPUT @Sa;"MKTRACK OFF;"
370  !find the peak of the signal; move peak to center
380  !of screen:
390 OUTPUT @Sa;"AUNITS V;"! MAKE READOUT UNITS VOLTS
400  !find peak of signal;  send amplitude value to
410  !computer
420  !enter the amplitude of the fundamental:
430 OUTPUT @Sa;"MKPK HI; MKA?;"
440 ENTER @Sa;Fund_amptd_v
450  !send marker frequency to the computer, enter
460  !frequencyvalue:
470 OUTPUT @Sa;"MKF?;"
480 ENTER @Sa;Fundamental
490  !make the fundamental frequency the center freq
500  !step size:
510 OUTPUT @Sa;"MKSS;"
520  !set the fundamental frequency units to MHz:
530 Fundamental=Fundamental/1.E+6
540 Harmonics:    !measure the amplitudes of the harmonics:,
550 FOR Number=2 TO Max-harmonic
560 DISP "MEASURING HARMONIC #";Number
570 OUTPUT @Sa;"SP 20MZ;" !set span to 20 MHz
580 OUTPUT @Sa;"CF UP; TS;" !tune to next harmonic
590  !take second sweep to allow spectrum analyzer to move to the
600  !centerfrequency; find the signal peak; activate
610  !signal track:
620 OUTPUT @Sa;"TS;"
630 OUTPUT @Sa;"MKPK HI; MKTRACK ON; SP IOOKZ; TS;"
640  !turn off signal track:
650 OUTPUT @Sa;"MKTRACK OFF;"
660  !find signal peak;  send amplitude value to computer
670  !enter the amplitude of the harmonic:
680 OUTPUT @Sa;"MKPK HI; MKA?;"
690 ENTER @Sa;Harmonic_v(Number)
700 NEXT Number
710  !set amplitude units to dBm:
720 OUTPUT @Sa;"AUNITS DBM;"
730  !calculate the fundamental amplitude in dBm because
740  !it was measured in volts:
750 Fund_amptd_dbm=10*LGT(Fund_amptd_v^2/.05)
760  !calculate the sum of the squares of the amplitudes
770  !of the harmonics; calculate amplitudes of
780  !harmonics (dBm):
790 Sum-sqr=0
800 FOR I=2 TO Max-harmonic
810  Sum_sqr=Sum_sqr+Harmonic_v(I)^2
820  Harmonic_dbc(I)=20*LGT(Fund_amptd_v/Harmonic_v(I))
830 NEXT I
```



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```
840  !calculate the percent distortion:
850 Prcnt_distort=SQR(Sum_sqr)/Fund_amptd_v*100
860 GOSUB Clearscreen   !clear the alpha screen:
870 !Output_data:
880  !send data to the screen of the computer:
890 OUTPUT CRT USING "7/,1X,K";"HARMONIC  DISTORTION  RESULTS"
900 OUTPUT CRT USING "11X,K,DDDD.D,K";"FREQ = ";Fundamental;" MHz"
910 OUTPUT CRT USING "11X,K,DDDD.D,K";"AMP = ";Fund_amptd_dbm;" dBm"
920 OUTPUT CRT USING "11X,K,DDD.D,K";"2nd HARMONIC = -";Harmonic_dbc(2);" dBc"
930 OUTPUT CRT USING "11X,K,DDD.D,K";"3rd HARMONIC = -";Harmonic_dbc(3);" dBc"
940 FOR I=4 TO Max-harmonic
950 OUTPUT CRT USING "10X,DD,K,DDD.D,K";I;"th HARMONIC = -";Harmonic_dbc(I) dBc"
960 NEXT I
970 OUTPUT CRT USING "11X,K,DDD.D,K";"TOTAL DISTORTION = ";Prcnt_distort;" %"
980 !
990 LOCAL 7
1000 STOP
1010 !
1020 Clearscreen:  !alpha clear subroutine
1030 !the statement below presses the "CLR SCR" key on
1040 !the keyboard:
1050 OUTPUT KBD USING "#,B";255,75
1060 RETURN
1070 END
```

The program prompts the user to connect a source to the spectrum analyzer INPUT and enter the source frequency. It sets the spectrum analyzer center frequency to the value of the source, or fundamental, frequency. It measures and records the frequency and amplitude of the fundamental, then measures and records the amplitude of the second, third, and fourth harmonics. These values are used to compute percent of harmonic distortion. The result of the harmonic distortion percentage computation, plus harmonic amplitudes in dBc (decibels relative to the carrier), are displayed on the computer display. Extensive annotation has been added (after the exclamation points) to help clarify the program.

If necessary, change the number of harmonics in line 80.



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## Program Example for the RS-232 Interface

```
IO 'File = THDTEST
20 OPEN "COM1:9600,N,8,1" AS #1
30 'allow user to change the number of harmonics
40 MAXHARMONIC=4
50 DIM HARMONICV(10),HARMONICDBC(10)
60 'clear the screen
70 CLS
80 'ask for the frequency of the fundamental
90 PRINT "******* HARMONIC DISTORTION *******"
100 PRINT
110 PRINT "CONNECT SOURCE TO ANALYZER INPUT, THEN"
120 PRINT "ENTER FREQUENCY OF THE FUNDAMENTAL IN MHZ"
130 PRINT
140 INPUT FUNDAMENTAL
150 CLS
160 'print measuring fundamental on screen
170 PRINT "MEASURING FUNDAMENTAL"
180 'preset the spectrum analyzer, set single-sweep and
185 'take sweep
190 PRINT #1,"IP;SNGLS;TS;"
200 PRINT #1,"DONE,"
210 INPUT #1,DONE
220 'tune the spectrum analyzer to the fundamental freq and set
225 '20 MHz span
230 PRINT #1,"CF ";FUNDAMENTAL;"MHZ"
240 PRINT #1,"SP 20MZ;TS;"
250 PRINT #1,"DONE;"
260 INPUT #l,DONE
270 'put a marker on signal peak, move marker to
275 'reference level
280 PRINT #1,"MKPK HI;MKRL;TS;"
290 'find signal peak, activate signal track, and
295 'narrow span
300 PRINT #1,"MKPK HI;TS;"
310 PRINT #1,"MKTRACK ON;SP 100KZ;TS;"
320 PRINT #1,"DONE,"
330 INPUT #1,DONE
340 'turn off signal track
350 PRINT #1,"MKTRACK OFF;"
360 'find peak of signal, move peak to center of screen
370 'make units in volts
380 PRINT #1,"AUNITS V;"
390 'find peak of signal, send amplitude value to
395 'computer
400 PRINT #1,"MKPK HI;MKA?;"
410 INPUT #l,FUNDAMPTDV
420 'send marker frequency to computer, enter frequency
425 'value
430 PRINT #1,"MKF?;"
440 INPUT #l,FUNDAMENTAL
450 'make the fundamental frequency the center freq
455 'step size
```



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```
460 PRINT #1,"MKSS;"
470 'set the fundamental frequency units to MHZ
480  FUNDAMENTAL=FUNDAMENTAL/lOOOOOO!
490 FOR NUMBER = 2 TO MAXHARMONIC
500 PRINT "MEASURING HARMONIC # ";NUMBER
510 'set span and tune to next harmonic
520 PRINT #1,"SP 20MZ;"
530 PRINT #1,"CF UP;TS;"
540 PRINT #1,"DONE;"
550 INPUT #l,DONE
560 'take a second sweep to allow spectrum analyzer to move to
570 'the center frequency, find the signal peak,
575 'activate the signal track
580 PRINT #1,"TS;"
590 PRINT #1,"MKPK HI;MKTRACK ON;SP 100KZ;TS;"
600 PRINT #1,"MKTRACK OFF;"
610 'find signal peak,  send amplitude value to computer
620 'enter amplitude of harmonic
630 PRINT #1,"MKPK HI;MKA?;"
640 INPUT #1,HARMONICV(NUMBER)
650 NEXT NUMBER
660 'set amplitude units to dBm
670 PRINT #l,"AUNITS DBM;"
680 'calculate the fundamental amplitude in dBm because
690 'it was measured in volts
700 FUNDAMPTDDBM=10*(LOG(FUNDAMPTDV^2/.05)/2.3026)
710 'calculate the sum of the squares of the amplitudes
720 'of the harmonics,  calculate  amplitudes  of
725 'harmonics (dBm)
730  SUMSQR=0
740 FOR I=2 TO MAXHARMONIC
750 SUMSQR=SUMSQR+HARMONICV(I)-2
760 HARMONICDBC(I)=20*(LOG(FUNDAMPTDV/HARMONICV(I))/2.3026)
770  NEXT I
780 'calculate the percent distortion
790 PRCNTDISTORT=SQR(SUMSQR)/FUNDAMPTDV*100
800  CLS
810 'output the data
820  PRINT "******* HARMONIC DISTORTION RESULTS *******"
830 PRINT "FREQUENCY = ";FUNDAMENTAL;"MHZ"
840 PRINT "AMPLITUDE = "; FUNDAMPTDDBM; "dbc"
850 FOR I=2 TO MAXHARMONIC
860  PRINT  "HARMONIC #";I;" = -";HARMONICDBC(I);"dbm"
870  NEXT  I
880 PRINT "TOTAL DISTORTION = ";PRCNTDISTORT;" %"
890 END
```

The RS-232 program prompts the operator to connect a source to the spectrum analyzer INPUT and enter the source frequency. It sets the spectrum analyzer center frequency to the value of the source, or fundamental, frequency. It measures and records the frequency and amplitude of the fundamental, then measures and records the amplitude of the second, third, and fourth harmonics. These values are used to compute percent of harmonic distortion. The results of the harmonic distortion percentage computation, plus harmonic amplitude in dBc (decibels relative to the carrier), are displayed on the computer display.

If necessary, change the number of harmonics in line 40.



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## Different Formats for Trace Data Transfers

Two different ways to format trace data using the TDF command were introduced earlier in this chapter (TDF P and TDF B). This section describes all the available trace data formats.

The HP 8590 Series spectrum analyzer provides five formats for trace data transfers: real number (P) format, binary (B) format, A-block format, I-block format, and measurement units (M) format.

### P Format

The P format allows you to receive or send trace data in a real-number format. This is the default format when the instrument is powered up. Numbers are in dBm, dBmV, dB$\mu$V, volts, or watts. The AUNITS command can be used to specify the amplitude units. Real-number data may be an advantage if you wish to use the data later in a program. However, data transfers using P format tend to be slow and take up a lot of memory (compared to binary format, the P format can take up to four times the amount of memory). Data is transferred as ASCII type.

Although the spectrum analyzer can send the trace data to the computer as real numbers, the trace data cannot be sent back to the spectrum analyzer without changing the trace data to measurement units (integers). See the following example.



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### Example of Using the P Format

This example sends trace datatothe computer and backtothe spectrum analyzer using P format.

**Note** The spectrum analyzer mustbeinthelog amplitude scale to use the TDF P format.

```
1 REAL Trace_data(1:401)                          Declare an array for trace data.
10 OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;SNGLS;TS;"   Take a measurement sweep.
20 OUTPUT 718;"TDF P;TRA?;"                       Activate the P format, output
                                                  trace A data.
30 ENTER 718;Trace_data(*)                        The computer receives trace A
                                                  data from the spectrum analyzer
40 OUTPUT 718;"VIEW TRA;MOV TRA,0;"               lb verify that the trace data is
                                                  transferred back to the spectrum
                                                  analyzer, set trace A to zeros.
50 OUTPUT 718;"RL?;"                              Determine the amplitude of the
                                                  reference level. The amplitude
                                                  of the reference level is used to
                                                  change the integers sent to the
                                                  spectrum analyzer into real numbers.
60 DISP "PRESS CONTINUE WHEN READY"
70 PAUSE
80 ENTER 718;Ref_level                            Get the reference level.
90 MAT Trace_data=Trace_data-(Ref_level)          These lines change the real trace
100 MAT Trace_data=Trace_data*(100)               data (stored in Trace-data) into
110 MAT Trace_data=Trace_data+(8000)              integers (in measurement units).
120 OUTPUT 718;"TRA ";                            Sends the trace data back to the
130 OUTPUT 718;Trace_data(*)                      spectrum analyzer in measure-
                                                  ment units.
140 LOCAL 718
150 END
```

The trace data is sent to the computer in parameter units. A parameter unit is a standard scientific unit. For the TDF P format, the parameter unit depends on the current amplitude units (dBm, dBmV, dB$\mu$V, V, W). Use the AUNITS command to change the units.

For more detailed information about the P format, see the description for TDF in Chapter 5.



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## B Format

The B format allows you to receive or send trace data in a binary format. The B format provides the fastest data transfer and requires the least amount of memory to store data. Each data point is transferred in binary as two 8-bit bytes. The data points are in the internal representation of measurement units (0 to 8000). Unlike the A-block format, the B format does not send a header. An end-or-identify (EOI) is sent with the last byte of data.

### Example of Using the B Format

This example sends trace data from the spectrum analyzer in B format. The trace data format must be changed to A-block format to return the trace data to the spectrum analyzer. See following example.

---

**Note** It is not possible to return data to the spectrum analyzer using binary format. You must use either A-block or I-block format to return the trace data to the spectrum analyzer.

---

```
10 INTEGER Tra_binary(1:401)                          Tra_binary stores the trace data.
20 ASSIGN @Sa TO 718;FORMAT OFF
30 OUTPUT @Sa;"IP;CF 300MZ;SP 20MZ;SNGLS;TS;"         Takes a measurement sweep.
40 OUTPUT @Sa;"MDS W;TDF B;TRA?;"                     Outputs trace A data.
50 ENTER @Sa;Tra_binary(*)
60 OUTPUT @Sa;"TDF A;"                                Changes the trace data format to A-
                                                      block format.
70 OUTPUT @Sa;"MOV TRA,0;"                            lb verify that the trace data is sent
                                                      back to the spectrum analyzer, move
                                                      all zeros into trace A.
80 DISP "PRESS CONTINUE WHEN READY"
90 PAUSE
100 OUTPUT @Sa USING "#,K,W";"TRA#A",802              Prepares the spectrum analyzer for
                                                      the trace data.
110 OUTPUT @Sa;Tra_binary(*)                          Transfers the trace data back to the
                                                      spectrum analyzer.
120 OUTPUT @Sa;"VIEW TRA;"
130 LOCAL 718
140 END
```

The result is transmitted as binary information. The MDS command can be used to change the data format from two 8-bit bytes to one 8-bit byte. For more detailed information about the B format and the MDS command, see the descriptions for TDF and MDS in Chapter 5.

Binary data can be converted to dBm or volts. For example, use the following equation to change the trace data (in measurement units) to a real logarithmic number (dBm):

$$\text{dBm} = ((\text{trace data} - 8000) \times 0.01) + \text{reference level(in dBm)}$$

To change the trace data (in measurement units) to linear data (volts):

$$\text{volts} = \left(\frac{\text{reference level}}{8000}\right) \times \text{trace data}$$



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The following programming converts binary data to dBm.

```
10    ! 859X binary data to real numbers
20    Sa=718
30    ASSIGN @Sa_bin TO Sa;FORMAT OFF
40    INTEGER Trace_a(1:401)
50    OUTPUT Sa;"AUNITS DBM;"
60    OUTPUT Sa;"RL?;"
70    ENTER Sa;Ref_lev
80    PRINT Ref_lev
90    OUTPUT Sa;"TDF B;TRA?;"
100   ENTER @Sa_bin;Trace_a(*)
110   ! now the spectrum analyzer has all the data
120   ! to determine the measured trace data
130   REAL Trace_a_real(1:401)
140     MAT Trace-a= Trace-a-(8000) ! Results in below ref
150     ! level
160     MAT Trace-a-real= Trace_a*(.01)! now in hundredths of db
170     ! below ref lev
180     MAT Trace-a-real=Trace_a_real+(Ref_lev)
190   FOR I=1 TO 401
200       PRINT  Trace-a-real(I)
210       NEXT I
220   END
```

The following programming converts binary data to volts.

```
10    ! 859X binary data to real numbers (linear)
20    Sa=718
30    ASSIGN @Sa_bin TO Sa;FORMAT OFF
40    INTEGER Trace_a(1:401)
50    OUTPUT Sa;"AUNITS V;"
60    OUTPUT  Sa;"RL?;"
70    ENTER Sa;Ref_lev
80    Ref_lev_factor=Ref_lev/8000
90    OUTPUT Sa;"TDF B;TRA?;"
100   ENTER @Sa_bin;Trace_a(*)
110   ! now the spectrum analyzer has all the data
120   ! to determine the measured trace data
130   REAL Trace_a_real(1:401)
140     MAT Trace-a-real=Trace_a*(Ref_lev_factor)
150   FOR I=1 TO 401
160       PRINT  Trace-a-real(I)
170       NEXT I
180   END
```



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### A-Block Format

The A-block format is similar to binary format in that each data point is sent as two 8-bit bytes (this, too, is in the internal representation of measurement data). A-block format also transfers a four-byte header before the 401 points of trace data. These bytes are the ASCII character "#", "A", and two-byte number representing the length of the trace data, followed by the data bytes.

### Example of Using the A-Block Format

This example sends trace data from the spectrum analyzer to the computer and back to the spectrum analyzer in A-block format.

```
10 INTEGER Tra_binary(1:401)
20 DIM Header$[4]
30 OUTPUT 718;"IP;CF 300MZ;SP 20MZ;SNGLS;TS;"
40 OUTPUT 718;"MDS W;TDF A;TRA?;"
50 ENTER 718 USING "#,4A,401(W)";Header$,Tra_binary(*)
60 PRINT "PRESS CONTINUE TO RETURN DATA TO THE ANALYZER"
70 PAUSE
80 OUTPUT 718;"IP;TS;VIEW TRA;"
90 OUTPUT 718;"TDF A;"
100 OUTPUT 718 USING'
"#,K,W,401(W)";"TRA#A",802,Tra_binary(*),";"
110 END
```

*Declare an array for trace data.*

*Declare a string for the #, A, MSB length, and LSB length header.*

*Take a measurement sweep.*

*Send trace A to the computer in A-block format.*

*The computer receives the header and the trace data.*

*View trace A.*

*The spectrum analyzer receives the trace data from the computer.*

The transferred trace data consists of #A, a two-byte number representing the most significant byte (MSB) length and the least significant byte (LSB) length, and the data bytes. Depending on the terminal you are using, the data bytes may appear as symbols instead of numbers. Consult your computer documentation to determine the numeric value of the data bytes.

For more detailed information about the A-block format and the MDS command, see the descriptions for TDF and MDS in Chapter 5.



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## I-Block Format

**Note** The I-block format is not recommended for use with the RS-232 interface (Option 043).

The I-block format transfers data points as two 8-bit bytes in the internal representation of measurement data. In addition to transferring trace data, I-block format also transfers the characters "#" and "I". These characters indicate that the trace data is in I-block format. The I-block format allows the spectrum analyzer to accept up to 401 points of trace data when using I-block format. Fewer than 401 points of trace data can be specified, and the spectrum analyzer will accept data until an EOI signal is sent to it. Therefore, returning the trace data to the spectrum analyzer requires an important instruction, END. (See following example.)

### Example of Using the I-Block Format

This example sends trace data from the spectrum analyzer to the computer and back to the spectrum analyzer in I-block format.

```
10 INTEGER Tra_binary(1:401)                          Declare an array for trace data.
20 DIM Header$[2]                                     Declare an array for #, I header:
30 OUTPUT 718;"IP;CF 300MZ;SP 20MZ;SNGLS;TS;"         Take a measurement sweep.
40 OUTPUT 718;"TDF I;TRA?;"                           Send trace A data in I-block format.
50 ENTER 718 USING "#,2A,401(W)";Header$,Tra_binary(*)  The computer receives the header and trace A data.
60 PRINT "PRESS CONTINUE TO RETURN DATA TO THE ANALYZER"
70 PAUSE
80 OUTPUT 718;"IP;TS;VIEW TRA;"                       View trace A.
90 OUTPUT 718;"TDF I;"
100 OUTPUT 718 USING "#,K,W,401(W)";"TRA#I",          The trace data is returned
Tra_binary(*)END                                      to the spectrum analyzer
110 END
```

The END statement in line 100 sends the spectrum analyzer the last data byte stored in the array and sets the HP-IB EOI line "true," as required by the I-block format.

The transferred trace data consists of #I, followed by data bytes until the EOI line is set true.

For more detailed information about the I-block format and the MDS command, see the descriptions for TDF and MDS in Chapter 5.



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## M Format

The M format is for sending trace data only. It formats the trace data in the internal format used by the spectrum analyzer, also known as measurement units.

Refer to Figure 3-1. The displayed amplitude of each element falls on one of 8000 vertical points with 8000 equal to the reference level. For log scale data, each point is equal to 0.01 dB. The peak of the signal in Figure 3-l is equal to -20 dBm, or two divisions below the reference level. In measurement units, it is equal to 6000 (8000 – 2000 = 6000). In linear mode, each point has a resolution of [reference level in volts divided by 8000]. The range of internal data is -32,768 to +32,767. In practice however, the range limits can be reached during trace math operations only.

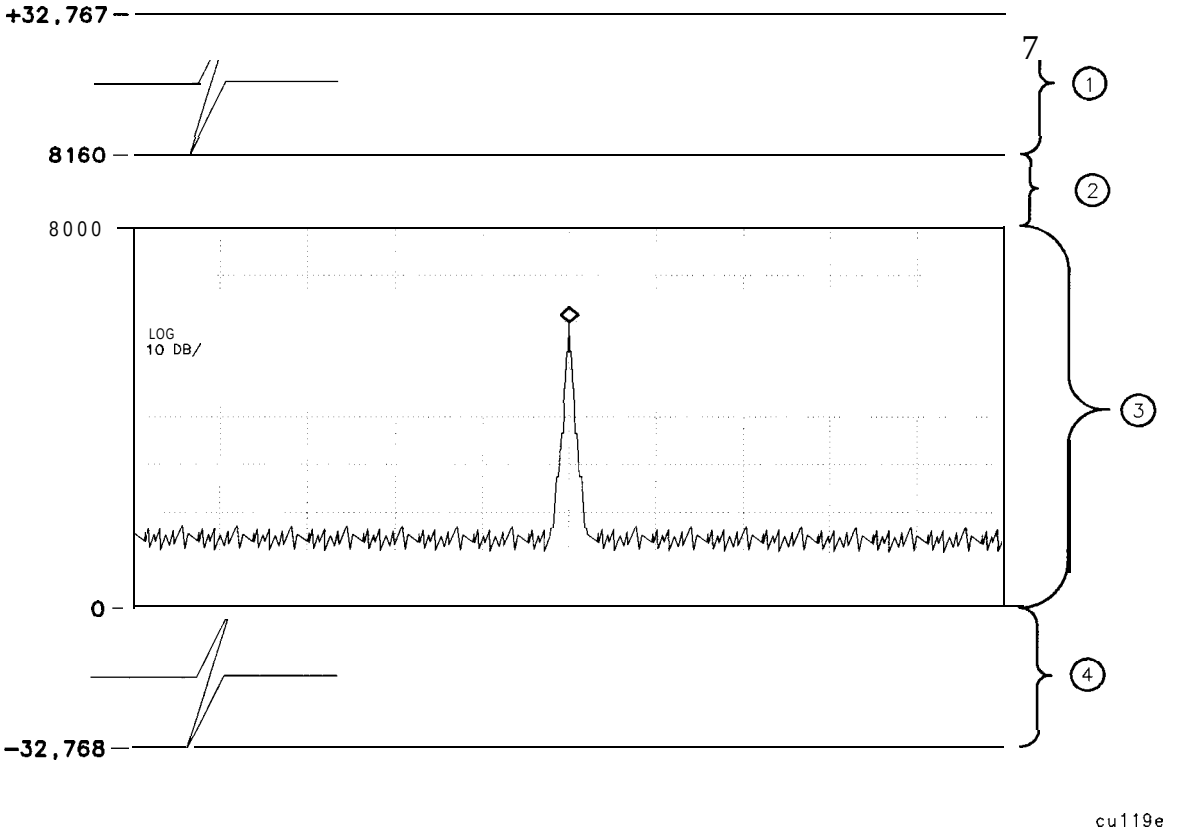



**Figure 3-1. Measurement Unit Range and Trace Amplitudes**



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**Table 3-1. Measurement Units**

| Index Number | Description |
|---|---|
| 1 | A number within the range of 8161 to 32,767 measurement units is obtainable with trace math operations only. |
| 2 | The area from 8000 (reference level) to 8160 (1.6 dB above reference level) represents the amount a trace element's amplitude can exceed the top graticule and still be valid. |
| 3 | The area from 0 to 8000 represents the displayed range for trace amplitude data. The range of 0 to 8000 varies according to the amplitude scale of the spectrum analyzer as follows:<br>■ In 10 dB/division, the range is from 0 to 8000.<br>■ In 5 dB/div, the range is from 4000 to 8000.<br>■ In 2 dB/div, the range is from 8000 to 6000.<br>■ In 1 dB/div, the range is from 8000 to 7000. |
| 4 | A number within the range of 0 to -32,768 measurement units is obtainable with trace math operations only. |

### Example of Using the M Format

This example sends trace data from the spectrum analyzer to the computer in M format.

```
10 INTEGER A(1:401)                                  Dimension array A.
30 OUTPUT 718;"IP;CF 300MZ;SP 20MZ;SNGLS;TS;"        Take a measurement sweep.
40 OUTPUT 718;"TDF M;TRA?;"                          Send trace A data in M format.
50 ENTER 718;A(*)                                    The computer receives the trace data.
60 PRINT A(*)                                        Print trace data.
70 END
```

**Note** All trace math functions are done using measurement units. See Table 5-4 for a list of all trace math functions. See the description for the AMB command in Chapter 5 for an example of trace math subtraction in measurement units.

The result is in measurement units (-32768 to +32767). For more detailed information about the M format, see the description for TDF in Chapter 5.

Table 3-2 summarizes the different trace data formats.



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**Table 3-2. Summary of the Trace Data Formats**

| Trace Data Format | Description | Remarks |
|---|---|---|
| TDF P | Real Number Format | Spectrum analyzer must be in log scale to use TDF P. To send the trace data back to the spectrum analyzer, the data must be converted to measurement units. |
| TDF B | Binary Format | Fastest format for trace data transfers. Use the A-block format to send data back to the spectrum analyzer. |
| TDF A | A-Block Data Format | Trace data preceded by "#," "A," and a two-byte number. To use the A-block format for sending data, you must provide the number of data bytes. |
| TDF I | I-Block Data Format | Trace data preceded by "#," and "I." This format is not recommended for use with an RS-232 interface. Unlike using the A-block format, you do not provide the number of data bytes when sending data. |
| TDF M | Measurement Data Format | TDF M cannot be used to send trace data back to the spectrum analyzer. |



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# 4

# Creating and Using Downloadable Programs

## What You'll Learn in This Chapter

This chapter provides fundamental information about downloadable programs (DLPs).

This chapter contains the following sections:

- Creating a DLP.
- Executing a DLP.
- Storing DLPs on a RAM card.
- Determining the amount of memory needed for a DLP.
- Using the DLP editor.
- DLP programming guidelines.

### What is a DLP?

A DLP is a sequence of programming commands used to perform a specific operation. You can define a DLP that is made up of several user-defined functions, user-defined variables, and user-defined traces, then store the DLP in analyzer memory or on a RAM card. Some commands used to create DLPs are FUNCDEF, VARDEF, ACTDEF, TRDEF, and KEYDEF.

### Why Use a DLP?

A DLP provides an easy way to execute programming commands without the use of an external controller. Almost any instruction that the analyzer can execute over the interface bus or with front-panel operation can be executed in a DLP DLPs can have decision making capabilities. In addition, DLPs have the ability to control other instruments over the instrument bus. DLPs remain in analyzer memory even when the spectrum analyzer power is turned off; the DLPs are stored in the battery-backed RAM of the analyzer memory and can be used repeatedly, whenever needed.



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## Creating a DLP

This section contains information about how to create a DLI? This section contains the following procedures:

- Use a user-defined function within a DLP.
- Use a user-defined variable within a DLI?
- Use a user-defined trace within a DLP.
- Enter values into a DLP.
- Create a modular DLP.



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## To Use a User-Defined Function within a DLP

A user-defined function is created by using the FUNCDEF command.

1. Begin the user-defined function definition by using the FUNCDEF command, the label (function name) for the function you are creating, a comma, and then a delimiter. See line 10 of the example.

   Use unique names (unique from the analyzer programming commands) for the label. lb avoid confusion with the internal variables used by the spectrum analyzer, it is recommended that you use an underscore as the second character of the label.

2. Enter in the programming commands that you want the function to perform. See lines 20 and 30 of the example. Be sure to use semicolons to separate and terminate each programming command.

   Terminating the end of each program line with a semicolon will suppress BASIC's carriage return and line feed. This saves memory since the carriage returns and line feeds won't be stored in the FUNCDEF.

3. End the FUNCDEF definition by specifying the same delimiter that was used in step 1. See line 40 of the example. The delimiters are used to enclose the programming commands for the function.

To avoid problems with the FUNCDEF definition, you should remember the following:

- A FUNCDEF does not return a value to a calling context like functions do in some languages.
- Loading functions into analyzer memory requires space in the analyzer's memory. If you are creating a large DLP, you should see "Determining the Amount of Memory Needed for a DLP" in this chapter for information on how to determine the amount of available analyzer memory and the size of the DLP.
- Limit the number of characters between the delimiters in the FUNCDEF declaration to a maximum of 2047 characters. If the function is too large, you may need to segment it into several functions. See "To Create a Modular DLP" in this chapter for more information.
- Ensure that the commands within the function are spelled correctly, that the syntax for the command is correct, and that each command is properly terminated with a semicolon.
- Keep the program lines short. If necessary, divide the spectrum analyzer programming commands into several lines. See the example.
- See the description for the FUNCDEF command in Chapter 5 for a list of programming commands that cannot be used within a FUNCDEF definition.

### Example

Executing the following programming lines creates a downloadable program called Z-OOM. Z-OOM presets the analyzer, sets the center frequency to 300 MHz, sets the span to 10 MHz, and places a marker on the highest signal. After executing the following lines, Z-OOM will be in spectrum analyzer memory.

```
10 OUTPUT 718;"FUNCDEF Z_OOM,@";
20 OUTPUT 718;"IP;CF 300MHZ;";
30 OUTPUT 718;"SP 10MHZ;TS;MKPK HI;";
40 OUTPUT 718;"@;"
50 LOCAL 718
60 END
```

*Begins the FUNCDEF definition. The "@" sign delimits the programming commands that are within the FUNCDEF called Z-OOM. The semicolon at the end of the line suppresses a carriage return and line feed.*

*Enters IP and CF 300 MH.. commands into Z_OOM.*

*Enters the SP 10 MHz, TS, MKPK HI commands into Z-OOM.*

*Ends the FUNCDEF definition.*

*Places the analyzer in local mode.*



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## To Use a User-Defined Variable within a DLP

User-defined variables are variables that you create with the VARDEF or ACTDEF commands. User-defined variables remain in spectrum analyzer memory and retain their values until redefined, disposed of, or altered by MOV or math commands. Turning the spectrum analyzer off, then on or pressing [PRESET] will reset the variables to values as specified in their declarations. Note that all user-defined variables are global in scope, any function can access any variable. All variables are of type REAL.

Variables should be declared outside of functions so the MEM? command returns the correct value for available spectrum analyzer memory after the DLP is downloaded by an external controller.

To use a user-defined variable within a DLP:

1. Use the VARDEF command to declare the variable. You should declare the variable outside of the function definition.
2. Begin the FUNCDEF definition.
3. Use the variable within the function. If YOU want to display the value of the variable, use the DSPLY command.
4. End the FUNCDEF definition.

### Example

```
10 OUTPUT 718;"VARDEF A_MP,0;";
20 OUTPUT 718;"FUNCDEF A,MPFUNC,!";
30 OUTPUT 718;"IP;SNGLS;";
40 OUTPUT 718;"FA 275MHZ;FB 325MHZ;";
50 OUTPUT 718;"TS;MKPK HI;";
60 OUTPUT 718;"MOV A_MP,MKA;";
70 OUTPUT 718;"PU;PA 60,180;TEXT %MARKER AMPLITUDE IS %;";
80 OUTPUT 718;"DSPLY A_MP,3.1;TEXT %dBm%;";
90 OUTPUT 718;"!;"
100 END
```

*Declares the variable called A_MP and initializes its value to zero.*

*Begins the definition of a function called A_MPFUNC.*

*Does an instrument preset, sets it to single-sweep mode.*

*Sets the start and stop frequencies to 275 and 325 MHz, respectively.*

*Puts a marker on the highest signal.*

*Moves the marker amplitude value into A-MI?*

*Displays the message "MARKER AMPLITUDE IS," then displays the marker amplitude and dBm.*

*Ends the function definition.*

The programming example above alters the variable A_MP that was defined with the VARDEF command. The math commands can be used to alter variable values. Examples of math commands are the ADD, DIV, SUB, and MPY. Refer to Table 5-4 in Chapter 5 for a complete list of the math commands.



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## To Use a User-Defined Trace within a DLP

Like variables, you should define user-defined traces outside of functions. User-defined traces retain their values until redefined, disposed of, or altered by the MOV command or a math command. User-defined traces are global in scope. Unlike user-defined variables, the elements of user-defined traces are of type INTEGER.

1. Use the TRDEF command to define a trace. Define the trace outside of the any functions.
2. Initialize the elements of the trace to 0. (Optional.)
3. Use the trace (you can use the trace within a function).
4. To display the contents of the user-defined trace, move the contents of the user-defined trace into trace A, trace B, or trace C with the MOV command and then use the VIEW command to display the destination trace (trace A, trace B, or trace C).

### Example

The following example demonstrates how to define a trace, move a value into the trace, move the trace to trace A, and view trace A.

```
10 OUTPUT 718;"TRDEF T_RACEA,401;";
20 OUTPUT 718;"MOV T_RACEA,0;";

130 OUTPUT 718;"FUNCDEF D_ISPTRACE,!";
140 OUTPUT 718;"MOV TRA,T_RACEA;";

150 OUTPUT 718;"VIEW TRA;";
160 OUTPUT 718;"!;"
170 END
```

*Defines a 401 -point trace called "T_RACEA."*
*Initializes the trace values to zero.*
*Use the T_RACEA for a measurement.*
*Defines a function called D_ISPTRACE.*
*Moves the contents of T_RACEA into trace A.*
*Displays trace A.*
*Ends the FUNCDEF definition.*



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## To Enter Values into a DLP

To allow the spectrum analyzer user to enter a value into a user-defined variable with the analyzer front-panel keys use the active function definition command (ACTDEF).

### Example

For example, if you want the user to enter the resolution bandwidth for use in the DLP, you would use the following:

```
OUTPUT 718;"ACTDEF M_BW,%ENTER THE RESOLUTION
BANDWIDTH%,5MHZ,STEP,!MOV RB,M_BW!;"
```

Lets *the user enter the value of the resolution bandwidth with the front-panel keys.*

Notice that like moving a value into a variable or a trace, the MOV command or another MATH command must be used to move the ACTDEF value into the RB command. See the command description for ACTDEF in Chapter 5 for more information.

## To Enter Values into a DLP by Using a Softkey

Use the KEYCMD command to assign the ACTDEF command to a softkey.

### Example

For example, to assign the ACTDEF to softkey 2, your would use the following:

```
OUTPUT 718;"KEYCMD 2, M_BW,";
OUTPUT 718;"%KEYENH 2, 'RES BW',ACTVF M_BW,0,%;";
```



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## To Create a Modular DLP

A modular DLP is a DLP that is made up of several user-defined functions. Within a modular DLP, there may be a main FUNCDEF which calls subordinate FUNCDEFs. A subordinate FUNCDEF is a user-defined function that usually performs only one task, and is called by another FUNCDEF.

To create a modular DLP:

1. Enter the file name that the DLP source code will be stored under, if desired.
2. Enter the date of the last revision to the DLP, if desired.
3. Enter the DLP author's name, if desired.
4. Begin the FUNCDEF definition for the subordinate FUNCDEF
5. Enter in the programming commands that you want the FUNCDEF to perform.
6. End the FUNCDEF definition.
7. Repeat steps 4 through 6 for all the subordinate FUNCDEFs.
8. Create a main FUNCDEF that calls the subordinate FUNCDEF.

Creating a modular DLP instead of a DLP that is made up of only one FUNCDEF has the following advantages:

- Because the number of characters for a FUNCDEF definition is limited to a maximum of 2047 characters, you must change a large FUNCDEF into smaller FUNCDEFs if its size exceeds 2047 characters.
- Modular DLPs are easier to write, read, and find problems within the DLP

It is also easier to read and find problems in a program that has a comments added to it. For example, adding the file name, the date of the last revision, and the author's name help keep a consistent program structure and make it easier to modify the DLI? The following program is an example of a modular DLP with the recommended program structure.

### Example

Notice that the program has a main FUNCDEF that calls the five subordinate FUNCDEF's (S_PANONE, S_PANTWO, S-PANTHREE, SPANFOUR, and C-HECK). Each of the five FUNCDEFs is called from the main FUNCDEF, E_XAMPLE. Line 560 assigns the DLP to softkey 2, so the function can be executed by pressing (MEAS/USER), User Menus , EXAMPLE .

The example uses descriptive labels and flows in a logical fashion, making the DLP easier to understand. In addition, the use of subordinate FUNCDEFs makes the DLP easier to modify because one FUNCDEF can be changed without having to modify the main FUNCDEF or other FUNCDEFs. For example, if the application requires the stop frequency of the last span to extend to 4 GHz, simply change the stop frequency (FB 110MHZ) in S_PANFOUR to a stop frequency of 4 GHz (FB 4GHZ).



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File name

```
10 !File name: EXAMPLE
```

Date and author's name

```
20 !Date: 9/1/88 Author: Jane Doe
```

Program Description

```
30 !Description of the program: This program checks for
40 !signals above -50 dBm in the following frequency
50 !spans: 10 to 12 MHz, 12 to 14 MHz,
60 !14 to 16 MHz, and 16 to 110 MHz. If a
70 !signal is found, it autozooms to
80 !1 MHz span, records the signal
90 !level, and displays the highest frequency
100 !signal found in trace B.
```

Define variable

```
110 OUTPUT 718;"VARDEF P_OWER,0;"; ! Defines a variable named
120 ! "P_OWER" and initialize it to zero.
```

Definetrace

```
130 OUTPUT 718;"TRDEF S_AVE,401;"; ! Defines a trace.
```

```
140 ! Subordinate FUNCDEFs:
```

Define FUNCDEF

```
150 OUTPUT 718;"FUNCDEF S_PANONE,0";!Defines a function.
160 OUTPUT 718;"FA 10MHZ;FB 12MHZ;";!Set the start and stop
170 ! frequencies.
180 OUTPUT 718;"@;"; Ends the function.
```

DefineFUNCDEF

```
190 OUTPUT 718;"FUNCDEF S_PANTWO,@;"
200 OUTPUT 718;"FA 12MHZ;FB 14MHZ;";
210 OUTPUT 718;"@;";
```

Define FUNCDEF

```
220 OUTPUT 718;"FUNCDEF S_PANTHREE,@";
230 DUTPUT 718;"FA 14MHZ;FB 16MHZ;";
240 OUTPUT 718;"@;";
```

DefineFUNCDEF

```
250 OUTPUT 718;"FUNCDEF S_PANFOUR,@";
260 OUTPUT 718;"FA 16MHZ;FB 110MHZ;";
270 OUTPUT 718;"@;";
```

Define FUNCEDEF

```
280 OUTPUT 718;"FUNCDEF C_HECK,@";
290 OUTPUT 718;"TS;MKPK HI;"; ! Places a marker on
295 ! highest signal.
300 OUTPUT 718;"IF MKA,GT,-50 THEN "; ! If the signal is higher
310 OUTPUT 718;"MKTRACK ON;"; ! than -50dBm, zoom to 1 MHz
320 OUTPUT 718;"SP 1MHZ;"; ! span, center it and bring it
330 DUTPUT 718;"MKTRACK OFF;TS;"; ! to the reference level.
340 OUTPUT 718;"MKPK HI;MKCF;TS;"; ! Store it in a 401-point
350 OUTPUT 718;"MKRL;TS;"; ! trace previously defined as
360 OUTPUT 718;"MOV P_OWER,MKA;"; ! having the label, "S_AVE".
370 OUTPUT 718;"MOV S_AVE,TRA;"; ! Save the control settings
380 OUTPUT 718;"SAVES 1;"; ! in register 1.
390 OUTPUT 718;"ENDIF;"; ! End the IF statement.
400 OUTPUT 718;"@;"; ! End the definition of C-HECK."
```

Define Main FUNCDEF

```
410 ! Main FUNCDEF
420 OUTPUT 718;"FUNCDEF E_XAMPLE,@"; ! Begins the main program.
430 OUTPUT 718;"IP;SNGLS;MOV S_AVE,0;"; ! Places the analyzer in
440 ! single-sweep mode and set all values in "S-AVE" to zero.
450 OUTPUT 718;" REPEAT ";
460 OUTPUT 718;" S_PANONE;C_HECK;";
470 OUTPUT 718;" S_PANTWO;C_HECK;"; ! Checks each span or a
480 OUTPUT 718;" S_PANTHREE;C_HECK;"; ! signal greater than -50 dBm.
490 OUTPUT 718;" S_PANFOUR;C_HECK;"; ! Repeat sequence until a
500 OUTPUT 718;"UNTIL S_AVE[0],NE,0;"; ! non-zero value is found in
510 OUTPUT 718;"MOV TRB,S_AVE;"; ! S_AVE. It then displays the located
520 OUTPUT 718;"RCLS 1;BLANK TRA;VIEW TRB;"; ! signal in trace B,
530 OUTPUT 718;"@;"; ! and recalls the analyzer settings
540 ! that existed when the signal
550 ! was found. E_XAMPLE is assigned
560 OUTPUT 718;"KEYDEF 2,E_XAMPLE,%EXAMPLE%;"; ! to softkey 2 so the
570 END ! program may be executed from the front panel.
```



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## Executing a DLP

This section contains information about how to execute a DLP. This section contains the following procedures:

- Execute the DLP by using a softkey.
- Execute the DLP within a program.

### To Execute a DLP by Using a Softkey

There are two ways to execute a DLP. You can execute the DLP by pressing a softkey that has been assigned a function as shown in this procedure, or execute the DLP within a program (shown in the following procedure).

1. Use the KEYDEF command to assign the function that you created with the FUNCDEF command to a softkey.
2. Press (MEAS/USER), User Menus to access the softkey.

#### Example

The following example uses the KEYDEF command to assigns the Z_OOM function to softkey 1.

```
10 OUTPUT 718;"KEYDEF 1, Z_OOM,%CAL SIG|ZOOM%;";
```

*Assigns the function Z_OOM to softkey 1 and assigns softkey 1 the label "CAL SIG ZOOM."*

```
20 LOCAL 718
30 END
```

You can access CAL SIG ZOOM by pressing (MEAS/USER), User Menus .

### lb Execute the DLP within a Program

You can also execute the DLP within a program.

- Use the name of the DLP within a program.

#### Example

The following programming line executes the Z_OOM function from an external controller.

```
OUTPUT 718;"Z_OOM;"
```



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## Storing DLPs on a RAM Card

If the spectrum analyzer has a memory card reader installed in it, you can store the DLP on a RAM card, and, at a later time, load the DLP into analyzer memory from the RAM card. This section contains the procedures for storing a DLP on a RAM card remotely, and loading the DLP from the RAM card into analyzer memory remotely.

These procedures are all for remote operation; *see* the *HP 8590 E-Series and L-Series Spectrum Analyzers* User's *Guide* for information about how to do these procedures by using the front-panel keys of the spectrum analyzer.

### To Store DLPs on a RAM Card

Storing the DLP on the RAM card is a convenient way of backing-up the FUNCDEFs, VARDEFs, ACTDEFs, TRDEF, and KEYDEFs in spectrum analyzer memory, and transferring them from one spectrum analyzer to another.

1. Install a RAM card into the memory card reader of the analyzer. Be sure the RAM card write-protect switch is not set to SAFE (write-protected).
2. Use the MSI command to select the memory card reader as the mass storage device.
3. Use the STOR command to copy the contents of spectrum analyzer memory onto the RAM card.

#### Example

The following example sets the mass storage device to the memory card reader, and then stores the contents of analyzer memory on the RAM card.

```
OUTPUT 718;"MSI CARD;STOR d,%dZ_OOM%,*;"
```

*Stores a copy of the contents of analyzer memory on the RAM card under the file name of Z_OOM.*

Saving a DLP on a RAM card saves all FUNCDEFs, VARDEFs, ACTDEFs, TRDEF, and KEYDEFs in the spectrum analyzer memory. This means a DLP cannot be saved selectively if several DLPs are present in the analyzer memory at the time. You may want to delete the items in user memory that you do not wish to be saved on the RAM card. See the DISPOSE command.



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## To Load DLPs from a Memory Card into Analyzer Memory

Once a DLP has been stored on a RAM card, it can be loaded back into spectrum analyzer memory when desired. DLPs remain in spectrum analyzer memory until disposed of with the DISPOSE command, ERASE command, or ERASE DLP MEM.

1. To load a DLP from a RAM or ROM card into analyzer memory, insert the memory card into the memory card reader.
2. Use the MSI command to select the memory card reader as the mass storage device.
3. Use the LOAD command to copy the contents of the RAM card file into spectrum analyzer memory.

### Example

The following example sets the mass storage device to the memory card reader, and then copies the contents of RAM card file called Z-OOM into spectrum analyzer memory.

```
OUTPUT 718;"MSI CARD;LOAD %dZ_OOM%;"
```

*Loads a copy of Z_OOM from the RAM card into spectrum analyzer memory.*

Note that loading does not dispose of any DLPs which were in memory before the load was executed.



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## Determining the Amount of Memory Needed for a DLP

FUNCDEFs, user-defined variables, user-defined traces, on event commands (for example, ONSRQ, ONEOS, and TRMATH), and user-defined softkeys all consume some amount of spectrum analyzer memory. If you write a large DLP, or if you have a several DLPs stored in spectrum analyzer memory, you may run out of spectrum analyzer memory that is available for storing the DLPs. Also, the storage space on a RAM card is finite. If you are creating large DLPs, you may need to determine the amount of spectrum analyze memory the DLP requires and delete unused items from spectrum analyzer memory. This section contains the procedures for the following:

- Determining the available amount of spectrum analyzer memory or RAM card space.
- Delete a DLP from spectrum analyzer memory or a RAM card.

### To Determine Available Analyzer Memory

Because the amount of analyzer memory available for user-defined functions is limited, it may sometimes be necessary to determine the amount of analyzer memory available.

- Use the MEM command to determine the available analyzer memory remotely.

#### Example

```
10 OUTPUT 718;"MEM?;";          Determines the available analyzer memory.
20 ENTER 718;Memory             Stores the available analyzer memory value in the variable memory.
30 PRINT "MEMORY = ";Memory     Prints the amount of analyzer memory.
40 END
```

If you are sure that the amount of memory that a DLP requires will not exceed the amount of spectrum analyzer memory available, you can download the DLP into analyzer memory and then execute the previous program again. The amount of analyzer memory that the DLP requires is the difference between the value that MEM? returned before the DLP was loaded into analyzer memory and the value MEM? returned after the DLP was loaded into analyzer memory.

If the amount of memory that a DLP requires could exceed the amount of spectrum analyzer memory available, you should delete any unnecessary variables, traces, or FUNCDEFs or on event commands from spectrum analyzer memory. See "To Delete a DLP from Spectrum Analyzer Memory" for more information.

### To Determine the Amount of Space on a RAM Card

'lb save a DLP on a RAM card, it may be necessary to determine the amount of space available on the RAM card. To determine the amount of space on a RAM card, you must do the following:

1. Catalog the memory card.
2. Determine the total number of records for the RAM card. The total number of records on the RAM card is displayed when cataloging the card (see Figure 4-l). The number of records on the RAM card is determined by dividing the memory capacity of the RAM card by 256 (because the records are 256 bytes long). For example, if the RAM card has a capacity of 32K bytes (which is equal to 32 x 1024), the total number of records on the RAM card is 128 (32,768 divided by 256).



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3. Determine the number of records on the RAM card that are in use. The number of records stored on the RAM card can be determined by cataloging the card, finding the starting record address for the last catalog entry, adding the number of records used for the last catalog entry to the starting record address, and then subtracting one.
4. Subtract the number of records stored (determined in step 3) from the total number of records available (determined in step 2) to determine the number of unused records on the RAM card.

### Example

Figure 4-l shows that the number of records on the RAM card that are in use is 53 (35 + 19 – 1 = 53), and the total number of records available are 128. The number of unused records on the RAM card is 75 (128 – 53 = 75).

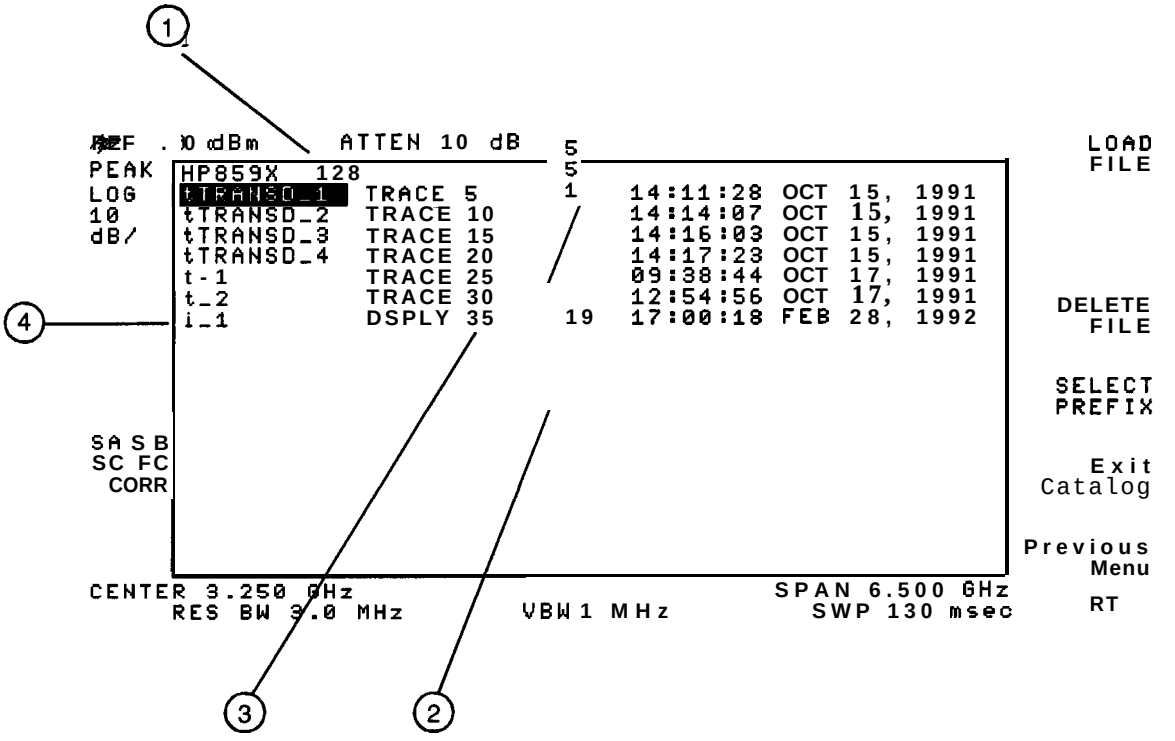



**Figure 4-1. Determining the Number of Records**

**Table 4-1. Cataloging a RAM Card**

| Index | Description |
|---|---|
| 1 | Total number of records. |
| 2 | Number of records for the last catalog item. |
| 3 | Starting record address for the last catalog entry. |
| 4 | The last catalog entry. |



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## 'lb Delete a DLP from Spectrum Analyzer Memory

■ Use the DISPOSE command to delete the DLP item from spectrum analyzer memory.

A FUNCDEF can be deleted from analyzer memory remotely by using the DISPOSE command. The DISPOSE command can also be used to remove softkey functions, user-defined variables, and user-defined traces. (See the description for the DISPOSE command in Chapter 5 for more information.)

### Example

To remove the FUNCDEF called Z_OOM from analyzer memory, you would execute the following command:

```
OUTPUT 718;"DISPOSE Z_OOM;";
```

Use DISPOSE ALL to remove all FUNCDEFs, user-defined traces, limit-lines, and user-defined variables from analyzer memory. For example, `OUTPUT 718 ; "DISPOSE ALL ;" ;` (`ERASE DLP MEM` is equivalent to DISPOSE ALL.)

## lb Erase the DLP from a RAM Card

■ Select the memory card as the mass storage device by using the MSI command, and then use the PURGE command to delete a specific file from the RAM card.

### Example

To delete the file called Z_OOM from the RAM card, you would execute the following command:

```
OUTPUT 718;"MSI CARD;PURGE %dZ_OOM%;"
```



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## Using the DLP Editor

The DLP editor functions allow you to create or modify a DLP with only an external keyboard connected to the spectrum analyzer (an external controller is not required). This section contains the following procedures:

- Connect the external keyboard to the spectrum analyzer.
- Access the DLP editor functions.
- 
- Use the DLP editor functions to modify a DLP
- Use the DLP editor functions to modify a catalog item.

The external keyboard can also be used to enter screen titles and remote programming commands; *see* the *HP 8590 E-Series and L-Series Spectrum Analyzers User's Guide* for more information.

### To Connect the External Keyboard to the Spectrum Analyzer

| Caution | The analyzer *must* be turned off before connecting an external keyboard to the spectrum analyzer. Failure to do so may result in loss of factory-installed correction constants. |
|---|---|

1. Turn off the spectrum analyzer.
2. Connect an HP C1405 Option 002 (or Option 003) cable from the spectrum-analyzer rear-panel connector EXT KEYBOARD to the HP C1405A Option ABA keyboard.
3. Press (LINE) to turn the spectrum analyzer on.
4. Place the template for the external keyboard on the external keyboard.

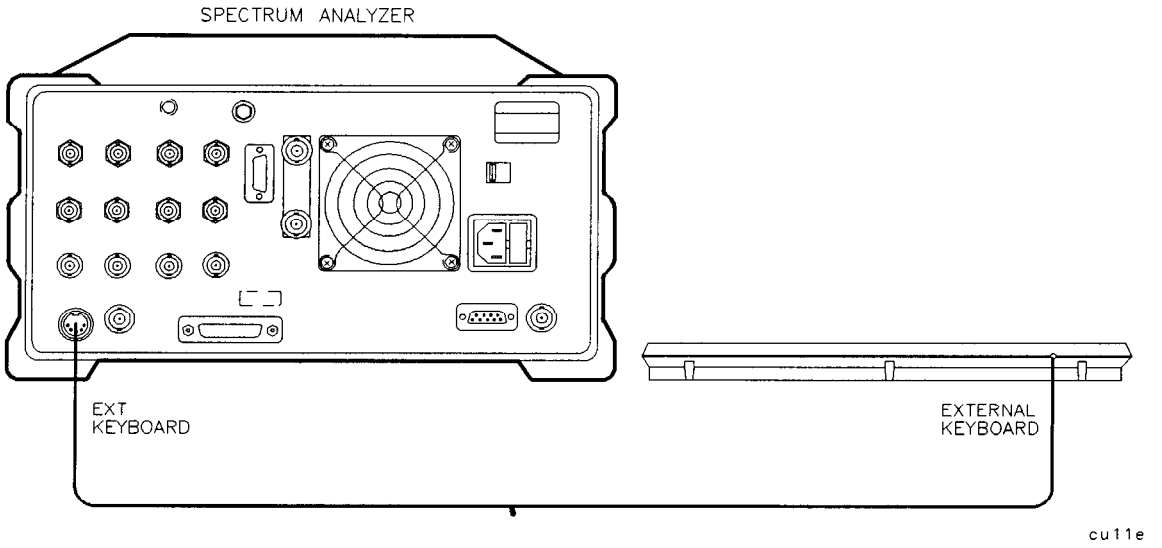



**Figure 4-2. Connecting the External Keyboard to the Spectrum Analyzer**

You can now use the external keyboard to enter or modify a DLP with the DLP editor, enter a screen title, enter programming commands, or enter a prefix.



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## To Access the DLP Editor

. Press (SAVE) or (RECALL), then INTERNAL CARD (so that INTERNAL is underlined), Catalog Internal , CATALOG ALL, and then Editor.

Or,

Press (Pause) on the external keyboard.

Editor or (Pause) accesses the DLP editor. There are some differences between using Editor and (Pause) however. Editor allows you to access all the DLP editor softkeys (EDIT LAST, EDIT CAT ITEM , APND CAT ITEM , SAVE EDIT, and NEW EDIT ). With (Pause), you can only access EDIT LAST, SAVE EDIT , and NEW EDIT . (Pause) allows you to change between the DLP editor functions and the "keyboard entry" functions such as entering programming commands, screen title, and prefix.

With the external keyboard connected to the spectrum analyzer, you can use the function keys (F1 through F6) of the external keyboard to accesses the softkeys of the spectrum analyzer. For example, you could press F1 to access the first softkey, F2 to access the second softkey, and so forth.

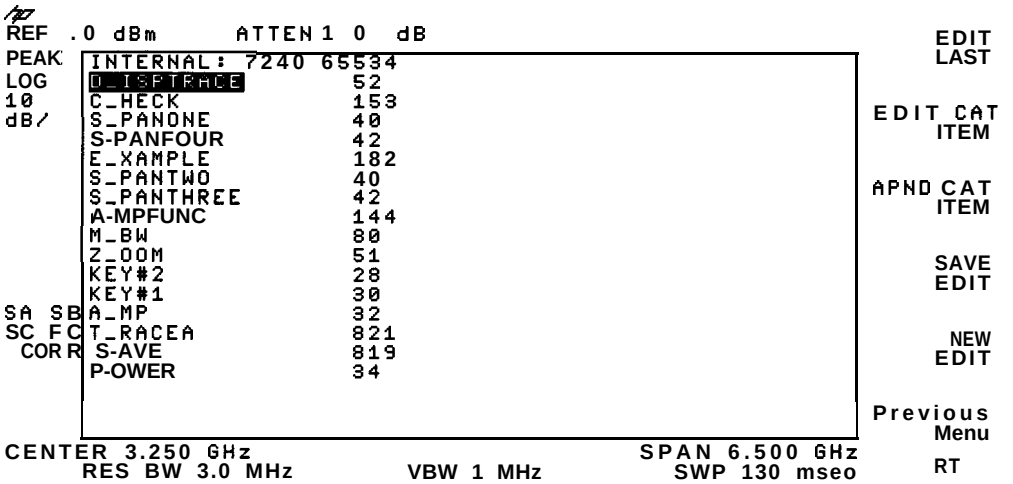



**Figure 4-3. Accessing the DLP Editor**



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## To Create a DLP

1. Press NEW EDIT, NEW EDIT to enter an individual DLP item (FUNCDEF, VARDEF, or TRDEF) into the buffer of the DLP editor.

2. Use the external keyboard keys to enter the DLP item. Because you are not using an external computer, the spectrum analyzer commands are entered without an OUTPUT or PRINT statement preceding them.

   While using the DLP editor, you may want to use the "typing keys." The typing keys are the function keys F7 through F12. The typing keys automatically place the command mnemonic at the position of the cursor on the spectrum analyzer display. The commands accessed by the typing keys are shown at the bottom of the spectrum analyzer display; you can use the Page Up and Page Down keys of the external keyboard to access different command mnemonics.

3. When the DLP item has been entered and you want it executed, press SAVE EDIT.

   SAVE EDIT executes the contents of the DLP editor buffer as remote commands, and when executing a FUNCDEF, will result in the FUNCDEF present in spectrum analyzer memory under the name given for the user-defined function. If you do not want to save the DLP, press NEW EDIT, NEW EDIT to clear the screen.

The buffer for the DLP editor is limited to 2500 characters, however, DLP items are limited to a maximum of 2047 characters.

For example, if you use the DLP editor to enter the Z_OOM function, the spectrum analyzer display would look as follows:

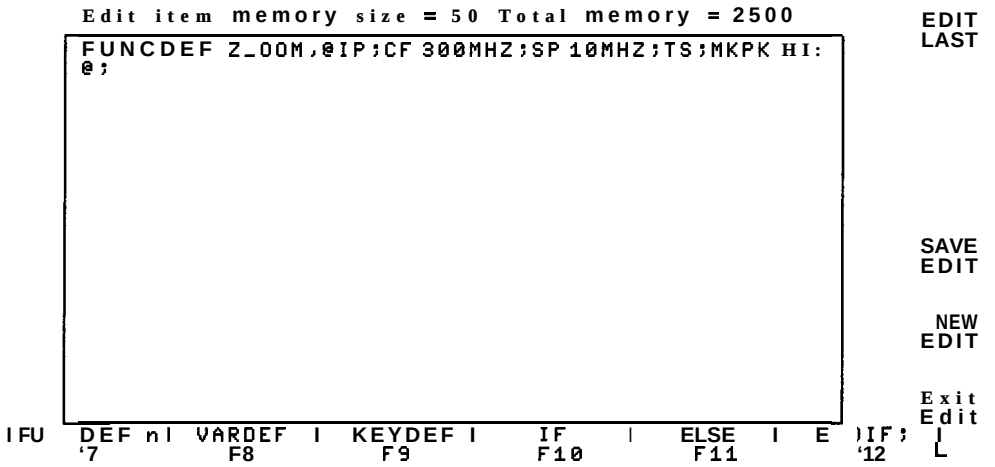



**Figure 4-4. Entering a DLP**



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## To Modify the DLP

1. If necessary, press Pause to reenter the DLP editor.
2. If the DLP is not displayed, press EDIT LAST to display the previous contents of the DLP editor.
3. Use the external keyboard keys to edit the DLP. Because you are not using an external computer, the spectrum analyzer commands are entered without an OUTPUT or PRINT statement preceding them.
4. When the DLP has been entered, press SAVE EDIT . SAVE EDIT executes the DLP in spectrum analyzer memory. If you do not want to execute the DLP, press NEW EDIT , NEW EDIT to clear the screen.



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## To Modify a Catalog Item

1. Press (RECALL) or (SAVE), then INTERNAL CARD (so that INTERNAL is underlined).
2. Press Catalog Internal , CATALOG ALL , and then Editor. (You can use one of the other catalog softkeys instead of CATALOG ALL . For example, you could press CATALOG DLP if you wanted only the DLPs cataloged.)
3. Use the large knob on the spectrum analyzer's front panel to highlight the item that you want to edit. The user-defined functions, user-defined traces, and user-defined variable are listed by their label, and user-defined softkeys are listed by "KEY" followed by the key number.
4. Press EDIT CAT ITEM . If there is already some text in the DLP editor, you need to press EDIT CAT ITEM again to clear the text from the DLP editor's buffer.
5. Use the external keyboard keys to edit the cataloged item. Because you are not using an external computer, the spectrum analyzer commands are entered without an OUTPUT or PRINT statement preceding them.
6. When the catalog item has been edited, press SAVE EDIT. SAVE EDIT executes the DLP in spectrum analyzer memory, and will replace the catalog item. If you do not want to the changes to the catalog item, press NEW EDIT , NEW EDIT to clear the screen.

You may find it useful to use APND CAT ITEM . APND GAT ITEM appends the catalog item to the text that is already in the DLP editor.

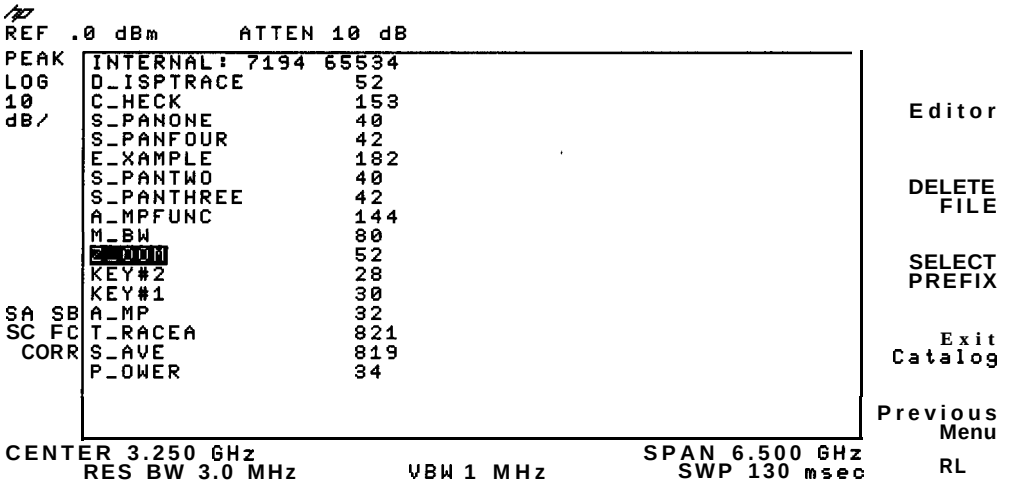



**Figure 4-5. Selecting a Catalog Item**



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## DLP Programming Guidelines

This section contains some suggestions that can make it easier to write a DLP, read and understand the DLP code, and find problems in a DLP.

### To Make the DLP More Readable

Here are a few suggestions which help make any program, including a DLP, more readable:

- Write short program lines. One or two commands per line.
- Use standard indent format for looping and branching.
- Use descriptive variable names and labels.
- Add comments to the source code.
- Make the program modular.

### To Find Problems in a DLP

More often than not, new programs do not work as they were intended to work. In DLPs, problems (also referred to as bugs) may appear in any of the following ways:

- As an error message displayed on the analyzer screen.
- The DLP does the unexpected. For example, it halts execution, or enters an infinite loop, or starts executing before its start-execution command occurs.
- As an unexpected or out-of-range result or value is obtained.

Some suggestions for find a problem in a DLP are as follows:

- Follow the suggestions in "To make the DLP more readable."
- Check that each function has matching delimiters, be careful with nested delimiters.
- Check that the commands within the DLP are spelled correctly, contain spaces where indicated by the syntax diagram for the command, and are terminated by a semicolon.
- You can use the DLP editor to inspect the contents of the DLP before you execute it. The DLP editor shows what characters the spectrum analyzer will use when executing the DLP. This can be helpful for finding omitted spaces.
- Test FUNCDEFs individually. Comment out the calls to the other FUNCDEFs in the main FUNCDEF, if necessary.



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If a DLP causes the spectrum analyzer not to respond normally (for example, the spectrum analyzer seems to be in an infinite loop or an error message is displayed), try one or all of the following suggestions:

- Press [PRESET].
- Press [CONFIG], More 1 of 3 , ERASE DLP MEM , ERASE DLP MEM . (ERASE DLP MEM requires a double key press and deletes any DLPs from spectrum analyzer memory.)
- Turn the spectrum analyzer off and then back on.

If the spectrum analyzer is still not responding, you should do the following:

- For a spectrum analyzer with Option 021 installed in it, execute the following program line:

```
SEND 7;UNL MTA LISTEN 18 CMD 12
```

*This sends a command to the spectrum analyzer instructing it to delete any DLPs and user-defined variables from spectrum analyzer memory.*

---

**Note** If the spectrum analyzer is not at address 18, change the number 18 in the previous program line to the spectrum analyzer's current address.

---

- For a spectrum analyzer with Option 023 installed in it, execute a break, and then press [CONFIG], More 1 of 3 , ERASE DLP MEM , ERASE DLP MEN . (ERASE DLP MEM requires a double key press.)



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# 5

# Programming Commands

## What You'll Learn in This Chapter

This chapter is a reference for the HP 8590 Series spectrum analyzer command language. It is a command dictionary; commands are listed alphabetically.

To find a programming command that performs a particular function, first refer to the functional index (Table 5-4) where commands are categorized by function. Once the desired command is found in the functional index, refer to the description for the command in this chapter.

This chapter includes the reference tables listed below:

- Table 5-1, Syntax Elements.
- Table 5-2, Characters and Secondary Keywords (Reserved Words).
- Table 5-3, Summary of Compatible Commands.
- Table 5-4, Functional Index.



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## Syntax Conventions

Command syntax is represented pictorially.

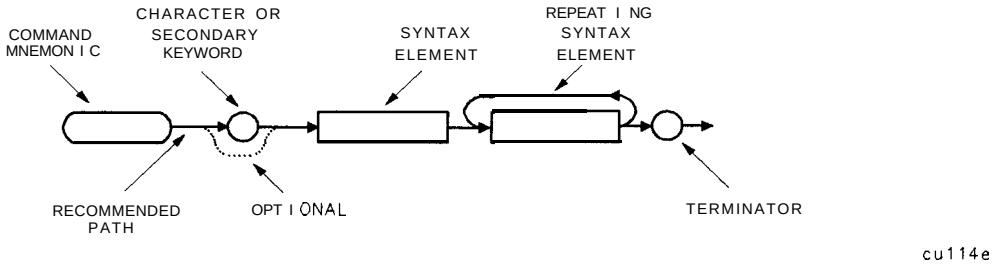



**Figure 5-1. Command Syntax Figure**

- Ovals enclose command mnemonics. The command mnemonic must be entered exactly as shown.
- Circles and ovals surround secondary keywords or special numbers and characters. The characters in circles and ovals are considered reserved words and must be entered exactly as shown. See Table 5-2.
- Rectangles contain the description of a syntax element defined in Table 5-l.
- A loop above a syntax element indicates that the syntax element can be repeated.
- Solid lines represent the recommended path.
- Dotted lines indicate an optional path for bypassing secondary keywords or using alternate units.
- Arrows and curved intersections indicate command path direction.
- Semicolons are the recommended command terminators. Using semicolons makes programs easier to read, prevents command misinterpretation, and is recommended by IEEE Standard 728.

Note — Uppercase is recommended for entering all commands unless otherwise noted.



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Syntax Elements are shown in the syntax diagrams as elements within rectangles.

**Table 5-1. Syntax Elements**

| Syntax Component | Definition/Range |
|---|---|
| analyzer command | Any spectrum-analyzer command in this chapter, with required parameters and terminators. |
| character | $S_P$ ! " # $ % & ' ( ) + , / 0 1 2 3 4 5 6 7 8 9 : ; A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ? _ ` a b c d e f g h i j k l m n o p q r s t u v w x y z (Characters are a subset of data byte.) |
| character & EOI | 8-bit byte containing **only** character data and followed by end-or-identify (EOI) condition, where the EOI control llne on HP-IB is asserted to indicate the end of the transmission. END signifies the EOI condition. |
| character string | A list of characters. |
| data byte | 8-bit byte containing numeric or character data. |
| data byte & EOI | 8-bit byte containing numeric or character data followed by end-or-identify (EOI) condition, where the EOI control line on HP-IB is asserted to Indicate the end of the transmission. END signifies the EOI condition. |
| delimiter | ~ \| \ @ = / ^ $ % ; ! ' : " &<br>Matching characters that mark the beginning and end of a character string, or a list of user-defined functions or spectrum analyzer commands. Choose delimiting characters that are not used within the string they delimit. |
| digit | 0 1 2 3 4 5 6 7 8 9 |
| lsb length | Represents the least significant byte of a two-byte word that describes the number of bytes returned or transmitted. See msb length. |
| msb length | Represents the most significant byte of a two-byte word that describes the number of bytes returned or transmitted. See lsb length. |
| number | Expressed as integer, decimal, or in exponential (E) form. Real Number Range: ± 1.797693134862315 x $10^{308}$, including 0.<br>Up to 15 **significant** figures allowed.<br>Numbers may be as small as ± 2.225073858507202 x $10^{-308}$<br>Integer Number Range: -32,768 through + 32,767 |
| output termination | Carriage return ($C_R$) and line feed ($L_F$), with end-or-identify (EOI) condition. ASCII codes 13 (carriage return) and 10 (line feed) is sent via HP-IB, then the end-or-identify control line on HP-IB sets to indicate the end of the transmission. |
| predefined function | ACTVF, AMPLEN, BITF, CNTLI, CORREK, DONE, HAVE, HN, LIMIFAIL, MEAN, MEANTH, MEM, MINPOS, MKBW, PEAKS, PKPOS, PWRBW, REV, RMS, SER, STB, STDEV, SUM, SUMSQR, TRCMEM, VARIANCE.<br>A **predefined** function is an **analyzer command** that returns a number that can be operated on by other spectrum analyzer commands. Insert a **predefined function** into a command statement where predefined function appears in the command syntax chart.<br>If a predefined function takes a parameter (for example, PKPOS TRA), it can be used only as the last parameter of an spectrum analyzer command that has two or more **predefined** functions as parameters. For example, MPY V_AR,PKPOS TRB,HAVE CARD; is illegal, but MPY V_AR,DONE,HAVE CARD; is not. |



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## Table 5-1. Syntax Elements (continued)

| Syntax Component | Definition/Range |
|---|---|
| predefined variable | The values of the following variables change depending on the current instrument settings. Each variable represents the value of the command function that has the same name as the variable.<br><br>AMB, AMBPL, ANLGPLUS, ANNOT, AT, BAUDRATE, CF, CNTLA, CNTLB, CNTLC, CNTLD, COUPLE, CRTHPOS, CRTVPOS, DATEMODE, DET, DL, DOTDENS, FA, FB, FMGAIN, FOFFSET, GATE, GATECTL, GD, GL, GP, GR, GRAT, INZ, LG, LIMIDISP, LIMIMODE, LIMIREL, LIMITEST, MEASURE, MENU, MF, MKA, MKACT, MKF, MKFCR, MKN, MKNOISE, MKP, MKPAUSE, MKPX, ML, MKTRACK, MODE, MSI, NRL, POWERON, PREAMPG, PRNTADRS, PSTATE, RB, RL, RLPOS, ROFFSET, SAVRCLN, SETDATE, SETTIME, SP, SQLCH, SRCALC, SRCAT, SRCNORM, SRCPOFS, SRCPSTP, SRCPSWP, SRCPWR, SRCTK, SS, ST, SWPCPL, SYNCMODE, TH, TIMEDATE, TIMEDSP, TVLINE, TVSFRM, TVSYNC, TVSTND, VB, VBR, WINZOOM, ZMKCNTR, ZMKSPAN. |
| trace element | Value contained in one trace point. Notated as TRA[N] where N specifies the point position in the trace array. Values for N are 1 to 401 (for traces A, B, C) or 1 to 2047 (for traces specified by TRDEF). The same values apply to trace B (TRB[N]), trace C (TRC[N]), and user-defined traces (LABEL[N]). |
| trace range | Values contained in trace segment. Multi-point segments are notated as TRA[N,M], where N and M are end points of a segment and specify point positions in trace array. Values for N or M are 1 to 401 (for traces A, B, C), or 1 to the length of a trace as specified by TRDEF. The same values apply to trace B (TRB[N,M]), trace C (TRC[N,M]), and user-defined traces (LABEL[N,M]). Single-point segments are notated the same as the trace element above. |
| units | Represent standard scientific units.<br><br>Frequency Units: GHZ or GZ, MHZ or MZ, KHZ or KZ, HZ<br><br>Amplitude Units: DB, DM, DBMV, DBUV, V, MV, UV, W, MW, UW<br><br>Time Units: SC, MS, US<br><br>Current Units: A, MA, UA<br><br>Impedance Units: OHM |
| user-defined function | A label 2 to 11 characters long that is defined by the FUNCDEF command. Choice of characters is A through Z and the underscore (_). The underscore should be used as the second character of the label. Omitting the underscore, or using the underscore as other than the second character in a label, is not recommended. |
| user-defined trace | A label 2 to 11 characters long that is defined by the TRDEF command. Choice of characters is A through Z and the underscore(-). The underscore should be used as the second character of the label. Omitting the underscore, or using the underscore as other than the second character in a label, is not recommended. |
| user-defined variable | A label 2 to 11 characters long that is defined by the VARDEF or ACTDEF command. Choice of characters is A through Z and the underscore(-). The underscore should used as be the second character of the label. Omitting the underscore, or using the underscore as other than the second character in a label, is not recommended. |



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In the syntax diagrams, characters and secondary keywords are shown within circles or ovals. Characters and secondary keywords must be entered exactly as shown.

**Table 5-2. Characters and Secondary Keywords (Reserved Words)**

| Element | Description |
|---|---|
| a | Amplitude correction factors. |
| A | Amp (unit) or A-block data field. |
| ABSHZ | Absolute Hz (unit). |
| AC | Alternating current. |
| ALL | All. |
| AM | Amplitude modulation. |
| AMP | Amplitude. |
| AMPCOR | Amplitude correction, |
| AUTO | Auto couple or set to automatic. |
| AVG | Average. |
| B | b-bit byte or binary format. |
| BOTH | Both odd and even frames trigger. |
| BW | Black and white. |
| CARD | Memory card. |
| CNT | Counter-lock. |
| COLOR | Color. |
| d | Downloadable programs. |
| DB | Decibel (unit). |
| DBM | Absolute decibel milliwatt (unit). |
| DBMV | Decibel millivolt (unit). |
| DBUV | Decibel microvolt (unit). |
| DC | Direct current. |
| DELTA | Delta. |
| DISP | Display. |
| DLP | Downloadable program. |
| DM | Absolute decibel milliwatt (unit). |
| DMY | Day, month, year format. |
| DN | Decreases parameter one step size. |
| DUMP | Dump. |
| EDGE | Triggers on the edge of the trigger input. |
| EP | Pauses program for data entry from spectrum analyzer front panel. |
| EQ | Equal to. |
| EVEN | Even video frame. |
| EXT | External trigger. |
| FADC | Fast analog-to-digital converter (ADC). |
| FETCH | Fetch. |
| FFT | Fast Fourier transform. |
| FIXED | Fixed. |
| FLAT | Flat. |
| FLATTOP | Flat top filter window. |
| FMD | Frequency modulation demodulator. |



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**Table 5-2.**
**Characters and Secondary Keywords (Reserved Words) (continued)**

| Element | Description |
|---|---|
| FM | Frequency modulation. |
| FMV | Frequency modulation detection. |
| FREE | Free run. |
| FREQ or FRQ | Frequency. |
| GATE | Gate. |
| GE | Greater than or equal to. |
| GHZ | Gigahertz (unit). |
| GT | Greater than. |
| GZ | Gigahertz (unit). |
| HANNING | Harming filter window. |
| HI | Highest. |
| HPIB | HP-IB. |
| HZ | Hertz (unit). |
| I | I-block data Eeld. |
| i | Display image file. |
| INIT | Initialize. |
| INT | Internal or integer. |
| IP | Instrument preset. |
| IST | Inverse sweep time. |
| K | Free Eeld ASCII format with no terminator. |
| KC | Free field ASCII format with “CR” an “LF” terminator. |
| KHZ | Kilohertz (unit). |
| KL | Free field ASCII format with “CR” an “END” terminator. |
| KZ | Kilohertz (unit). |
| l | Limit line. |
| LAST | Last state. |
| LE | Less than or equal to. |
| LEVEL | Level gating. |
| LIMILINE | Limit line. |
| LINE | Line trigger. |
| LOAD15 | Loads the values for the horizontal and vertical position of the spectrum analyzer. |
| LOWER | Lower limit line. |
| LT | Less than. |
| M | Measurement units. |
| MA | Milliamp (unit). |
| MDY | Month, day, year format. |
| MHZ | Megahertz (unit). |
| MS | Millisecond (unit). |
| MTR | Meter. |
| MV | Millivolts (unit). |
| MW | Milliwatt (unit). |
| MZ | Megahertz (unit). |
| NE | Not equal to. |
| NEG | Negative. |
| NH | Next highest peak. |
| NL | Next peak left. |



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**Table 5-2.**
**Characters and Secondary Keywords (Reserved Words) (continued)**

| Element | Description |
|---|---|
| NONE | No units. |
| NR | Next peak right. |
| NRM or NORMAL | Normal. |
| NTSC or NTSC15 | NTSC video format. |
| OA | Output amplitude. |
| ODD | Odd video frame trigger. |
| OFF | Turns off function. |
| ON | Turns on function. |
| P | Parameter units. |
| PAL or PAL15 | PAL video format. |
| PALM | PAL-M video format. |
| PER | Period. |
| PKAVG | Peak average. |
| PKPIT | Peak pit. |
| POINT | Point. |
| POS | Positive. |
| PSN | Position. |
| RECALL | Recall operation. |
| RS232 | RS-232 interface. |
| s | State. |
| SA | Signal analysis. |
| SAVE | Save operation. |
| SC | Seconds (unit). |
| SECAML | SECAM-L video format. |
| SLOPE | Slope. |
| SMP | Sample detection mode. |
| SP | Space. |
| SR | Stimulus response. |
| STATE | State register. |
| STEP | Step key ability. |
| STORE | Store. |
| SWT | Sweep time. |
| t | Trace. |
| TG | Tracking generator. |
| TRA | Trace A. |
| TRB | Trace B. |
| TRC | Trace C. |
| TV | TV trigger. |
| UA | Microamp (unit). |
| UNIFORM | Uniform filter window. |
| UP | Increases the parameter one step sire. |
| UPLOW | Upper and lower limit lines. |
| UPPER | Upper limit line. |
| u s | Microseconds (unit). |
| u v | Microvolts (unit). |
| u w | Microwatt (unit). |



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**Table 5-2.**
**Characters and Secondary Keywords (Reserved Words) (continued)**

| Element | Description |
|---|---|
| V | Volts (unit). |
| VERTICAL | Vertical triggering. |
| VID | Video trigger. |
| W | Watts or word (for MDS command). |
| YTF | YIG-tuned filter. |
| XTAL | Crystal. |
| * | Asterisk (used as a wildcard). |
| | Semicolon (ASCII code 59). |
| | Comma (ASCII code 44). |
| 0 | Off (command argument). |
| 1 | On (command argument). |
| 50 | 50Ω. |
| 75 | 753. |
| ? | Returns a query response containing the value or state of the associated parameter. The query response is followed by a carriage-return/line-feed. |



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The alternate commands (listed in the left column of Table 5-3) provide compatibility with commands used by the HP 8566A/B, HP 8568A/B, and HP 70000 Series instruments. The equivalent commands for the HP 8590 Series spectrum analyzer are listed in the right column.

**Table 5-3. Summary of Compatible Commands**

| Alternate Commands | Description | HP 8590 Series Command |
|---|---|---|
| A1 | Clear write trace A | **CLRW TRA** |
| **A2** | Max hold trace A | **MXMH TRA** |
| **A3** | Store and view trace A | **VIEW TRA** |
| **A4** | Store and blank trace A | BLANK TRA |
| **B1** | Clear write trace B | **CLRW TRB** |
| **B2** | Max hold trace B | MXMH TRB |
| B3 | Store and view trace B | **VIEW TRB** |
| **B4** | Store and blank trace B | BLANK TRB |
| BL | B – DL -> B | BML |
| C1 | Trace A minus trace B off | **AMB OFF** |
| c2 | Trace A minus trace B on | **AMB ON** |
| **CA** | Coupled input attenuation | AT AUTO |
| CR | Coupled resolution bandwidth | RB **AUTO** |
| **cs** | Coupled step size | **SS AUTO** |
| **CT** | Coupled sweep time | **ST AUTO** |
| **cv** | Coupled video bandwidth | VB AUTO |
| E1 | Peak search | MKPK HI |
| E2 | Enter marker into center frequency | **MKCF** |
| **E3** | Enter marker delta into center frequency step size | MKSS |
| **E4** | Enter marker amplitude into reference level | MKRL |
| EM | Erase graphics memory | CLRDSP |
| EX | Exchange trace A and B | AXB |
| KSA | dBm amplitude units | **AUNITS** DBM |
| KSB | dBmV amplitude units | **AUNITS** DBMV |
| KSC | dB$\mu$V amplitude units | **AUNITS** DBUV |
| KSD | Volt amplitude units | **AUNITS** V |
| KSE | Screen title | TITLE |
| KSG | Video average on | VAVG ON |
| KSH | Video average off | **VAVG OFF** |
| **KSM** | Marker noise | MKNOISE |
| **KSO** | Marker value to span | MKSP |
| KS2 | Reference level offset | ROFFSET |
| KSC | Trace A plus trace B into trace A | **APB** |
| **KSi** | Exchange trace B and C | BXC |
| KS1 | Trace B into trace C | BTC |
| **KSm** | Graticule off | GRAT OFF |
| **KSn** | Graticule on | GRAT ON |
| **KSo** | Annotation off | **ANNOT** OFF |
| **KSp** | Annotation on | **ANNOT** ON |
| LO | Display line off | DL OFF |



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**Table 5-3. Summary of Compatible Commands (continued)**

| Alternate Commands | Description | HP 8690 Series Command |
|---|---|---|
| Ml | Marker off | MKOFF |
| M2 | Marker normal | MKN |
| M3 | Marker delta | MKD |
| MA | Marker amplitude | MKA? |
| MC | Marker count | MKFC |
| MT0 | Marker track off | MKTRACK OFF |
| MT1 | Marker track on | MKTRACK ON |
| 01 | Output format, in real number format | TDF P |
| 02 | Output format, in binary format, two bytes (word) per element | TDF B;MDS W |
| 03 | Output format, in measurement data format | TDF M |
| 04 | Output format, in binary format, 1 byte per element | TDF B;MDS B |
| R1 | Activates illegal command service request only | RQS 32 |
| R2 | Activates end-of-sweep, illegal command | RQS 36 |
| R3 | Activates broken hardware, illegal command | RQS 40 |
| R4 | Activates units-key pressed, illegal command | RQS 34 |
| RC | Recall state | RCLS |
| S1 | Sweep continuous | CONTS |
| s2 | Sweep single | SNGLS |
| sv | Save state | SAVES |
| TO | Threshold off | TH OFF |
| T1 | Trigger mode free run | TM FREE |
| T2 | Trigger mode line | TM LINE |
| T3 | Trigger mode external | TM EXT |
| T4 | Trigger mode video | TM VID |
| T7 | Trigger mode level | GATECTL LEVEL |
| T8 | Trigger mode edge | GATECTL EDGE |



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This functional index categorizes the programming commands by the type of function that the command performs. The functional index contains the following information: the programming command mnemonic, the softkey or front-panel key that corresponds to the command's function, and a brief definition of the command. Once the desired command is found, refer to the alphabetical listing of commands later in this chapter for more information about the command.

**Table 5-4. Functional Index**

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| AMPLITUDE | AT | ATTEN AUTO MAN | Specifies RF input attenuation. |
| | AUNITS | Amptd Units | Specifies amplitude units for input, output, and display. |
| | COUPLE * | COUPLE AC DC * | Selects direct-current (dc) coupling or alternating-current (ac) coupling. |
| | INZ | INPUT Z 50Ω 75Ω | Specifies the value of input impedance expected at the active input port. |
| | LG | SCALE LOG LIN (when LOG is underlined) | Specifies the vertical graticule divisions as logarithmic units, without changing the reference level. |
| | LN | SCALE LOG LIN (when LIN is underlined) | Specifies the vertical graticule divisions as linear units, without changing the reference level. |
| | ML | MAX MXR LVL | Specifies the maximum signal level that is applied to the input mixer for a signal that is equal to or below the reference level. |
| | NRL | | Sets the normalized reference level. |
| | PREAMPG | EXTERNAL PREAMPG | Subtracts a positive or negative preamplifier gain value from the displayed signal. |
| | PP† | PRESEL PEAK † | Performs a preselector peak. |
| | RESETRL | | Resets the reference level to its instrument preset level. |
| | RL | REF LVL | Specifies the amplitude value of the reference level. |
| | ROFFSET | REF LVL OFFSET | Offsets all amplitude readouts without affecting the trace. |
| AUTO COUPLING | AUTO | AUTO ALL | Couples the active functions automatically. |
| AUXILIARY CONTROL | CNTLA | CNTL A 0 1 | Sets the control line A of the auxiliary interface high or low. |
| | CNTLB | CNTL B 0 1 | Sets the control line B of the auxiliary interface high or low. |
| | CNTLC | CNTL C 0 1 | Sets the interface control line C of the auxiliary interface high or low. |
| | CNTLD | CNTL D 0 1 | Sets the interface control line D of the auxiliary interface high or low. |
| | CNTLI | DISPLAY CNTL I | Returns a "1" when the interface control line I of the auxiliary interface is high, and "0" if the line is low. |

For HP 8594E, HP 85953, or HP 8596E only.
For HP 8592L, HP 85933, HP 85953, or HP 85963 only.



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| AUXILIARY CONTROL (continued) | COMB* | COMB GEN ON OFF * | Turns on or off the comb generator. |
| | DEMOD† | DEMOD ON OFF †, DEMOD AM FM † | Turns the demodulator on or off, and selects between AM, FM, or quasi-peak demodulation. |
| | FMGAIN† | FM GAIN † | Sets the total FM frequency deviation for full screen demodulation. |
| | MEASURES | | Determines the type of measurement: signal analysis, stimulus response, or signal normalization. |
| | NRL | | Sets the normalized reference level. |
| | RLPOS | | Selects the position of reference level. |
| | SPEAKER† | SPEAKER ON OFF † | Turns on or off the internal speaker. |
| | SQLCH† | SQUELCH † | Sets the squelch level. |
| | SRCALC‡ | ALC MTR TNT XTAL ‡ or ALC INT EXT ‡ | Selects internal or external leveling for the tracking generator. |
| | SRCAT‡ | SRC ATN NAN AUTO ‡ | Attenuates the source output level. |
| | SRCNORM | | Subtracts trace B from trace A, adds the display line, and sends the result to trace A. |
| | SRCPOFS‡ | SRC PWR OFFSET ‡ | Offsets the source power level readout. |
| | SRCPSTP‡ | SRC PWR STP SIZE ‡ | Selects the source-power step size. |
| | SRCPSWP‡ | PWR SWP ON OFF ‡ | Selects sweep range of the source output. |
| | SRCPWR‡ | SRC PWR ON OFF ‡ | Selects the source power level. |
| | SRCTK‡ | MAN TRK ADJUST ‡ | Adjusts tracking of source output with spectrum-analyzer sweep. |
| | SRCTKPK‡ | TRACKING PEAK ‡ | Adjusts tracking of source output with spectrum-analyzer sweep. |
| | SWPCPL‡ | SWP CPLG SR SA ‡ | Selects a stimulus-response (SR) or spectrum-analyzer (SA) auto-coupled sweep time. |
| BANDWIDTH | RB | RES BW AUTO HAN , 200 Hz EMI BW §, 9 kHz EMI BW, 120 kHz EMI BW | Specifies the resolution bandwidth. |
| | VAVG | VID AVG ON OFF | Turns on or off video averaging. |
| | VB | VID BW AUTO NAN | Specifies the video bandwidth. |
| | VBR | VBW/RBW RATIO | Specifies coupling ratio of video bandwidth to resolution bandwidth. |

For HP 8592L, HP 85933, or HP 85963 only.
For Options 102, 103, or 301 only.
For Options 010 or 011 only.
For Option 130 only.



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| CALIBRATION | AMPCOR | Amp Cur functions | Applies amplitude corrections at specified frequencies. |
| | AMPLEN | | Returns the number of frequency-amplitude correction factors that have been entered. |
| | CAL | (CAL) calibration functions | Initiates self-calibration routines. |
| | CNF | CONF TEST | Performs the confidence test. |
| | CORREK | | Returns a " 1" if the correction factors are on, a "0" if they are off. |
| | CRTHPOS | CRT HORZ POSITION | Specifies the horizontal position of the text and graticule on the spectrum analyzer's display. |
| | CRTVPOS | CRT VERT POSITION | Specifies the vertical position of the text and graticule on the spectrum analyzer's display. |
| COMMAND TRIGGER | ONCYCLE | | Executes the list of analyzer commands periodically. |
| | ONDELAY | | Executes the list of analyzer commands after the time value has elapsed. |
| | ONEOS | | Executes the list of analyzer commands after the end of the sweep. |
| | ONMKR | | Performs the list of analyzer commands when the sweep reaches the marker position. |
| | ONMKRU | | Executes the list of analyzer commands whenever the value or the units of the active marker are changed. |
| | ONSRQ | | Executes the list of analyzer commands whenever a service request occurs. |
| | ONSWP | | Executes the list of analyzer commands at the beginning of the sweep. |
| | ONTIME | | Executes the list of analyzer commands at the specified time. |
| | WAIT | | Suspends all spectrum analyzer operation for the specified time duration. |
| CONFIGURATION | BAUDRATE | BAUD RATE | Specifies the baud rate of a spectrum analyzer with Option 043 installed in it. |
| | CAT | Catalog Card *, Catalog Internal | Returns the catalog information of either spectrum analyzer memory or the memory card. |
| | DATEMODE | DATEMODE MDY DMY | Allows you to set the format for displaying the real-time clock. |
| | DISPOSE | ERASE DLP MEM | Frees spectrum analyzer memory that was previously allocated for user-defined operands. |
| | FORMAT* | FORMAT CARD * | Formats the memory card. |
| | PLTPRT | PLT PORT HPIB PAR | Directs the plotter output to HP-IB or parallel ports for Option 041. |
| | PLTPRT | PLT PORT SER PAR | Directs the plotter output to RS-232 or parallel ports for Option 043. |
| | POWERON | POWER ON IP LAST | Selects the spectrum analyzer's power on state. |

An HP 8590L or HP 8592L needs an Option 003 installed in it to use this command.



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| **CONFIGURATION (continued)** | PREFX | Change Prefix | Specifies or changes the prefix used in save and recall operations. |
| | PRNPRT | PRN PORT HPIB PAR | Directs the printer output to HP-IB or parallel ports for Option 041. |
| | PRNPRT | PRN PORT SER PAR | Directs the printer output to RS-232 or parallel ports for Option 043. |
| | SETDATE | SET DATE | Sets the date of the real-time clock. |
| | SETTIME | SET TINE | Sets the time of the real-time clock. |
| | SYNCMODE | SYNC NRM NTSC , DEFAULT SYNC, SYNC NRM PAL | Selects either the horizontal and vertica synchronizing constants, or the synchronization rate for the internal monitor. |
| | TIMEDATE | | Sets the time and date of the real-time clock. |
| | TIMEDSP | TIMEDATE ON OFF | Turns on or off the display of the real-time clock. |
| **DISPLAY** | ANLGPLUS* | ANALOG+ ON OFF * | Turns the Analog+ display mode on or Off. |
| | ANNOT | ANNOTATN ON OFF | Turns on or off the screen annotation. |
| | DA | | Accesses the current address of the display list. |
| | DL | DSP LINE ON OFF | Defines the level of the display line in the active amplitude units and displays the display line on the spectrum analyzer screen. |
| | DOTDENS* | ANALOG+ ON OFF * | Sets the dot density value in the Analog+ display mode. |
| | DSPLY | | Displays the value of a variable on the spectrum analyzer screen. |
| | GRAT | GRAT ON OFF | Turns on or off the graticule. |
| | HD | HOLD or (HOLD) | Disables data entry via the spectrum analyzer numeric keypad, knob, or step keys. The active function readout is blanked, and any active function is deactivated. |
| | MENU | | Displays specified menu on the spectrun analyzer screen. |
| | PREFX | Change Prefix | Specifies the prefix. |
| | TH | THRESHLD ON OFF | Clips signal responses below the threshold level. |
| | TITLE | Change Title | Activates the screen title mode. |
| **FREQUENCY** | CF | CENTER FREQ | Specifies center frequency. |
| | FA | START FREQ | Specifies the start frequency. |
| | FB | STOP FREQ | Specifies the stop frequency. |
| | FOFFSET | FREQ OFFSET | Specifies the frequency offset for all absolute frequency readouts such as center frequency. |
| | ss | CF STEP AUTO NAN | Specifies center-frequency step size. |

' For Option 101 or 301 only.



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| GRAPHICS | CLRBOX | | Clears a rectangular area on the spectrum analyzer display. |
| | CLRDSP | | Erases user-generated graphics and text. |
| | DA | | Accesses the current address of the display list. |
| | DRAWBOX | | Draws a rectangular box on the spectrum analyzer display. |
| | DT | | Defines any character as a label terminator. |
| | GETPLOT | (copy) | Initiates output of the spectrum analyzer display to a plotter. |
| | GETPRNT | COPY | Initiates output of the spectrum analyzer display to a printer. |
| | GR | | Graphs the given *y* coordinate while incrementing the *x* coordinate by 1. |
| | LB | | Writes text at the current pen position. |
| | PA | | Moves the pen to a vector location on the spectrum analyzer screen relative to the reference coordinates (0,0). |
| | PD | | Instructs the spectrum analyzer to plot vectors on the spectrum analyzer screen until a PU command is received. |
| | PR | | Moves the pen to a new plot location on the spectrum analyzer screen relative to the current coordinates in display units |
| | PRINT | COPY to a printer | Prints screen data. |
| | PRNTADRS | PRINTER ADDRESS | Allows you to set the HP-IB address of the printer. |
| | PU | | Instructs the spectrum analyzer not to plot vectors on the spectrum analyzer screen until a PD command is received. |
| | TEXT | | Writes text on the analyzer screen at the current pen position. |
| | TRGRPH | | Graphs compressed trace. |
| INFORMATION | ACTVF | | Returns a "0" if the given function is not active, a "1" if it is active. |
| | BIT | | Places the state of a bit in the destination. |
| | BITF | | Returns the state of a bit. |
| | CLS | | Clears all status bits. |
| | HAVE | SHOW OPTIONS | Returns a "0" if a device or option is not installed. |
| | ID | SHOW OPTIONS | Returns the spectrum analyzer model number. |
| | MDU | | Returns values for the spectrum analyzer's baseline and reference level. |
| | OP | | Returns the coordinates of the lower-left and upper-right comers of the spectrum analyzer display. |
| | PARSTAT | | Returns parallel port status. |
| | PWRUPTIME | | Returns the number of milliseconds that have elapsed since the spectrum analyzer was turned on. |



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| NFORMATION continued) | REV | SHOW OPTIONS | Returns the date code of the Ermware revision number in YYMMDD format. |
| | RQS | | Sets a bit mask for service requests. |
| | SER | SNOW OPTIONS | Returns the serial number suffix of the spectrum analyzer. |
| | SRQ | | The SRQ command is used by an external controller to simulate interrupts from the spectrum analyzer. |
| | STB | | Returns to the controller the decimal equivalent of the status byte. |
| NPUT and OUTPUT | EE | | Sends the controller the values entered on the spectrum analyzer numeric keypad by the operator. |
| | EK | | Allows data entry with the front-panel knob when the spectrum analyzer is under remote control. |
| | ENTER | | Allows the spectrum analyzer to receive data from other devices on the HP-IB. |
| | EP | | Sends values entered on the spectrum analyzer number keyboard to the present active function value. |
| | DA | | Returns the value of the active function. |
| | OL | | Transmits information to the controller that describes the state of the spectrum analyzer when the OL command is executed. |
| | OUTPUT | | Allows the spectrum analyzer to send data to other devices on the HP-IB. |
| | RELHPIB | | Releases spectrum analyzer control of the HP-IB. |
| | TA | | Returns trace A amplitude values from the analyzer to the controller. |
| | TB | | Transfers trace B amplitude values from the analyzer to the controller. |
| | TDF | | Formats trace information for return to the controller. |
| | TRA TRB TRC | | Controls trace data input or output. |
| IMIT LINES | LIMIDEL | 'URGE LIMITS | Deletes all segments in the current limit-line table. |
| | LIMIDISP | LMT DISP Y N AUTO | Controls when the limit line (or limit lines) are displayed. |
| | LIMIFAIL | Xl' TEST ON OFF | Returns a "0" if the last measurement sweep of trace A is equal to or within the limit-line bounds. |
| | LIMIFT | LIMITS FRQ TIME | Selects how the limit-line segments are placed on the spectrum analyzer display: according to frequency, or according to the sweep time setting of the spectrum analyzer. |
| | LIMIHI | | Allows you to specify a fixed trace as the upper limit line. |
| | LIMILINE | | Outputs the current limit-line table definitions. |



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| **LIMIT LINES (continued)** | LIMILO | | Allows you to specify a Axed trace as the lower limit line. |
| | LIMIMIRROR | | Reflects the current definition about the amplitude axis at the largest frequency or the largest sweep time in the definition. |
| | LIMIMODE | Edit Wpper , Edit Lover, Edit Up/Low , Edit Mid/Delt | Determines whether the limit-line entries are treated as upper amplitude values, lower amplitude values, upper and lower amplitude values, or mid-amplitude and delta values. |
| | LIMIREL | LIMITS FIX REL | Specifies the current limit lines as fixed or relative. |
| | LIMISEG | Edit Wpper , Edit Lower | Adds new segments to the current frequency limit line in either the upper limit llne or the lower limit line. |
| | LIMISEGT | Edit Upper, Edit Lower | Adds new segments to the current sweep time limit line in either the upper limit line or the lower limit line. |
| | LIMITEST | LMT TEST ON OFF | Compares trace A with the current limit-line data. |
| | SEGDEL | DELETE SEGMENT | Deletes the specified segment from the limit-line tables. |
| | SENTER | Edit Up/Low , Edit Mid/Delt | Enters the limit-line data in either the upper and lower limit-line tables or the mid and delta table for limit lines based on frequency. |
| | SENTERT | Edit Up/Low , Edit Mid/Delt | Enters the limit-line data in either the upper and lower limit-line table or the mid and delta table for limit lines based on sweep time. |
| **MARKER** | MDS | | Specifies measurement data size as byte or word. |
| | MF | | Returns the frequency (or time) of the on-screen active marker. |
| | MKA | | Specifies amplitude of the active marker |
| | MKACT | SELECT 1 2 3 4 | Specifies the active marker. |
| | MKACTV | MARKER <number> ON OFF | Makes the current active marker the active function. |
| | MKBW | N dB PTS ON OFF | Returns the bandwidth at the specified power level relative to an on-screen marker (if present) or the signal peak (if no on-screen marker is present). |
| | MKCF | MARKER -> CF | Sets the center frequency equal to the marker frequency and moves the marker to the center of the screen. |
| | MKCONT | | Resumes the sweep after execution of a MKSTOP command. |
| | MKD | MARKER A | Activates the delta marker. |
| | MKDLMODE | TABLE ADL NRM | Selects if the marker amplitude values are shown as relative to the reference level or relative to the display line. |
| | MKF | | Specifies the frequency value of the active marker. |



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| MARKER (continued) | MKFC* | MK COUNT ON OFF * | Turns on or off marker frequency counter. |
| | MKFCR* | CNT RES AUTO MAN * | Sets the resolution of the marker frequency counter. |
| | MKMIN | MARKER -> MINIMUM | Moves active marker to minimum signal detected. |
| | MKN | MARKER NORMAL | Activates and moves the marker to the specified frequency. |
| | MKNOISE | MK NOISE ON OFF | Displays the average noise level at the marker. |
| | MKOFF | MARKER ALL OFF | Turns off either the active marker or all the markers. |
| | MKP | | Places the active marker at the given Z-coordinate. |
| | MKPAUSE | MK PAUSE ON OFF | Pauses the sweep at the active marker for the duration of the delay period. |
| | MKPK | (PEAK SEARCH), NEXT PEAK, NEXT PX RIGHT, NEXT PK LEFT, MARKER->PK-PK | Positions the active marker on a signal peak. |
| | MKPX | PEAK EXCURSN | Specifies the minimum signal excursion for the spectrum analyzer's internal peak-identiftcation routine. |
| | MKREAD | MK READ F T I P | Selects the type of active trace information displayed by the spectrum analyzer marker readout. |
| | MKRL | MARKER -> REF LVL | Sets the reference level to the amplitude value of the active marker. |
| | MKSP | MARKER A -> SPAN | Sets the start and stop frequencies to the values of the delta markers. |
| | MKSS | MARKER -> CF STEP | Sets the center-frequency step-size to the marker frequency. |
| | MKSTOP | | Stops the sweep at the active marker. |
| | MKTBL | MK TABLE ON OFF | Turns on or off the marker table. |
| | MKTRACE | *MK* TRACE AUTO ABC | Moves the active marker to a corresponding position in trace A, trace B, or trace C. |
| | MKTRACK | MK TRACK ON OFF | Moves the signal with an active marker to the center of the spectrum analyzer display and keeps the signal peak at center screen. |
| | MKTYPE | MARKER AMPTD | Changes the type of the current active marker. |
| | M4 | | Activates a single marker on the trace and enables the knob to change the position of the marker. The active function is then set to span. |
| | PKDLMODE | PK MODE <>DL NRM | Selects the signal peaks that are displayed in the peak table. |
| | PKRES | | Returns the x-axis coordinates of the peaks in the peak table. |

Not available for an HP 8592L. An HP 8590L needs Option 013 installed in it.



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| MARKER (continued) | PKSORT | PK SORT FRQ AMP | Selects how the signal peaks listed in the peak table are sorted: by decreasing amplitude or by ascending frequency. |
| | PKTBL | PK TABLE ON OFF | Turns on or off the peak table. |
| MATH (see also Trace Math) | ABS | | Places the absolute value of the source values in the destination. |
| | ADD | | Adds the sources and sends the sum to the destination. |
| | AVG | | Averages the source and the destination |
| | BIT | | Returns the state of a bit. |
| | CTA | | Converts the source values from measurement units to the current absolute amplitude units and stores the result in the destination. |
| | CTM | | Converts the source values to measurement units and places the result in the destination. |
| | DIV | | Divides source 1 by source 2 and places the result in the destination. |
| | EXP | | Places the exponential of the source in the destination. |
| | INT | | Places the greatest integer that is less than or equal to the source value into the destination. |
| | LOG | | Takes the logarithm (base 10) of the source, multiplies the result by the scaling factor, then stores it in the destination. |
| | MEAN | | Returns the mean value of the given trace in measurement units. |
| | MEANTH | | Returns the mean value of the given trace above the threshold, in measurement units. |
| | MIN | | Compares source 1 and 2, point by point, and stores the lesser of the two in the destination. |
| | MINPOS | | Returns a value, which is the s-axis position (in display units) of the minimum amplitude value in trace A, trace B, trace C, or user-defined trace. |
| | MOD | | Stores the remainder from the division of source 1 by source 2 in the destination. |
| | MPY | | Multiplies the sources, point by point, and places the results in the destination. |
| | MXM | | Compares source 1 and source 2, point by point, sending the greater value of each comparison to the destination. |
| | PDA | | Sums the probability distribution of amplitude in the destination trace with the amplitude distribution function of the source trace. |
| | PDF | | Increments an element of the destination trace whenever the corresponding element of the source trace exceeds a threshold. |



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| MATH (continued) | RMS | | Returns the root mean square value of the trace in measurement units. |
| | SQR | | Places the square root of the source into the destination. |
| | STDEV | | Returns the standard deviation of the trace amplitude in measurement units. |
| | SUB | | Subtracts source 2 from source 1, point by point, and sends the difference to the destination. |
| | VARIANCE | | Returns the amplitude variance of the specified trace, in measurement units. |
| MEASURE/USER | ACP | ADJ CHAN POWER | Performs the adjacent channel power measurement. |
| | ACPBW | CHANNEL BANDWDTH | Allows you to specify the channel bandwidth used for the adjacent channel power (ACP), adjacent channel power extended (ACPE), and channel power (CHP) measurements. |
| | ACPCONTM | CONT MEAS | Changes the spectrum analyzer's sweep mode to continuous sweep, and then performs the previous power measurement (occupied bandwidth, adjacent channel, or channel power) at the end of every sweep. |
| | ACPE | ADJ CHAN PWR extd | Performs the adjacent channel power extended measurement. |
| | ACPGRAPH | COMPUTE ACPGRAPH | Computes and displays an adjacent channel power (ACP) graph. |
| | ACPPAR | PARAM AUTO MAN | Determines if the spectrum analyzer settings used for the adjacent channel power (ACP), adjacent channel power extended (ACPE), channel power (CHP), or occupied bandwidth (OBW) measurement are set manually or automatically. |
| | ACPSNGLM | SINGLE WAS | Changes the spectrum analyzer's sweep mode to single sweep, performs a take sweep (TS), and then performs the previous power measurement. |
| | ACPSP | CHANNEL SPACING | Allows you to specify the frequency spacing between channels. |
| | CHP | CHANNEL POWER | Performs the channel power measurement. |
| | FFT | | Performs a discrete fast Fourier transform on the source trace array and stores the result in the destination array. |
| | FFTAUTO | MARKER -> AUTO FFT | Performs a fast Fourier transform (FFT) on the signal on which the marker is placed. |
| | FFTCLIP | | Indicates if the FFT results are valid. |
| | FFTCONTS | CONTINUS FFT | Performs a fast Fourier transform (FFT) continuously on the current signal. |
| | FFTMKR | FFT MARKERS | Activates the FFT markers and displays the FFT annotation on the spectrum analyzer display. |



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| **MEASURE/USER (continued)** | FFTMM | BARKER -> **MID SCRN** | Changes the FFT midscreen frequency of the spectrum analyzer to the frequency of the FFT marker. |
| | FFTMS | **MARKER** -> FFT STOP | Changes the FFT stop frequency of the spectrum analyzer to the frequency of the FFT marker. |
| | FFTOFF | FFT **OFF** | Exits the fast Fourier transform (FFT) measurement and FFT settings. |
| | FFTPCTAM | **%** AH **ON** OFF (during an FFT measurement) | Turns the percent AM function on or Off. |
| | FFTPCTAMR | | Returns the percent of amplitude modulation (AM). |
| | FFTSNGLS | **SINGLE** FFT | Changes the spectrum analyzer's sweep mode to single sweep mode (if necessary), and then performs a fast Fourier transform **(FFT)** on trace A. |
| | FFTSTAT | | Returns the status of the spectrum analyzer's **FFT** measurement functions. |
| | **FFTSTOP** | | Sets the FFT stop frequency of the **FFT** measurement. |
| | MEASOFF | **MEAS** OFF | Turns off the current measurement, erases the display, and then displays the menu accessed by **MEAS/USER**. |
| | NDB | N **dB** PTS ON OFF | Specifies the distance **(in dB)** from the signal peak for the N **dB** points measurement (NDBPNT). |
| | NDBPNT | N **dB** PTS ON **OFF** | Turns on or off the N **dB** points measurement. |
| | NDBPNTR | | Returns the bandwidth measured by the N **dB** points measurement (NDBPT). |
| | OBW | **OCCUPIED BANDWDTH** | Performs the occupied bandwidth measurement using the value for occupied bandwidth percent (OBWPCT). |
| | OBWPCT | OCC BY **%** POWER | Specifies the percent of total power that is to be used **in** calculating the occupied bandwidth (OBW). |
| | PCTAM | **%** AM **ON** OFF | Turns on or off the percent AM measurement. |
| | PCTAMR | | Returns the percent AM measured by the percent AM measurement **(PCTAM).** |
| | PWRBW | | Computes the bandwidth around the trace center, which includes signals whose total power is a specified percentage of the total trace signal power. |
| | **TOI** | **TOI ON** OFF | Turns on or off the third-order intermodulation **(TOI)** measurement. |
| | TOIR | | Returns the highest third-order intermodulation product measured by the third-order intermodulation measurement **(TOI).** |
| **MODE** | MODE | **SPECTRUM ANALYZER** | Returns a "0" if the mode of operation is spectrum analysis. A number other than **"0" is** returned if the operating mode (also called "personality") is other than spectrum analysis. |



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| OPERATOR ENTRY | DN | ▼ | Reduces the active function by the applicable step size. |
| | EE | | Enables front-panel number entry. |
| | EK | | Enables front-panel knob control. |
| | EP | | Enter parameter from front panel. |
| | HD | HOLD or [HOLD) | Holds or disables entry and blanks active function readout. |
| | UP | ▲ | Increases the active function by the applicable step size. |
| PLOTTER | GETPLOT | COPY | Initiates output of the spectrum analyzer display to a plotter. (For use within a downloadable program.) |
| | PLOT | COPY (to a plotter) | Initiates output of the spectrum analyzer display to a plotter. |
| PRESET | IP | PRESET | Performs an instrument preset. |
| | LF* | | Performs an instrument preset to the base band (band 0). |
| | POWERON | POWER ON IP LAST | Selects the state the spectrum analyzer will be in when it is turned on: IP (instrument preset) or LAST state. |
| | RESETRL | | Resets the reference level to instrument preset value. |
| PRINTER | GETPRNT | COPY | Initiates output of the spectrum analyzer display to a printer. (For use within a downloadable program.) |
| | PRINT | COPY (to a printer) | Initiates output of the spectrum analyzer display to a printer. |
| PROGRAM FLOW | ABORT | | Stops the execution all user-defined functions and readies the instrument for the next command received. |
| | IF | | IF/THEN/ELSE/ENDIF forms a decision and branching construct. |
| | REPEAT | | REPEAT/UNTIL forms a looping construct. |
| | RETURN | | Stops the operation of a user-defined command and returns program operation to the point where the user-defined function was called. |
| | WAIT | | Suspends all spectrum analyzer operation for the specified time duration. |
| RECALL or SAVE | CAT | Catalog Internal, Catalog Card † | Displays directory information from either the specified or the current mass storage device. |
| | LOAD† | LOAD FILE † | Loads a file from the memory card. |
| | MSI | INTERNAL CARD | Allows you to specify the current mass storage device as the spectrum analyzer memory or a memory card. |
| | PREFX | Change Prefix | Specifies the prefix. |

For HP 8592L, HP 85933, HP 8595E, or HP 85963 only.
Option 003 required for HP 8590L or HP 8592L.



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| RECALL or SAVE | PSTATE | SAV LOCK ON OFF | Protects all of the spectrum analyzer's user state and trace registers from being changed. |
| | PURGE | DELETE FILE | Deletes the specified file from the current mass storage device. |
| | RCLS | INTERNAL -> STATE | Recalls spectrum analyzer state data from one of the nine state registers in spectrum analyzer memory. |
| | RCLT | The softkeys accessed by Internal -> Trace | Recalls previously saved trace data, amplitude factors, or limit-line data from the trace registers in spectrum analyzer memory. |
| | SAVES | STATE -> INTRNL | Saves the currently displayed instrument state in spectrum analyzer memory. |
| | SAVET | The softkeys accessed by Trace -> Intrnl | Saves the selected trace data and state information, amplitude correction factors, or limit-line tables in spectrum analyzer memory. |
| | SAVRCLF | (SAVE) or (RECALL) | Specifies either a save or recall operation. |
| | SAVRCLN | | Specifies the number to append to the prefix for a save or recall operation, and initiates the transfer of data. |
| | SAVRCLW | | Specifies the data to be transferred. |
| | STOR* | STATE -> CARD *,<br>Trace -> Card *,<br>ALL DLP -> CARD * | Stores data on a RAM card. |
| SPAN | FS | FULL SPAN | Sets the frequency span of the spectrum analyzer to full span. |
| | HN† | | Returns the harmonic number of the current harmonic band in which the spectrum analyzer is tuning. |
| | HNLOCK† | Band selection accessed by Band Luck † or<br>BND LOCK OR OFF † | Forces the spectrum analyzer to use only the selected harmonic band. |
| | HNUNLK† | BND LOCK ON OFF (OFF is underlined)+ | Unlocks the harmonic band. |
| | LSPAN | LAST SPAN | Changes the spectrum analyzer's span to the previous span setting. |
| | PKZMOK | | Returns a "0" if the peak zoom routine (PKZOOM) found only the spectrum analyzer's local oscillator feedthrough, otherwise a "1" is returned. |
| | PKZOOM | PEAK ZOOM | Automatically tunes the spectrum analyzer to the signal with the highest amplitude level while narrowing the frequency span to the specified frequency span. |

Option 003 required for HP 8590L or HP 8592L.
For HP 8592L, HP 85933, HP 85953, or HP 85963 only.



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| SPAN (continued) | SP | SPAN | Changes the total displayed frequency range symmetrically about the center frequency. |
| | SPZOOM | SPAN ZOOM | Places a marker on the highest on-screen signal (if an on-screen marker is not present), turns on the signal track function, and activates the span function. |
| SWEEP | CONTS | SWEEP CONT SGL (CONT is underlined) | Sets the spectrum analyzer to the continuous sweep mode. |
| | GATE' | GATE ON OFF * | Turns on or off the time-gating. |
| | GATECTL* | GATE CTL EDGE LVL * | Selects between the edge and the level mode for Option 105, the time-gated spectrum analysis capability. |
| | GC* | PRESET | Presets Option 105, the time-gated spectrum analysis capability. |
| | GD* | GATE DELAY * | Sets the delay time before the gate opens. |
| | GDRVCLPAR* | CLEAR PARAM * | Clears the pulse parameters (pulse width, pulse repetition interval, and reference edge) for a time-gate measurement by setting the pulse parameters to 0. |
| | GDRVGDEL* | GATE DELAY • (when using the gate utility) | For the frequency window only, GDRVGDEL sets the time delay from when the gate trigger occurs to when the gate is opened. |
| | GDRVGLEN* | GATE LENGTH * | Adjusts the gate length in both the time and frequency windows. |
| | GDRVGT* | GATE ON OFF * | Turns on or off the gate in the frequency window. |
| | GDRVGTIM* | TRIG MKR ON OFF * | Activates the gate trigger marker, and places it at the given value. |
| | GDRVPRI' | ENTER PRI * | Enters the specified value as the pulse repetition interval. |
| | GDRVPWID* | ENTER WIDTH * | Enters the specified value as the pulse width. |
| | GDRVRBW* | CPL RBW ON OFF • | Couples or uncouples the resolution bandwidth to the specified pulse width. |
| | GDRVREFE * | ENTER REF EDGE* | Allows you to enter the position (in time) for a reference edge. |
| | GDRVST* | CPL SWP ON OFF * | Couples or uncouples the sweep time to the pulse repetition interval. |
| | GDRVSWAP * | UPDATE TIMEFREQ * | Makes the window (either the time or frequency window) that is currently not the active window, the active window. |
| | GDRVSWDE* | SWEEP DELAY * | Allows you to specify the delay from the edge of the gate trigger until the sweep is started in the time window. |

Option 105 required.



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| SWEEP (continued) | GDRVSWP* | T WINDOW SWP TIME * | Specifies the sweep time for the time domain window of the gate utility. |
| | GDRVUTIL* | GATE UTILITY * | Turns on or off the gate utility. |
| | GDRVVBW* | CPL VBW ON OFF * | Couples or uncouples the video bandwidth to the gate length. |
| | GL* | GATE LENGTH * | Sets the length of time the gate is open. |
| | GP* | EDGE POL POS NEG * | Sets the polarity (positive or negative) for the gate trigger. |
| | ST | SWP TIME AUTO HAN | Specifies the time in which the spectrum analyzer sweeps the displayed frequency range. |
| SYNCHRONIZATION | DONE | | Allows you to determine when the spectrum analyzer has started to execute all commands prior to and including DONE. |
| | TS | | Starts and completes one full sweep before the next command is executed. |
| TRACE | AMB | A - B -> A ON OFF | Subtracts trace B from trace A and sends the result to trace A during every sweep of the spectrum analyzer. |
| | AMBPL | NORMLIZE ON OFF | Subtracts trace B from trace A, adds thr display line value to the difference, and sends the result to trace A during every sweep of the spectrum analyzer. |
| | AXB | A <--> B | Exchanges trace A and trace B. |
| | BLANK | BLANK A, BLANK B , BLANK C | Blanks trace A, trace B, or trace C and stops taking new data into the specified trace. |
| | BML | B - DL -> B | Subtracts display line from trace B and places the result in trace B. |
| | BTC | B -> C | Transfers trace B into trace C. |
| | BXC | B <--> C | Exchanges trace B and trace C. |
| | CLRW | CLEAR WRITE A, CLEAR WRITE B , CLEAR WRITE C | Clears the specified trace and enables trace data acquisition. |
| | DET | DETECTOR PK SP NEG or DETECTOR SMP PK | Selects the spectrum analyzer detection mode. |
| | :B | | Provides a method for putting values into trace B. |
| | MERGE | | Merges the source trace into the specified area of the destination trace. |
| | MINH | MIN HOLD c | Updates trace C elements with minimum level detected. |
| | MOV | | Copies the source values into the destination. |
| | MXMH | MAX HOLD A, NAX HOLD B | Updates trace elements with maximum level detected. |
| | PKPOS | | Returns a value, which is the index of the maximum value in trace A, trace B, trace C, or user-defined trace. |

Option 105 required.



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| TRACE (continued) | TA | | Returns trace A data. |
| | TB | | Returns trace B data. |
| | TRA TRB TRC | | Controls trace data input and output. |
| | TRCMEM | | Returns a nonnegative integer that indicates the total number of trace registers available for SAVET and RCLT. |
| | TRDEF | | Creates a user-defined trace. |
| | TRDSP | | Turns on or off the display of trace A, B, or C without clearing the trace (measurements can still be taken). |
| | TRGRPH | | Displays a compressed trace on the analyzer display. |
| | TRPRST | | Sets the trace operations to their preset values. |
| | TRSTAT | | Returns the status of traces A, B, and C: clear write, blank, view, minimum hold, or maximum hold. |
| | TWNDOW | | Creates a window trace array for the fast Fourier transform (FFT) function. |
| | VAVG | VID AVG ON OFF | Enables the video-averaging function, which averages trace points to smooth the displayed trace. |
| | VIEW | VIEW A, VIEW B, VIEW C | Displays trace A, trace B, or trace C, and stops taking new data into the viewed trace. |
| TRACE MATH (see also Math) | APB | | Adds trace A to trace B and sends the result to trace A. |
| | CLRAVG | VID AVG ON OFF | Restarts video averaging. |
| | COMPRESS | | Reduces the number of trace elements while retaining the relative frequency and amplitude characteristics of the trace data. |
| | CONCAT | | Combines two traces. |
| | FFT | | Calculates fast Fourier transform. |
| | LINFILL | | Fills linear interpolated data into the specified trace data points of a destination trace. |
| | MIRROR | | Displays the mirror image of a trace. |
| | PEAKS | | Sorts signal peaks by frequency or amplitude, stores the results in the destination trace, and returns the number of peaks found. |
| | SMOOTH | | Smooths the trace according to the number of points specified for the running average. |
| | SUM | | Returns the sum of the amplitudes of the trace elements in measurement units. |
| | SUMSQR | | Returns the sum of the squares of the amplitude of each trace element. |
| | TRMATH | | Executes a list of analyzer commands at the end of each sweep. |
| | XCH | | Exchanges traces. |



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| TRIGGER | ONEOS | | Performs the command list at the end of sweep. |
| | ONSWP | | Performs the command list at beginning of sweep. |
| | SNGLS | SGL SWP, SWEEP CONT SGL (SGL is underlined) | Selects single-sweep mode. |
| | TM | FREE RUN, LINE, VIDEO, EXTERNAL, TV TRIG * | Specifies trigger mode. |
| | TS | | Begins a new sweep. |
| | TVLINE* | TV LINE # * | Sets the line number of the horizontal line of video on which to trigger. |
| | TVSFRM* | TV TRIG ODD FLD *, TV TRIG EVEN FLD ●, TV TRIG VERT INT * | Specifies type of video frame to trigger on. |
| | TVSTND * | TV Standard * | Selects the triggering for NTSC, PAL, PAL-M, and SECAM-L formats. |
| | TVSYNC* | TV SYNC NEG PBS * | Selects between negative and positive triggering for video frame formats. |
| USER-DEFINED | ABORT | | Aborts all user-defined functions. |
| | ACTDEF | | Creates a user-defined active function. |
| | DISPOSE | ERASE DLP MEM | Deletes user-defined functions. |
| | ERASE | | Clears trace A and trace B, disposes of the contents of the user memory, and resets the state reglsters and the spectrum analyzer to the instrument preset state. |
| | FUNCDEF | | Defines a routine consisting of spectrum analyzer commands, assigns the routine a label, and stores the routine and its label in the user memory. |
| | KEYCLR | | Clears softkeys 1 through 6. |
| | KEYCMD | | Allows you define the function and label of a softkey. The softkey label is updated whenever a softkey is pressed. |
| | KEYDEF | | Assigns a label and user-defined function to a softkey. |
| | KEYENH | | Allows you to activate inverse video mode or underline part or all of the softkey label. |
| | KEYEXC | | Executes the specified, previously defined softkey. |
| | KEYLBL | | Relabels a softkey without changing its function. |
| | MEM | | Returns the amount of spectrum analyzer memory available. |
| | MENU | | Selects and displays the softkey menus on the spectrum analyzer screen. |
| | RETURN | | Returns from user-defined function. |
| | SAVEMENU | | Saves menu 1 under the specified menu number. |

' Options 101 and 102, or Option 301 required.



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## Table 5-4. Functional Index (continued)

| Function Category | Command | Corresponding Key Function | Description |
|---|---|---|---|
| **USER-DEFINED** | TRDEF | | Declares a user-defined trace. |
| | USTATE | | Transmits information that has been stored in the analyzer by the user. |
| | VARDEF | | Creates a user-defined variable and assigns it a value. |
| **WINDOWS** | **WINNEXT** | (NEXT)* | Makes the window that is currently not the active window, active. |
| | **WINOFF** | **WINDOWS** OFF * | Turns off the windows **display.** |
| | **WINON** | (ON)* | Activates the windows display mode. |
| | **WINZOOM** | (ZOOM)* | Expands the **size** of the active window so that it fills the entire spectrum analyzer display. |
| | ZMKCNTR | ZONE **CENTER** * | Positions the zone marker at the specified frequency. |
| | ZMKPNL | **ZONE PK** LEFT * | Places the zone marker at the next signal peak that is left of the zone marker's current position. |
| | ZMKPNR | **ZONE PK RIGHT** * | Places the zone marker at the next peak to the rlght of the zone marker's current position. |
| | ZMKSPAN | **ZONE** SPAN * | Allows you to change the width of the zone marker. |

' Not available for the HP 8590L or HP 8592L.



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# ABORT
# Abort

Stops the execution all user-defined functions and readies the instrument for the next command received.

## Syntax




XABOR1

Related Commands: ACTDEF, FUNCDEF, REPEAT/UNTIL, RETURN.

## Example

In the example below, ABORT is in the function called D_LP.

```
10 OUTPUT 718;"IP;"                                  Initializesspectrum analyzer
20 OUTPUT718;"CLRDSP;"                               Clears graphics from the spec-
                                                     trum analyzer display.
30 OUTPUT 718;"TRDSP TRA,OFF;"                       Turns off trace A.
40 OUTPUT 718;"ANNOT OFF;GRAT OFF;"                  Blanks annotation and graticule.
50 OUTPUT 718;"VARDEF C_OUNT,0;"                     Declares a user-defined vari-
                                                     able called C_OUNT.
60 !
70 OUTPUT 718;"FUNCDEF D_LP,@";                      Declares a user-defined func-
                                                     tion called D_LP.
80 OUTPUT 718;"REPEAT;";                             Begins a repeat loop.
90 OUTPUT 718;"ADD C_OUNT,C_OUNT,100;";              Adds 100 to C_OUNT.
100 OUTPUT 718;"PU,PA 100,100;PD;";
110 OUTPUT 718;"DSPLY C_OUNT,4.0;";                  Displays the value of C_OUNT.
120 OUTPUT 718;"IF C_OUNT,EQ,300 THEN;ABORT;ENDIF;"; Aborts the function when
                                                     C_OUNT is equal to 300.
130 OUTPUT 718;"UNTIL C_OUNT,EQ,400;";               This is not executed because
                                                     of the ABORT command in
                                                     line 120.
140 OUTPUT 718;"@;";                                 Marks end of D-LI?
150 OUTPUT 718;"FUNCDEF S_HELL,@";                   Defines second user-defined
                                                     function called SHELL.
160 OUTPUT 718;"D_LP;TEXT!INSIDE S_HELL!;@"          Executes D_LP and displays
                                                     message on display
170 !
180 OUTPUT 718;"S_HELL;"                            This calls the S_HELL func-
                                                     tion which in turn calls the
                                                     D_LP function.
190 END
```



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**ABORT Abort**

## Description

If ABORT is encountered in a function that has been executed by pressing a softkey, the function is interrupted and front-panel control is returned.

If the ABORT function is nested within one or more user-defined functions, ABORT stops the execution of all user-defined functions and readies the spectrum analyzer to act on the next command received.

In comparison, the RETURN command also interrupts operation of a user-defined function, but RETURN returns the operation to the point at which the user-defined function was called. (See "RETURN" for more information.)

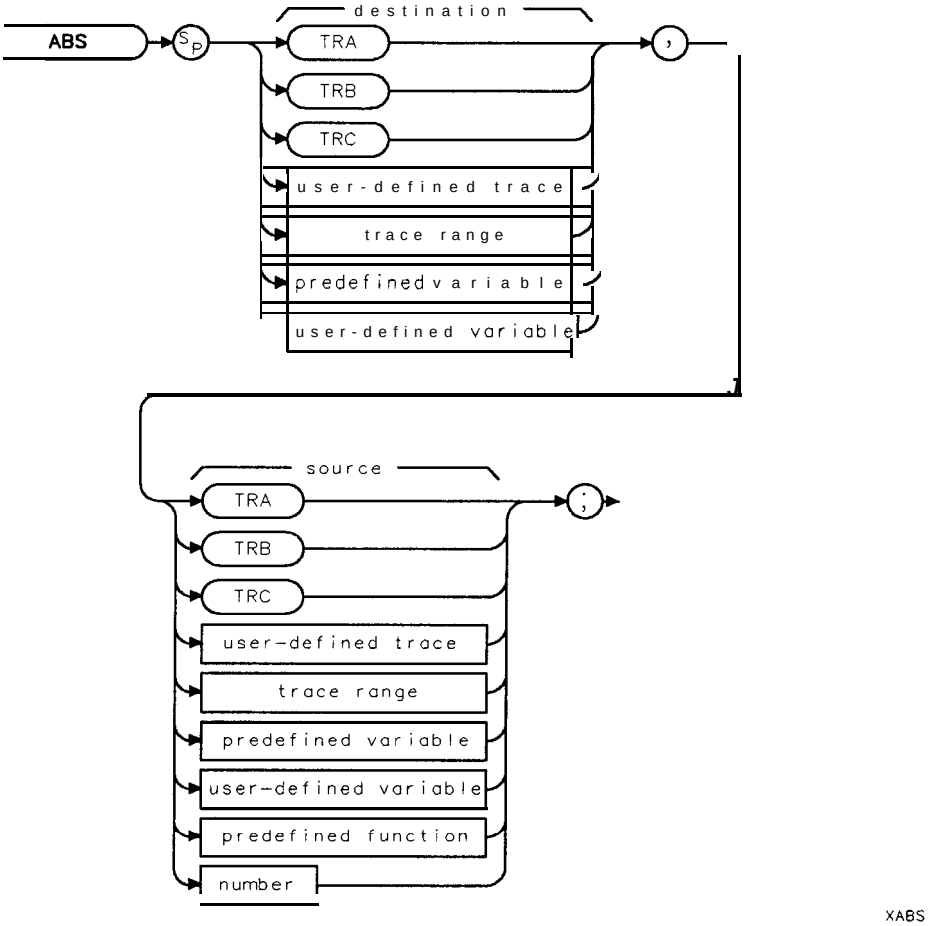


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# ABS
# Absolute

Places the absolute value of the source values in the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| **User-defined** trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable **defined** by VARDEF or ACTDEF commands. | Any valid variable **name.** |
| **Predefined** variable | A command that acts as a variable. Refer to Table 5-l. | |
| **Predefined** function | Function that returns a value. Refer to Table 5-l. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Anv real or inteeer number. | Real number range. |

Prerequisite Commands: TRDEF when using user-defined trace. ACTDEF or VARDEF when using user-defined variable. TS when using trace data.



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## Example

```
10 OUTPUT718;"IP;SNGLS;"              Initializes spectrum analyze?; stops sweeping.
20 OUTPUT 718;"VARDEF P_OINT,0;"      Defines a variable, called P_OINT, and initializes it
                                      to 0.
30 OUTPUT 718;"ABS P_OINT,-2;"        Places the absolute value of -2 into POINT
40 OUTPUT718;"P_OINT?;";              Returns value of POINT to computer
50 ENTER718;Second                    Assigns value to computer variable, Second.
60 DISP Second                        Displays the absolute value (2).
70 END
```

## Description

The source and the destination may be different lengths. The lengths of predefined traces (trace A, trace B, or trace C) is 401, while user-defined traces have a length of up to 2047, and variables have a length of 1. When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.



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# ACP
# Adjacent Channel Power

Performs the adjacent channel power measurement.

## Syntax




XACP

Equivalent Softkey: ADJ CHAN POWER.

Related Commands: ACPPAR, ACPSP, ACPBW, ACPSNGLM, ACPCONTM, ACPGRAPH, ACPGR, ACPMK.

## Example

```
OUTPUT 718;"ACP;"
```

*Performs the adjacent channel power measurement.*

## Description

ACP measures the power of the carrier and the power of the channels that are adjacent to the carrier, and then computes a power ratio for each of the adjacent channels, using the carrier power as a reference. ACP performs the adjacent channel power measurement using the values for channel spacing (ACPSP) and channel bandwidth (ACPBW).

To use ACP:

1. Set the center frequency to the carrier's frequency.
2. For best accuracy, set the reference level so that the carrier signal peak is within the first (top) division of the display graticule.
3. Select the channel spacing with the ACPSP command.
4. Select the channel bandwidth with the ACPBW command.
5. If you want the spectrum analyzer settings to be set automatically, ensure that ACPPAR is set to 1. If you want to set the spectrum analyzer settings manually, set ACPPAR to 0. (See "ACPPAR" for more information about selecting the spectrum analyzer settings manually.)
6. If the spectrum analyzer is in the continuous-sweep mode, use the single sweep command (SNGLS) to select the single-sweep mode.
7. Execute the ACP command.
8. Query ACPERR to determine if there is a setup error for the ACP measurement. See the following table for more information about ACPERR.
9. If no error occurred, query ACPPWRTX, ACPMAX, ACPLOWER, and ACPUPPER variables for the numeric results of the ACP measurement. See the following table for more information about these variables.
10. If no error occurred, query trace A (TRA) for the trace results of the ACP measurement.

**Measurement Results:** The results of the ACP command are stored in the variables and trace in the following table.



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**ACP Measurement Results**

| Variable or Trace | Description | units |
|---|---|---|
| ACPERR | A variable that indicates if setup errors occurred for the ACP measurement. If ACPERR is 0, no errors occurred. If ACPERR is greater than 0, an error occurred. An ACPERR value of 1 to 7 indicates that the frequency span, channel spacing, or the channel bandwidth are not set correctly. An ACPERR value of 1 to 7 indicates the following:<br>1 Frequency span < (2 x channel spacing + channel bandwidth).<br>2 Channel bandwidth > 2 x channel spacing.<br>3 Frequency span < (2 x channel spacing + channel bandwidth) and channel bandwidth > 2 x channel spacing.<br>4 Channel bandwidth < frequency span/100.<br>5 Frequency span < (2 x channel spacing + channel bandwidth) and channel bandwidth < frequency span/100.<br>6 Channel bandwidth > 2 x channel spacing and channel bandwidth < frequency span/100.<br>7 Frequency span < (2 x channel spacing + channel bandwidth), channel bandwidth > 2 x channel spacing, and channel bandwidth < frequency span/100. | None |
| ACPPWRTX | A variable that contains the total transmit band carrier power. ACPPWRTX is calculated by the following:<br>$10 \times log(Power_{Carrier})$ | Determined by AUNITS command Default unit is dBm. |
| ACPMAX | A variable that contains the relative power level of the adjacent channel with the highest measured power level. | dB |
| ACPLOWER | A variable that contains the relative power level found in the lower adjacent channel. ACPLOWER is calculated by the following:<br>$10 \times log(\frac{Power_{lower\ channel}}{Power_{carrier}})$ | dB |
| ACPUPPER | A variable that contains the relative power level found in the upper adjacent channel. ACPUPPER is calculated by the following:<br>$10 \times log(\frac{Power_{upper\ channel}}{Power_{carrier}})$ | dB |
| 'RA | TRA is trace A. Trace A contains the swept RF spectrum that was used to measure adjacent channel power. | Determined by the trace data format (TDF) command. |

## Restrictions

Executing ACP exits the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), the FFT menu measurements (FFTAUTO, FFTCONTS, FFTSNGLS), gate utility functions (GDRVUTIL), TO1 measurement (TOI), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), or peak zoom (PKZOOM).

AUNITS of W or V, will give incorrect results for ACPMAX, ACPLOWER, and ACPUPPER.

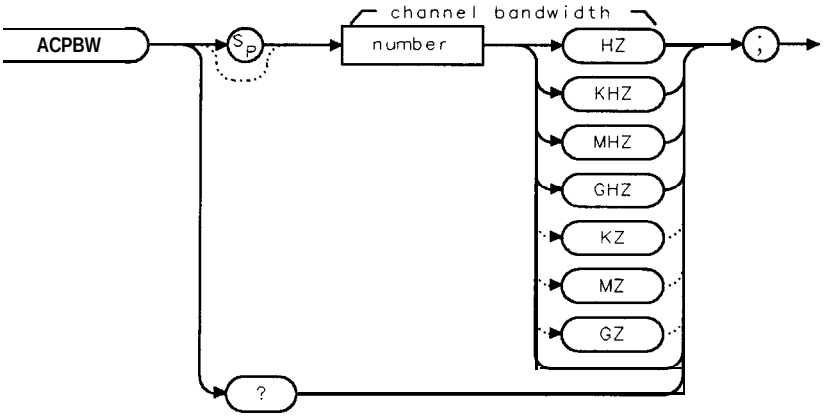


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# ACPBW
# Channel Bandwidth

Allows you to specify the channel bandwidth used for the adjacent channel power (ACP), adjacent channel power extended (ACPE), and channel power (CHP) measurements.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | 1 kHz to 999.9 MHz. |

Equivalent Softkey: CHANNEL BAMDWDTH .
Initial Value: 16 kHz.
Preset Value: last value entered.
Related Commands: ACP, ACPE, CHP.

## Example

```
OUTPUT 718;"MOV ACPBW,100KHZ;"
OUTPUT 718;"ACP;"
```

*Specifies a 100 kHz integration bandwidth.*
*Performs the adjacent channel power measurement.*



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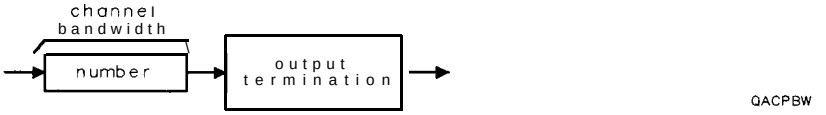
## Description

The value of ACPBW is used when calculating the results of the adjacent channel (ACP), adjacent channel extended (ACPE), or channel power (CHP) measurement. The value of ACPBW is also used when ACPPAR is set for automatic coupling the spectrum analyzer settings for the ACP, ACPE, or CHP measurement.

Once you enter a value into ACPBW, that value is retained until you change it, or execute DISPOSE ALL. Pressing PRESET or turning the spectrum analyzer off does not change the value of ACPBW.

You can execute the ACPBW command two different ways. You can either execute the ACPBW command directly (for example, `"ACPBW 100KHZ; "`) or use the MOV command to move the value for the bandwidth into the ACPBW command (for example, `"MOV ACPBW,100KHZ;"`). If you use the MOV command, no text is displayed in the active function area during command execution.

## Query Response






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# ACPCONTM
# Continuous Sweep Measurement

Changes the spectrum analyzer's sweep mode to continuous sweep, and then performs the previous power measurement (occupied bandwidth, adjacent channel, or channel power) at the end of every sweep.

## Syntax




XACPCONTM

Equivalent Softkey: CONT MEAS .
Related Commands: ACP, ACPSNGLM, CHP, CONTS, SNGLS, OBW.

## Example

```
OUTPUT 718;"ACP;"
OUTPUT 718;"ACPCONTM;"
```

*Performs the adjacent channel power measurement.*
*Places the spectrum analyzer into continuous sweep mode so that the adjacent channel power measurement will be performed at the end of every sweep.*

## Description

When ACPCONTM is executed, the numeric or graph results of adjacent channel (ACP), channel power (CHP), or occupied bandwidth (OBW) measurements are calculated at the end of every sweep. While in the continuous sweep measurement, you can change the channel spacing (ACPSP), channel bandwidth (ACPBW), or another spectrum analyzer setting and the numeric or graph results for the ACP, CHP, or OBW measurement will be automatically updated.

If ACPCONTM is executed after the adjacent channel power extended command (ACPE), only the trace results for the top 80 dB are obtained; the numeric or ACP graph results of the ACPE measurement are not available in continuous sweep mode.

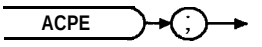


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# ACPE
# Adjacent Channel Power Extended

Performs the adjacent channel power extended measurement.

## Syntax




XACPE

Equivalent **Softkey: ADJ CHAN PWR** extd .
Related Commands: ACPPAR, ACPSNGLM, ACPSP, ACPBW.

## Example

```
OUTPUT 718;"ACPE;"
```

*Performs the adjacent channel power extended measurement.*

## Description

ACPE performs the adjacent channel power measurement using the values for channel spacing (ACPSP) and channel bandwidth (ACPBW). ACPE is similar to ACP, but unlike ACP, ACPE measures the adjacent channel power over an extended dynamic range. The extended range is measured by taking two measurement sweeps, with the reference level for each sweep set to different values, and then combining the trace data.

Executing ACPE places the spectrum analyzer in the single sweep measurement mode. The log scale is set to 13 **dB/div,** which provides an actual display range of 104 **dB.** If you execute the continuous sweep measurement command (ACPCONTM), only the trace results for the top 80 **dB** are obtained; the numeric and ACP graph results of the ACPE measurement are not available.

To use ACPE:

1. Set the center frequency to the carrier's frequency.
2. For best accuracy, set the reference level so that the carrier signal peak is within the first (top) division of the display graticule.
3. Select the channel spacing with the ACPSP command.
4. Select the channel bandwidth with the ACPBW command.
5. If you want the spectrum analyzer settings to be set automatically, ensure that ACPPAR is set to 1. If you want to set the spectrum analyzer settings manually, set ACPPAR to 0. See "ACPPAR" for more information about selecting the spectrum analyzer settings manually.
6. If the spectrum analyzer is in the continuous-sweep mode, use the single sweep command (SNGLS) to select the single-sweep mode.
7. Execute the ACPE command.
8. Query ACPERR to determine if there is a setup error for the ACP measurement. See the following table for more information about ACPERR.
9. If no error occurred, query ACPPWRTX, ACPMAX, ACPLOWER, and ACPUPPER variables for the numeric results of the ACPE measurement. See the following table for more information about these variables.



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10. If no error occurred, query trace A (TRA) for the trace results of the ACPE measurement.

**ACPE Measurement Results**

| Variable or Trace | Description | Units |
|---|---|---|
| \CPERR | A variable that indicates if setup errors occurred for the ACPE measurement. If ACPERR is 0, no errors occurred. If ACPERR is greater than 0, an error occurred. An ACPERR value of 1 to 7 Indicates that the frequency span, channel spacing, or the channel bandwidth are not set correctly. An ACPERR value of 1 to 7 indicates the following:<br>1 Frequency span < (2 x channel spacing + channel bandwidth).<br>2 Channel bandwidth > 2 x channel spacing.<br>3 Frequency span < (2 x channel spacing + channel bandwidth) and channel bandwidth > 2 x channel spacing.<br>4 Channel bandwidth < frequency span/100.<br>5 Frequency span < (2 x channel spacing + channel bandwidth) and channel bandwidth < frequency span/100.<br>6 Channel bandwidth > 2 x channel spacing and channel bandwidth < frequency span/100.<br>7 Frequency span < (2 x channel spacing + channel bandwidth), channe bandwidth > 2 x channel spacing, and channel bandwidth < frequency span/100. | None |
| \CPPWRTX | A variable that contains the total transmit band carrier power. ACPPWRTX is calculated by the following:<br>$10 \times log(Power_{Carrier})$ | Determined by \UNITS command Default unit is dBm. |
| \CPMAX | A variable that contains the relative power level of the adjacent channel with the highest measured power level. | dB |
| LCPLOWER | A variable that contains the relative power level found in the lower adjacent channel. ACPLOWER is calculated by the following:<br>$10 \times log(\frac{Power_{lower\ channel}}{Power_{carrier}})$ | dB |
| \CPUPPER | A variable that contains the relative power level found in the upper adjacent channel. ACPUPPER is calculated by the following:<br>$10 \times log(\frac{POW.3_{upper\ channel}}{Power_{carrier}})$ | dB |
| 'RA | TRA is trace A. Trace A contains the swept RF spectrum that was used to measure adjacent channel power. | Determined by the race data format TDF) command. |

## Restrictions

Executing ACPE exits the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), the FFT menu measurements (FFTAUTO, FFTCONTS, FFTSNGLS), gate utility functions (GDRVUTIL), TO1 measurement (TOI), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), or peak zoom (PKZOOM).

AUNITS of W or V, will give incorrect results for ACPMAX, ACPLOWER, and ACPUPPER.

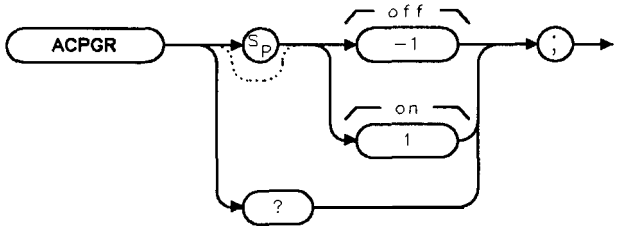


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# ACPGR
# Adjacent Channel Power Graph On or Off

Determines if the adjacent channel power (ACP) graph function is enabled or disabled.

## Syntax




xacpgr

Equivalent Softkey: ACPGRAPH ON OFF .
Related Commands: ACP, ACPE.

## Example

```
OUTPUT 718;"ACP;"
OUTPUT 718;"MOV ACPGR,1;"
```

*Performs the adjacent channel power measurement.*
*Enables the ACP graph function and creates a graph of ACP as a function of the frequency offset from the center frequency.*

## Description

Setting ACPGR to 1, does the following:

- Turns off the display of the ACP numeric results.
- Generates a graph of the adjacent channel power ratio, for the selected channel bandwidth, as a function of frequency spacing from the center frequency.
- Places the graph in trace C.
- Adds the GRPH MKR ON OFF softkey to the menu.
- If in continuous measurement mode, the ACP graph will be updated at the end of every sweep.



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Setting the ACPGR to –1, does the following:

- Turns off the display of the ACP graph in trace C.
- Calculates and displays the ACP numeric results.
- Removes the GRPH MKR ON OFF softkey from the menu.
- Turns off the ACP graph marker.
- If in continuous measurement mode, the numeric results will be updated at the end of every sweep.

When the graph is generated, the reference level represents an adjacent channel power ratio of 0, and the horizontal center represents a frequency offset (and channel spacing) of 0 Hz. The results of ACPGR are not defined for frequency spacings where the graph is drawn below the bottom graticule line.



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# ACPGRAPH
## Compute the Adjacent Channel Power Graph

Computes and displays an adjacent channel power (ACP) graph.

### Syntax




XACPGRAPH

Equivalent **Softkey**: none.
Related Commands: ACP, ACPE.

### Example

```
OUTPUT 718;"ACP;"
OUTPUT718;"ACPGRAPH;"
```

*Performs the adjacent channel power measurement.*

*Creates a graph of ACP as a function of the frequency offset from the center-frequency.*

### Description

ACPGRAPH uses the ACP spectrum data that was obtained (in trace A) by the previous adjacent channel power or adjacent channel power extended measurement to generate the graph. (Use the ACP or ACPE command to perform the adjacent channel power measurement.) ACPGRAPH does the following:

- Generates a graph of the adjacent channel power ratio, for the selected channel bandwidth, as a function of frequency spacing from the center frequency.
- Places the graph in trace C. The units for all traces is determined by the trace data format (TDF) command.

When the graph is generated, the reference level represents an adjacent channel power ratio of 0, and the horizontal center represents a frequency offset (and channel spacing) of 0 Hz. The results of ACPGRAPH are not defined for frequency spacings where the graph is drawn below the bottom graticule line.

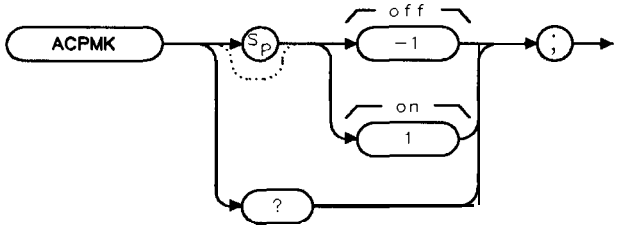


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# ACPMK
# Adjacent Channel Power Marker On or Off

Determines if the graph marker function is enabled or disabled for the adjacent channel power (ACP) graph.

## Syntax




xacpmk

Equivalent Softkey: GRPH ON OFF .
Related Commands: ACPGR, ACPGRAPH, CHPGR, ACPSNGLM, ACPCONTM.

## Example

| | |
|---|---|
| `OUTPUT 718;"ACP;"` | *&forms the adjacent channel power measurement.* |
| `OUTPUT 718;"MOV ACPGR,1;"` | *Enables the ACP graph function and creates a graph of ACP as a function of the frequency offset from the center frequency.* |
| `OUTPUT 718;"MOV ACPMK,1;"` | *Enables the ACP graph marker.* |

## Description

Setting ACPMK to 1, does the following for ACP graph:

- Positions a reference marker on the trace for ACP graph at the center frequency position.
- Positions a A marker on the trace at one channel spacing above the center frequency.
- Displays numeric values for delta frequency, ACP ratio, and channel power at the marker position.

Setting ACPMK to 1, does the following for channel power graph:

- Positions a marker on the trace for channel power graph at center frequency position.
- Displays numeric values for frequency and channel power at the marker position.

Setting the ACPMK to -1, turns off the marker function.

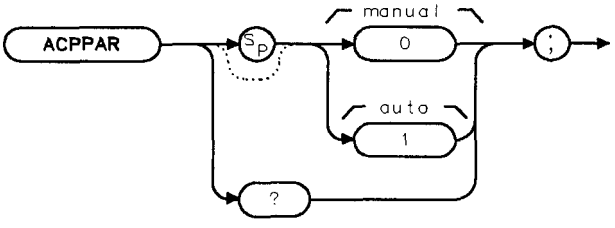


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# ACPPAR
# ACP Manual or Auto

Determines if the spectrum analyzer settings used for the adjacent channel power (ACP), adjacent channel power extended (ACPE), channel power (CHP), or occupied bandwidth (OBW) measurement are set manually or automatically.

## Syntax




XACPPAR

Equivalent **Softkey: PARAM** AUTO MAN .

Related Commands: ACP, ACPE, ACPSP, ACPBW, OBW, CHP, DET, ST, VB, RB, SS.

## Example

```
OUTPUT 718;"MOV ACPPAR,1;"
```

*Sets theparametersfor the adjacent channel power parameters automatically.*

## Description

When ACPPAR is set to 1, the spectrum analyzer settings for the ACP, ACPE, CHP, or OBW measurement are set by the spectrum analyzer. When ACPPAR is set to 1, the spectrum analyzer does the following before the measurement is performed:

- Performs the trace preset (TRPRST) command.
- Changes the trigger mode to free run.
- Changes the detector mode to sample.
- Changes the amplitude scale to 10 dB per division.
- Sets the frequency span, resolution bandwidth, video bandwidth, center frequency step size, and sweep time based on the channel spacing (ACPSP) and channel bandwidth (ACPBW). See the following table for more information about the spectrum analyzer settings for each measurement.
- Takes a sweep.



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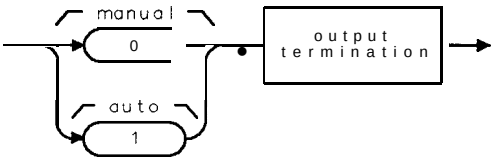
**Table 5-5. Spectrum Analyzer Settings, ACPPAR is Set to Automatic**

| Measurement | Res Bandwidth | Video Bandwidth | Span | Step Size | Sweep Time |
|---|---|---|---|---|---|
| Adjacent Channel Power (ACP) | Highest setting that does not exceed 0.025 x ACPBW' | 10 x RB | $\frac{(400 \times ACPSP)}{INT[\frac{(400 \times ACPSP)}{(2 \times ACPSP + 1.2 \times ACPBW)}]}$ | ACPSP | Auto |
| Channel Power (CHP) | Highest setting that does not exceed 0.025 x ACPBW' | 10 x RB | 2 x ACPBW | ACPSP | Auto |
| Occupied Bandwidth (OBW) | Highest setting that does not exceed 0.02 x ACPSP * | 10 x RB | 3 x ACPSP | ACPSP | Auto |
| * If Option 130 is not installed in the spectrum analyzer, the narrowest resolution bandwidth is limited to 1 kHz. | | | | | |

When ACPPAR is set to 0, you must set the spectrum analyzer settings for the ACP, ACPE, CHP, or OBW measurement. You must ensure that trace A contains the RF spectrum to be measured, and that the frequency span, resolution bandwidth, video bandwidth, and the detector are set appropriately for the measurement. When ACPPAR is set to 0, the measurement commands (ACP, ACPE, OBW, CHP) do not take a sweep before making the measurement.

You can execute the ACPPAR command two different ways. You can either execute the ACPPAR command directly (for example, "ACPPAR 1; ") or use the MOV command to move the 1 or 0 into the ACPPAR command (for example, "MOV ACPPAR, 1; "). If you use the MOV command, no text is displayed in the active function area during command execution.

## Query Response




QACPPAR



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## ACPSNGLM
## Single Sweep Measurement

Changes the spectrum analyzer's sweep mode to single sweep, performs a take sweep (TS), and then performs the previous power measurement (occupied bandwidth, adjacent channel, adjacent channel power extended, or channel power).

### Syntax




XACPSNGLM

Equivalent **Softkey**: SINGLE **MEAS**.
Related Commands: ACP, ACPCONTM, ACPE, CHP, CONTS, SNGLS, OBW.

### Example

```
OUTPUT 718;"ACP;"          Performs the adjacent channel power measurement.
OUTPUT718;"ACPSNGLM;"      Repeats the previous measurement once.
```

### Description

See the "ACP," "ACPE," "CHP," and "OBW" for more information about the measurement results of each measurement.

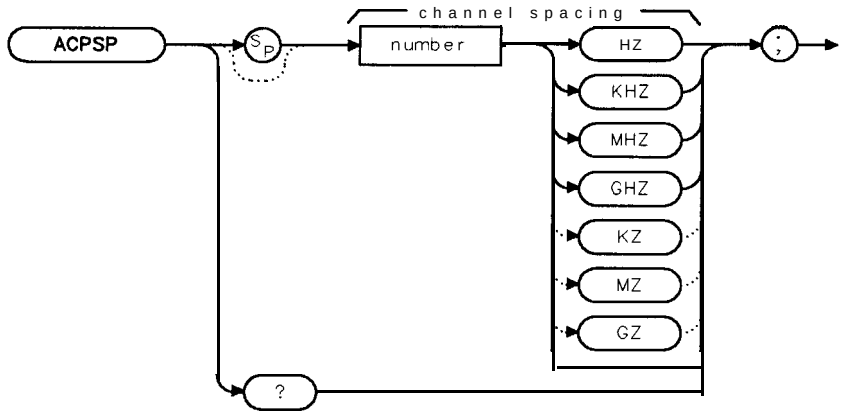


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# ACPSP
# Channel Spacing

Allows you to specify the frequency spacing between channels.

## Syntax




XACPSP

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | 1 kHz to 999.9 MHz. |

Equivalent Softkey: CHANNEL SPACING,
Initial Value: 25 kHz.
Preset Value: last value entered.
Related Commands: ACP, ACPE.

## Example

```
OUTPUT 718;"MOV ACPSP,100KHZ;"
OUTPUT 718;"ACP;"
```

*Specifies 100 kHz frequency spacing between channels.*
*Performs the adjacent channel power measurement.*

## Description

The value of ACPSP is used when calculating the results of the adjacent channel (ACP) or adjacent channel extended (ACPE) measurement. The value of ACPSP is also used when ACPPAR is set for automatic coupling of the spectrum analyzer settings for the ACP, ACPE, CHP, or OBW measurement.

Once you enter a value into ACPSP, that value is retained until you change it, or execute DISPOSE ALL. Pressing PRESET or turning the spectrum analyzer off does not change the value of ACPSP

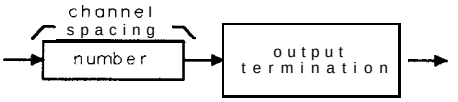
You can execute the ACPSP command two different ways. You can either execute the ACPSP command directly (for example, `"ACPSP 100KHZ ;"`) or use the MOV command to move the frequency value into the ACPSP command (for example, `"MOV ACPSP,100KHZ;"`). If you use the MOV command, no text is displayed in the active function area during command execution.



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## ACPSP Channel Spacing

### Query Response




QACPSP

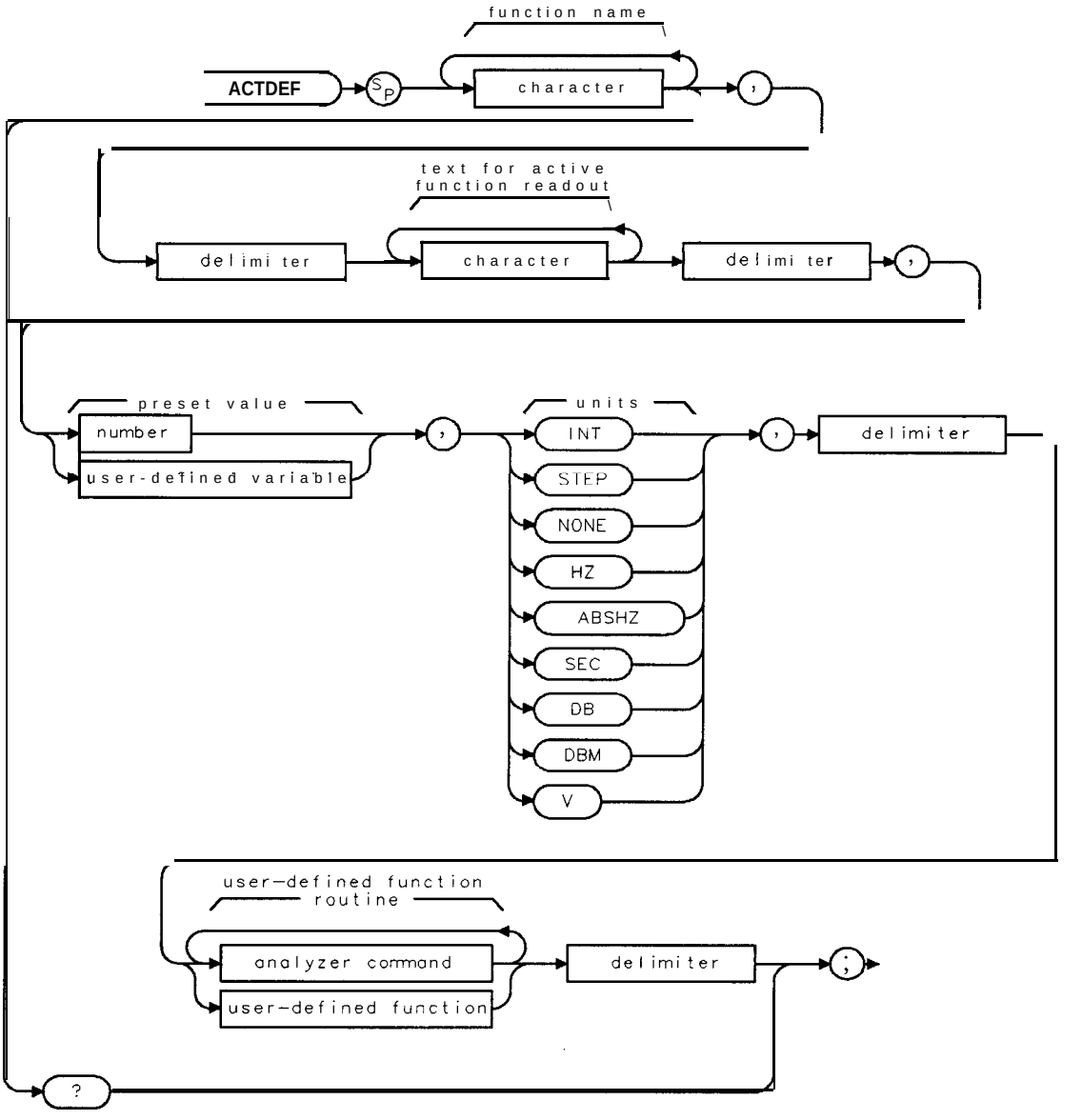


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# ACTDEF
# Active Function Definition

Creates a user-defined active function.

## Syntax




XACTDEF



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## ACTDEF Active Function Definition

| Item | Description/Default | Range |
|---|---|---|
| Character (function name) | Any valid character. Use the function name as the remote command name. | 2 to 11 characters long, A through Z and the underscore (the underscore should be used as the second character of the label). |
| Character (text for active function label) | Any valid character. The active function label is displayed in the active function block (when the function is active). | |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Number | Any real or integer number. Default value is 0, default unit is none. | Real number range. |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Analyzer command | Any valid spectrum analyzer command. | |
| User-defined function | A function defined by the FUNCDEF command. | Any valid function name. |

Prerequisite Command: FUNCDEF when using a user-defined function. VARDEF when using a user-defined variable.

### Example 1

```
10 DIM A$[1501

20 OUTPUT 718;"ACTDEF M_BW,%MY BANDWIDTH%,5MHZ,STEP,@";
30 OUTPUT 718;"MOV RB,M_BW@;";

40 OUTPUT 718;"M_BW;"
50 OUTPUT 718;"ACTDEF M_BW?;"

60 ENTER 718;A$
70 DISP A$

80 END
```

*Dimensions array to hold query response.*

*Defines a function called M_BW. M_BW allows manipulation of the initial value of RES BW (5 MHz) by the step keys and the knob. The resolution bandwidth will be rounded to the nearest allowable bandwidth, however. The "@" symbol marks the end of the ACTDEF declaration.*

*Activates the M_BW function.*

*Queries the definition of the M_BW function.*

*Displays the definition of the M_BW function.*



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## Example 2

This example uses ACTDEF in a downloadable program that is created by the KEYDEF command. In this example, the ACTDEF function D-SPAN is assigned to **softkey** 1. When **softkey** 1 is pressed, ENTER FFT SPAN is displayed on the spectrum analyzer display. When a value is entered, the sweep time is changed to prepare the spectrum analyzer for making a fast Fourier transform measurement. (See "FFT" for more information about making a fast Fourier transform measurement.)

```
OUTPUT 718;"KEYDEF 1,D_SPAN,@ FFT|SPAN@;"
OUTPUT 718;"ACTDEF D_SPAN,@ENTER FFT SPAN@,100,HZ,@";
OUTPUT 718;"MOV SP,0;";
OUTPUT 718;"DIV ST,200,D_SPAN;";
OUTPUT 718;"@;"
LOCAL 718
```

*Assigns D_SPAN to softkey 1.*

*Defines the D_SPAN function. The D_SPAN function displays* ENTER FFT SPAN *on the spectrum analyzer display, and has an initial value of 100 Hz.*

*The frequency span must be zero to make a FFT measurement.*

*Changes the spectrum analyzer sweep time according to the value of D_SPAN. D_SPAN is divided by 200, which represents the number of buckets.*

*Ends the ACTDEF declaration.*

After executing this example, the **softkey** label of **softkey** 1 is FFT **SPAN** . **Softkey** 1 can be accessed by pressing (MEAS/USER), **User Menus** .

## Description

With the ACTDEF command, you can create an active function that is similar to the active functions that are already provided by the spectrum analyzer. For example, CF, DL, AT, MKA, MKFCR, MKD, MKF, MKN, RB, SS, ST, TH, VAVG, VB, VBR are all active functions that are provided by the spectrum analyzer.

The ACTDEF command consists of the function name, the text for the active function readout, the preset value, the unit, and the analyzer commands or user-defined function.

**Function name:** The function name is the name that will be used to invoke the ACTDEF function. See line 40 of Example 1 for an example of invoking an ACTDEF function.

**Text for the active function readout:** This is the text is displayed, when the ACTDEF function is active, in the active function readout area of the spectrum analyzer display.

**Preset value:** The preset value is the value of the ACTDEF function until you change it. Executing an instrument preset (IP) resets the ACTDEF function's value back to the preset value.

**Units:** The ACTDEF function's value can be manipulated in different ways depending on the units parameter that is specified. For example, if you select INT (integer) units, the value of the ACTDEF function can only be incremented or decremented by 1. For the INT unit, the step keys and the knob can be used to change the function's value.



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Refer to the following table for a description of the different unit parameter.

**Behavior of Unit Parameters for ACTDEF Command**

| Parameter | Step Increment Value | Knob Increment Value | unit-Keys |
|---|---|---|---|
| INT | Integer, increment or decrement by 1 only | 1 | None |
| STEP | Increment or decrement by 1 only | 1 | None |
| NONE | Not applicable | Not applicable | None |
| HZ | Resolution bandwidth during zero-span mode; otherwise, 10% of span. | Resolution bandwidth, during zero-span mode; otherwise, 0.05% of span. | Frequency |
| ABSHZ | 1.5, 2, 3, 5, 7.5 | 1% | Frequency, in absolute Hz |
| SEC | 1.5, 2, 3, 5, 7.5 | 1% | Time |
| DB | dB per division | 1% of dB per division | Relative amplitude |
| DBM | dB per division | 1% of dB per division | Absolute amplitude |
| V | 1.5, 2, 3, 5, 7.5 | 1% | Volts |

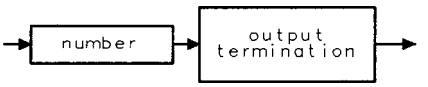
Some of the unit parameters specify the units of the function value (Hz, seconds, dB, dBm, V). The STEP, INT, and NONE parameters are unitless values. The STEP unit parameter works the same as the INT unit parameter. When using the INT, STEP, and NONE parameters in an ACTDEF declaration, the value displayed on spectrum analyzer display for the ACTDEF function value is rounded to the nearest integer; however the actual value in spectrum analyzer memory is not rounded.

Use the following guidelines when defining ACTDEF:

- The function name used in the ACTDEF declaration must be unique. Do not use an existing Table 5-2 for a list of reserved words.
- Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.

## Query Response

There are two ways to query the ACTDEF command. Querying the ACTDEF function's name returns the value of the ACTDEF function. For example, if the ACTDEF function's name is TEST, executing `OUTPUT 718;"TEST? ;"` returns the value of ACTDEF function TEST in the following format:

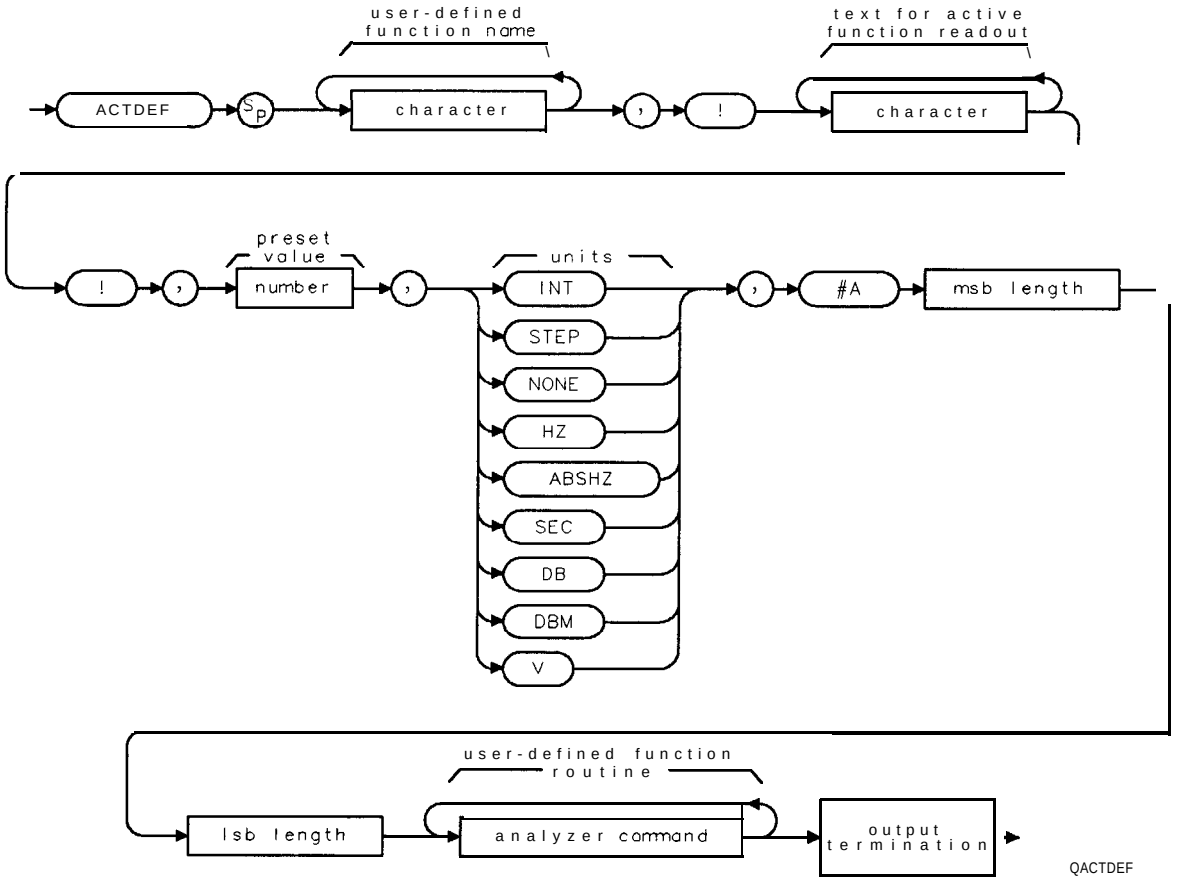



QQ1



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Querying both “ACTDEF” and the ACTDEF function’s name returns the definition of the function. For example, execute `OUTPUT 718 ; "ACTDEF TEST. ?,·"` (TEST is the ACTDEF function’s name).



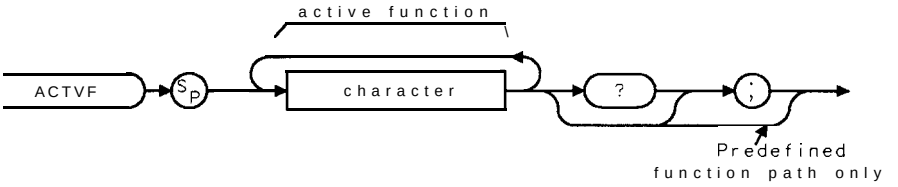



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# ACTVF
# Active Function

Returns a “0” if the given function is not active. A “1” if it is active.

## Syntax




XACTVF

| Item | Description/Default | Range |
|---|---|---|
| Character | Any valid character. | Any active function name. |

Related Commands: Any active function (see the list of active functions in the description below), IP.

## Example

```
OUTPUT 718;"RB 100KHZ;"     Makes resolution bandwidth the active function.
OUTPUT 718;"ACTVF RB;"      Determines if resolution bandwidth is the active function.
ENTER 718;A                 Gets the response from the spectrum analyzer
DISP A                      Displays response from the spectrum analyzer.
```

## Description

The active functions are ACPBW, ACPSP, AT, BAUDRATE, CF, COUPLE, CRTHPOS, CRTVPOS, DA, DET, DL, DOTDENS, FA, FB, FFTSTOP, FMGAIN, FOFFSET, GATECTL, GD, GL, GP, INZ, LG, MKA, MKD, MKFC, MKFCR, MKN, MKPAUSE, MKPX, ML, MODE, MSI, M4, NDB, NRL, PREAMPG, PRNTADRS, RB, RCLS, ROFFSET, RL, RLPOS, SAVES, SAVRCLN, SETDATE, SETTIME, SP, SQLCH, SRCALC, SRCAT, SRCPOFS, SRCPSTP, SRCPSWP, SRCPWR, SRCTK, SWPCPL, SS, ST, TH, TIMEDATE, TVSYNC, TVLINE, VAVG, VB, VBR, ZMKSPAN, ZMKCNTR and user-defined active function specified by the ACTDEF command.

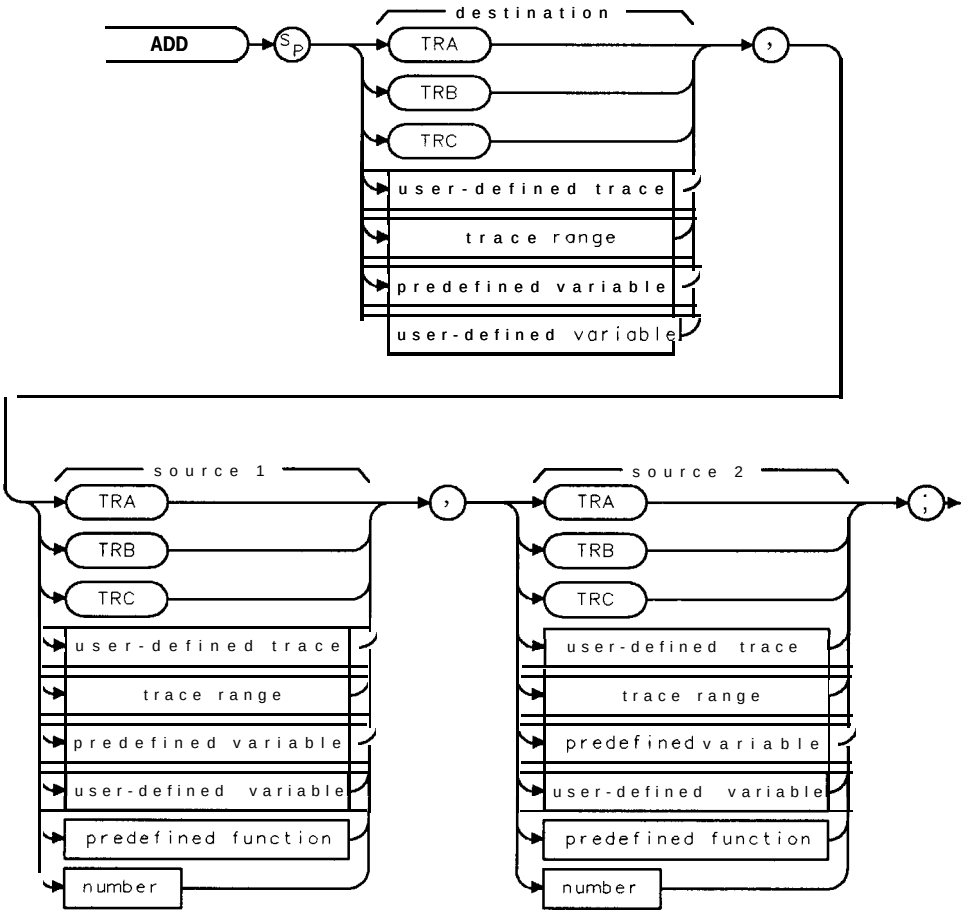


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# ADD
# Add

Adds the sources and sends the sum to the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable **defined** by VARDEF or ACTDEF commands. | Any valid variable name. |
| **Predefined** variable | A command that acts as a variable. Refer to Table 5-l. | |
| **Predefined** function | Function that returns a value. Refer to Table 5-1. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using user-defined trace. ACTDEF or VARDEF when using user-defined variable. TS when using trace data.
Related Commands: AMBPL, APB, SUB.



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## Example

Add 38 MHz to the center frequency, then store the sum in a user-defined variable.

```
10 OUTPUT 718;"IP;"                    Initializes spectrum analyzer.
20 OUTPUT 718;"CF 300MHZ;"             Changes the center frequency.
30 OUTPUT 718;"VARDEF N_EW,0;"         Defines a variable, N_EW, and initializes it to 0.
40 OUTPUT 718;"ADD N_EW,CF,38E6;"      Adds 38 MHz to the center frequency, then places
                                       the sum in N_EW.
50 OUTPUT 718;"N_EW?;"                 Returns value of N_EW to the computer:
60 ENTER 718;Freq                      Assigns value to variable, Freq.
70 DISP Freq                           Displays Freq on computer display.
80 END
```

## Description

The ADD command adds values of source 1 and source 2 (point by point), and sends the sum to the destination.

Traces, user-defined traces, and trace ranges are added as 16-bit integers. Negative numbers are represented in two's complement format. Single variables and numbers are treated as floating point numbers and must be within the real number range as defined in Table 5-1.

The sources and destination may be different lengths. The length of predefined traces (trace A, trace B, or trace C) is 401. User-defined traces have a length of up to 2047, and variables have a length of 1. When sources differ in length, the last element of the shorter source is repeated for the addition process. After the addition, the last element is repeated if the destination is longer than the sum trace. When the sources are longer than the destination, they are truncated to fit.

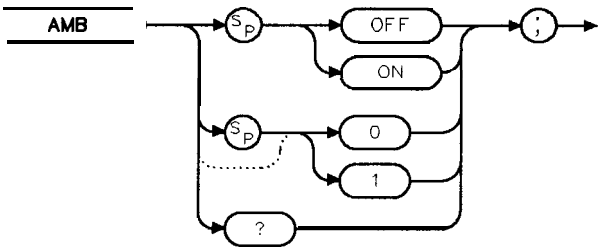


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# AMB
# Trace A Minus Trace B

Subtracts trace B from trace A and sends the result to trace A during every sweep of the spectrum analyzer.

## Syntax




XAMB

Preset State: AMB OFF.
Related Commands: CLRW, CONTS, MXMH, SNGLS, TS, VAVG, VIEW.
Restrictions: Not compatible with Analog+ display mode. See "ANLGPLUS" for more information.

Equivalent Softkey: A – B -> A ON OFF .

## Example 1

```
10 OUTPUT 718;"IP;"
20 OUTPUT 718;"CLRW TRB;TS;VIEW TRB;AMB ON;"

30 OUTPUT 718;"AMB?;"
40 ENTER 718;Reply$

50 DISP Reply$

60 END
```

*Initializes spectrum analyzer.*
*Displays trace B and turns on the AMB function. If trace A and trace B contain exactly the same trace data, the result is trace data at 0 measurement units, at the bottom of the display.*
*Queries the state of the AMB function.*
*The query response is placed in a string variable.*
*"ON" is displayed on the computer display.*



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## Example 2

```
10 OUTPUT 718;"IP;SNGLS;"
20 OUTPUT 718;"MOV TRA, 8000;"

30 OUTPUT 718;"VIEW TRA;"
40 OUTPUT 718;"MOV TRB,7000;"

50 OUTPUT 718;"VIEW TRB;"
60 OUTPUT 718;"AMB ON;"
70 OUTPUT 718;"BLANK TRB;VIEW TRA;"

80 END
```

*Initializes spectrum analyzer*
*Each element of trace A is set to 8000 measurement units, which is equal to 0 dBm.*
*Places trace A in the view mode.*
*Each element of trace B is set to 7000 measurement units, which is equal to -10 dBm.*
*Places trace B in the view mode.*
*Subtracts trace B from trace A.*
*The result is displayed at 1000 measurement units which is equal to -70 dBm.*

## Example 3

```
10 OUTPUT 718;"IP;SNGLS;RL 20DB;"

20 OUTPUT 718;"MOV TRA,5000;"

30 OUTPUT 718;"VIEW TRA;"
40 OUTPUT 718;"MOV TRB,4000;"

50 OUTPUT 718;"VIEW TRB;"
60 OUTPUT 718;"DL 0DB;"

70 OUTPUT 718;"BML;"


80 OUTPUT 718;"AMB ON;"




90 OUTPUT 718;"BLANK TRB;VIEW TRA;"
100 END
```

*Initializes the spectrum analyzer and sets the reference level.*
*Sets trace A to 5000 measurement units, which is equal to -10 dBm.*
*Places trace A in the mew mode.*
*Sets trace B to 4000 measurement units, which is equal to -20 dBm.*

*Sets display line to 0 dBm, which is at 6000 measurement units.*
*Subtracts trace B minus display line. Result is 4000 – 6000 = -2000 measurements units (off screen).*
*Subtracts trace A minus modified trace B (5000 -(-2000) = 7000 or 10 dBm. Notice that this has resulted in a subtraction of amplitude in dBm, -10 dBm -(-20 dBm) = 10 dBm.*



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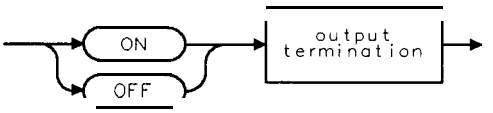
## Description

The AMB command subtracts trace B from trace A (point by point), and sends the result to trace A. The AMB function remains in effect until it is turned off by executing “AMB OFF;“.

The AMB command is a trace math command and subtracts trace B from trace A in measurement units (see “CTA” for information about measurement units). Because subtracting trace B from trace A can cause the result in trace A to be displayed off screen, the trace A minus trace B plus display line (AMBPL) command can be used. As shown in example 2, if the trace data value of trace A is 0 dBm (8000 measurement units), and trace B is -10 dBm (7000 measurement units), the result of executing AMB is 1000 measurement units. If the AMBPL command is used instead of AMB, and the display line is set at -50 dBm (mid-screen), the result in trace A is kept at mid-screen.

A common use of trace subtraction is to normalize one trace with respect to another. For example, traces are frequently subtracted to normalize the spectrum analyzer response when a tracking generator is used. In such applications, amplitude units in dBm should be subtracted. As shown in example 2, subtraction of measurement units is not equivalent to subtraction of amplitude units. Correct results are obtained if the display line is set to 0 dBm using DL, and BML is used to subtract the display line from trace B. See example 3 for an example of subtracting the display line from trace B.

## Query Response




002

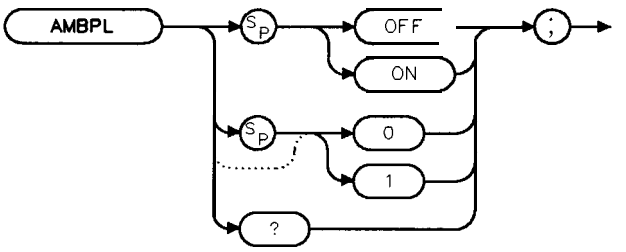


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# AMBPL
## Trace A Minus Trace B Plus Display Line

Subtracts trace B from trace A, adds the display line value to the difference, and sends the result to trace A during every sweep of the spectrum analyzer.

### Syntax




Equivalent Softkey: NORMLIZE ON OFF .
Preset State: AMBPL OFF.
Related Commands: ADD, AMB, CONTS, CLRW, DL, MXMH, SNGLS, SUB, TS, VAVG, VIEW.
Restrictions: Not compatible with Analog+ display mode. See "ANLGPLUS" for more information.

### Example

```
10 OUTPUT 718;"IP;SNGLS;RL 20DB;"
20 OUTPUT 718;"MOV TRA,5000;"
30 OUTPUT 718;"VIEW TRA;"
40 OUTPUT 718;"MOV TRB,4000;"
50 OUTPUT 718;"VIEW TRB;"
60 OUTPUT 718;"DL 0DM;"
70 OUTPUT 718;"AMBPL ON;"
80 OUTPUT 718;"BLANK TRB;VIEW TRA;"
90 END
```

*Initializes spectrum analyzer, activates single-sweep mode.*

*Sets trace A to 5000 measurement units, which is equal to -10 dBm.*

*Sets trace B to 4000 measurement units, which is equal to -20 dBm.*

*Sets display line to 0 dBm, which is at 6000 measurement* units.

*Performs trace A – trace B + display line. The result is 5000 – 4000 + 6000 = 7000 or 10 dBm. Note that this has resulted in a subtraction of amplitude in dBm, -10 dBm -(-20 dBm) = 10 dBm.*



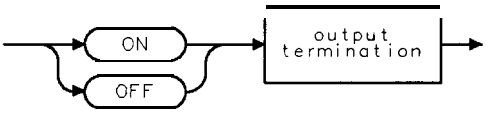
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## Description

The AMBPL command subtracts trace B from trace A (point by point), adds the display line value to the difference, and sends the result to trace A. The AMBPL function remains in effect until it is turned off by executing “AMBPL OFF;“.

A common use of trace subtraction is to normalize one trace with respect to another. For example, traces are frequently subtracted to normalize the spectrum analyzer response when a tracking generator is used. In such applications, amplitude units in dBm should be subtracted. To accomplish this, the display line should be set to 0 dBm using DL as shown in the example. To compare how you would use the AMB command to do the same operation, see examples 2 and 3 for the AMB command.

## Query Response




002

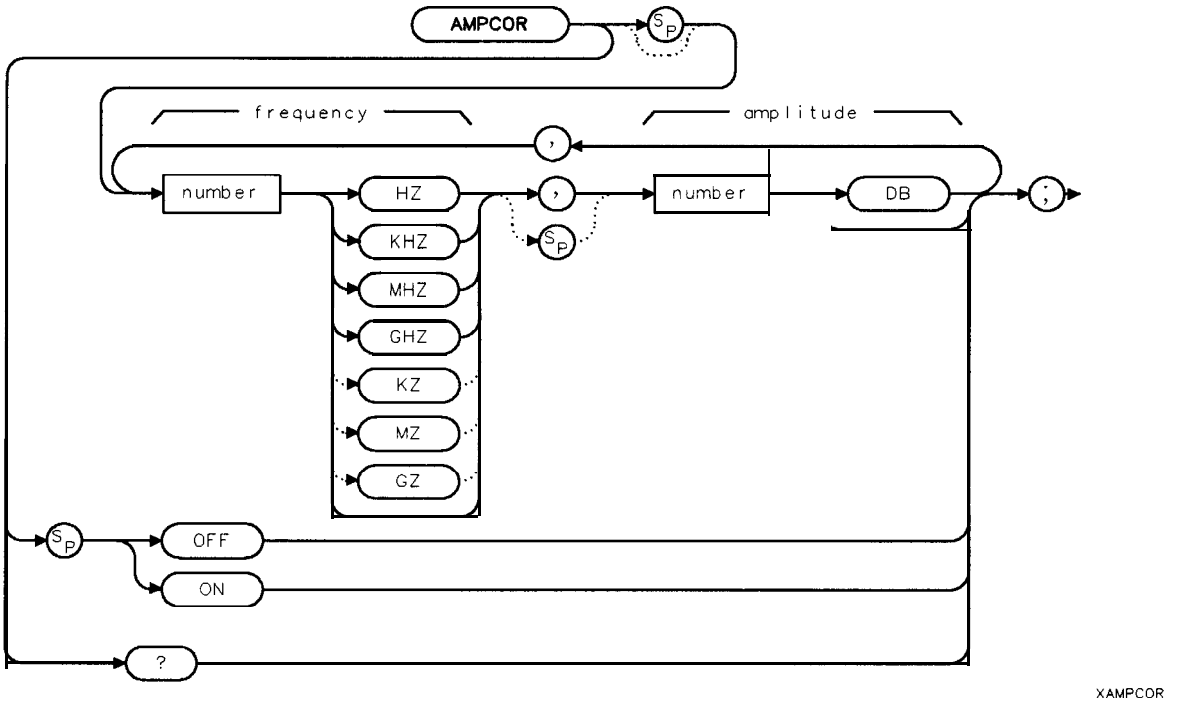


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# AMPCOR
# Amplitude Correction

Applies amplitude corrections at specified frequencies.

## Syntax




XAMPCOR

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is dB. | Frequency: 0 to 1000 GHz Amplitude: f327 dB. |

Equivalent Softkeys: the softkeys accessed by **Amp Cor** .
Preset State: AMPCOR OFF.
Related Commands: **AMPLEN**, AT, RL.

## Example

Compensate for frequency-dependent amplitude inaccuracies at the input.

```
10    DIM A$[200]
20    OUTPUT 718 ;"CF 1GHZ ; SP 200MHZ ;"   Sets center frequency and span.
30    OUTPUT 718;"AMPCOR 100MHZ,5DB,        Stores frequency-amplitude pairs in spectrum
1GHZ,-5DB,1.5GHZ,10DB;"                     analyzer Notice that frequencies are in as-
                                            cending order.
40    OUTPUT718;"AMPCOR?;"                  Returns correction values to computer
50    ENTER 718;A$
60    PRINT A$                              Displays the frequency-amplitude pairs.
70    OUTPUT 718;"AMPCOR OFF;"              Turns off the amplitude correction constants.
```



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```
80     OUTPUT718;"AMPCOR?;"
90     ENTER 718;A$
100    PRINT A$                          Because AMPCOR is off, "0,0" is displayed.
110'   END
```

## Description

Use AMPCOR to compensate for frequency-dependent amplitude variations at the spectrum analyzer input. Up to 79 pairs of frequency-amplitude correction points can be entered. The frequency values entered must either be equal or in increasing order, or an error condition results. Whenever AMPCOR is on, the correction values are added to all measurement results. Executing "AMPCOR ON;" or entering frequency and amplitude corrections, turns on the amplitude correction factors. Performing an instrument preset (IP) or turning off the spectrum analyzer sets AMPCOR to OFF. (Setting AMPCOR to OFF does not change the frequency-amplitude correction factors that have been entered.)

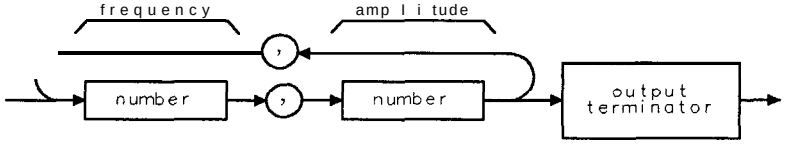
The values of the correction points are applied across the active measurement range. Between points, the correction values are interpolated. When measuring at frequencies outside the first and last correction points, these values are used as the correction value. If you do not want any amplitude correction outside of the first and last correction points, set the amplitude correction to 0 at the frequencies that are outside of the first and last correction values.

**With the Analog + display mode:** When the Analog+ display mode is turned on, AMPCOR applies only one amplitude correction across the displayed frequency span. When the Analog+ display mode is turned on, the amplitude correction for the current center frequency is used over the entire frequency span.

Amplitude correction factors can be stored in spectrum analyzer memory with the SAVET or SAVRCLN commands, or on the memory card with the STOR or SAVRCLN commands. The amplitude correction factors can be edited and viewed with the Amp Cor **softkey** functions.

## Query Response

AMPCOR? returns the frequency and amplitude correction pairs.




QAMPCOR

Returned values are 0,0 when AMPCOR is set to OFF

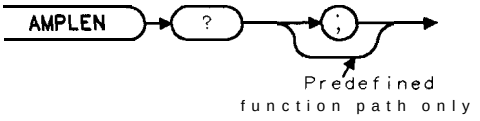


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# AMPLEN
## Amplitude Correction Length

Returns the number of frequency-amplitude correction factors that have been entered.

### Syntax




XAMPLEN

Related Commands: AMPCOR.

### Example

```
OUTPUT718;"AMPLEN?;"
```

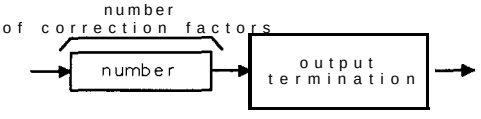
### Description

The absolute value of the number that **AMPLEN?** returns is the number of **frequency**-amplitude correction factors that have been entered. If no amplitude correction factors have been entered, **AMPLEN?** returns a 0. (See "AMPCOR" for more information about frequency-amplitude correction factors.)

**AMPLEN** returns the number of frequency-amplitude correction factors as a positive or negative number. If **AMPLEN** returns a positive number, the frequency-amplitude correction factors are turned on. If **AMPLEN** returns a negative number, the frequency-amplitude correction factors are turned off.

### Query Response

**AMPLEN** can return a number from 80 to -80.




QAMPLEN

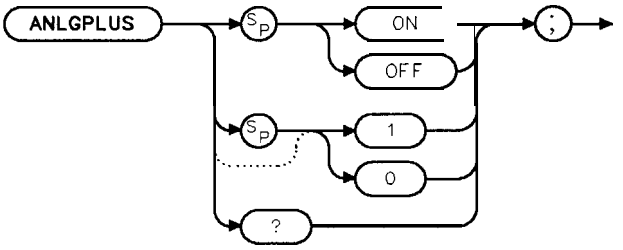


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# ANLGPLUS
# Analog Plus

Turns on or off the Analog+ display mode.

## Syntax




Equivalent Softkey: ANALOG+ ON OFF .
Required Option: Option 101 or 301.
Preset State: ANLGPLUS OFF
Related Commands: DOTDENS.

## Example

```
OUTPUT 718;"ANLGPLUS ON;"
```

*Turns on the Analog+ display mode.*

## Description

The Analog+ display mode enables the trace display to emulate an analog display. Emulating an analog display means that a dot density of up to 40 dots per trace element can be obtained instead of the usual one point per trace element.

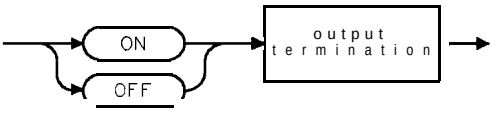
**Restrictions:** Analog+ display mode is only available with sweeptimes greater than 200 ms. Certain programming commands are not compatible with the Analog+ display mode. You should not use the Analog+ display mode with the following programming commands: AMB, AMBPL, AXB, BML, CLRW (TRB or TRC only), DEMOD, FFT, FF'IAUTO, FFTCONTS, FFTSNGLS, LIMITEST, MEANTH, MINH, MKFC, MKPAUSE, MKSTOP, MKTRACK, MXMH, ONMKR, PLOT, PP, SPZOOM, SRCTKPK, TH, TRDSP, VAVG, and VIEW.

Some programming commands allow you to specify a destination trace for the trace results. If you are using the Analog+ display mode and you specify trace A as the destination trace, the trace results are moved into the 401 point trace and not into the dots on the display. The dots on the display remain unchanged. The programming commands that allow you to specify trace A as the destination trace are as follows: ABS, ADD, APB, AVG, COMPRESS, CONCAT, DIV, EXP, INT, LOG, MIN, MIRROR, MOD, MOV, MPY, MXM, PDA, PDF, PEAKS, SMOOTH, SQR, SUB, TRA, TWNDOW, XCH.



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## Query Response




QQ2

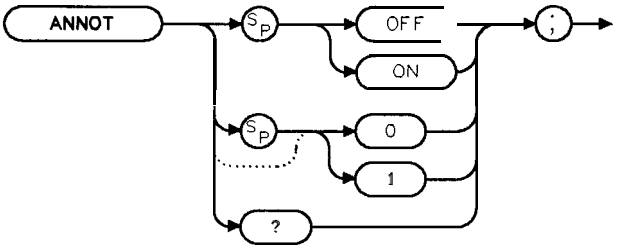


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# ANNOT
## Annotation

Turns on or off the display annotation.

### Syntax




XANNOT

Equivalent Softkey: ANNOTATN ON OFF .
Preset State: ANNOT ON.
Related Commands: GRAT, TITLE.

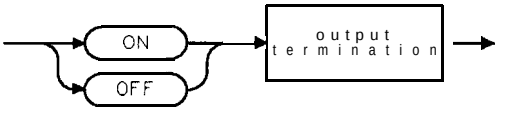
### Example

```
10 OUTPUT 718 ;"ANNOT ON ;"     Turns on the annotation.
20 OUTPUT 718;"ANNOT?;"         Queries state of the annotation function.
30 ENTER 718;Reply$             Places response in a variable.
40 DISP Reply$                  Displays response on the computer screen.
50 END
```

### Description

The ANNOT command turns on or off all the words and numbers (annotation) on the spectrum analyzer display (except for the softkey labels).

### Query Response




QQ2



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# APB
## Trace A Plus Trace B

Adds trace A to trace B and sends the result to trace A.

### Syntax




Related Commands: CLRW, SNGLS, TS, VIEW.

### Example

```
10 OUTPUT 718;"IP;SNGLS;"
20 OUTPUT 718;"TS;"
30 OUTPUT 718;"VIEW TRA;RL -20DM;CLRW TRB;"
40 OUTPUT 718;"TS;VIEW TRB;"
50 OUTPUT 718;"APB;"
60 OUTPUT 718;"BLANK TRB;VIEW TRA;"
70 END
```

*Initializes spectrum analyzer, changes to single-sweep mode.*
*Updates the trace.*
*Changes the reference level.*
*Takes a measurement sweep.*
*Activates APB command.*
*Displays the result of APB.*

### Description

The traces are added as 16-bit integers. Negative numbers are represented in two's complement format. The two's complement representation of a negative number is obtained by changing the 1s to 0s in the binary representation of the number, and then binarily adding 1.

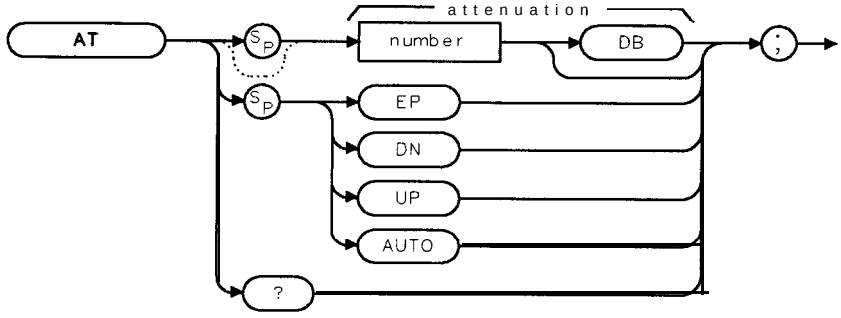


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# AT
# Attenuation

Specifies the RF input attenuation.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer. Default units are dB. | Input attenuator range of spectrum analyzer. |

Equivalent Softkey: ATTEN AUTO #AM is similar.
Preset State: 10 dB.
Step Increment: in 10 dB steps.
Related Commands: AUTO, ML, RL.

## Example

OUTPUT 7 18;"AT 40DB;" *Sets the attenuation to 40 dB.*
OUTPUT 7 18;"AT UP;" *Increases the attenuation to 50 dB.*

## Description

The AT command specifies the input attenuation in 10 dB steps. Normally, the input attenuator is coupled to the reference level. When a continuous wave signal is displayed with its peak at or below the reference level, the coupling keeps the mixer input level at or below the specified level (also see the command "ML"). The AT command allows less than the specified value at the mixer input.

When the attenuation is increased with the AT command, the reference level does not change. If the attenuation is decreased from the coupled value using the AT command, the reference level will be decreased. When the reference level is changed using the RL command, the input attenuation changes to maintain a constant signal level on the screen if attenuation is auto-coupled. Using auto-coupling resets the attenuation value so that a continuous wave signal displayed at the reference level yields -10 dBm (or the specified mixer level) at the mixer input.

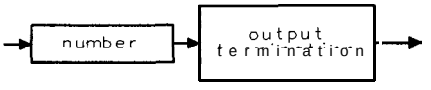
The step keys, knob, and DN parameter do not allow an attenuation entry below 10 dB. Only direct entry of "AT 0DB;" will achieve 0 dB attenuation.



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Caution Signal levels above + 30 dBm will damage the spectrum analyzer.

## Query Response




QQ1

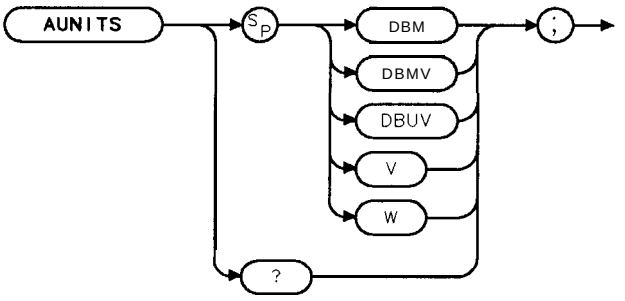


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# AUNITS
# Amplitude Units

Specifies the amplitude units for input, output, and display.

## Syntax




XAUNITS

Equivalent Softkey: Amptd Units .
Related Commands: CAL, DL, MKA, RL, TH.

## Example

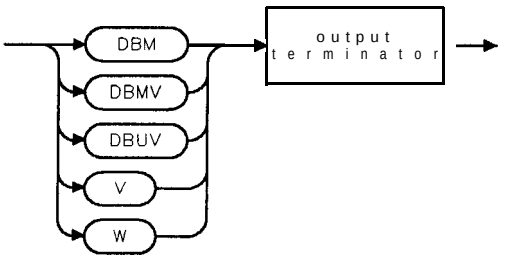
```
OUTPUT718;"LN,"          Changes spectrum analyzer to linear mode.
OUTPUT 718;"AUNITS DBMV ;"  Changes the linear amplitude units to DBMV.
OUTPUT718;"AUNITS?;"     Queries current amplitude units.
ENTER718;Reply$          Puts response in a variable.
DISP Reply$              Displays response on the computer screen.
```

## Description

The AUNITS command sets the amplitude readouts (reference level, marker, display line, and threshold) to the specified units. Different amplitude units can be set for log and linear amplitude scales.

## Query Response

The query response returns the current amplitude units for the current amplitude scale.




QAUNITS

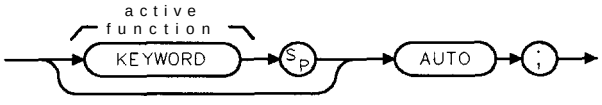


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# AUTO
## Auto Couple

Couples the active functions automatically.

### Syntax




QAUTO

Related Commands: AT, DL, HD, MKA, MKD, MKF, MKFCR, MKN, RB, SRCPSTP, SRCPSWP, SRCPWR, SS, ST, TH, VAVG, VB, VBR.

### Example

| | |
|---|---|
| `OUTPUT 718;"AT AUTO;"` | *Couples the attenuation.* |
| `OUTPUT 718;"HD;AUTO;"` | *Couples all functions.* |
| `OUTPUT 718;"AUTO;"` | *Couples and* deactivates *a related function (if* one was *active),* **or** *couples all functions (if no functions were active).* |

### Description

The result of the AUTO command depends on the active function it acts upon. The following are the functions that are affected by the AUTO parameter:

| | |
|---|---|
| AT | couples attenuation to the reference level. |
| DL | turns off display of line but does not change the value of the display line. |
| MKA | turns off marker. |
| MKD | turns off marker. |
| MKF | turns off marker. |
| MKFCR | deactivates use of user-supplied counter resolution value, however, the value remains unchanged. |
| MKN | turns off marker. |
| RB | couples resolution bandwidth to frequency span. |
| SRCPSTP | sets source power step to 0 (it may value may be displayed at 10 however). |
| SRCPSWP | turns off power sweep. |
| SRCPWR | turns off source power. |
| SS | couples step size to frequency span. |
| ST | couples sweep time to frequency span. |
| TH | turns off display of threshold, but does not change its value or prevent usage in peak searching. |
| VAVG | stops averaging. |
| VB | couples video bandwidth to resolution bandwidth. |
| VBR | sets the video to bandwidth ratio to 0.3. |

Individual functions can be coupled by entering the keyword for the command before AUTO, (for example, "AT AUTO; ").

AUTO has no effect if the active function is not in the above list.

Executing "AUTO;" if no functions are active couples all functions. Executing "HD;AUTO;" couples all functions, turns off the reference position, and turns off normalization.

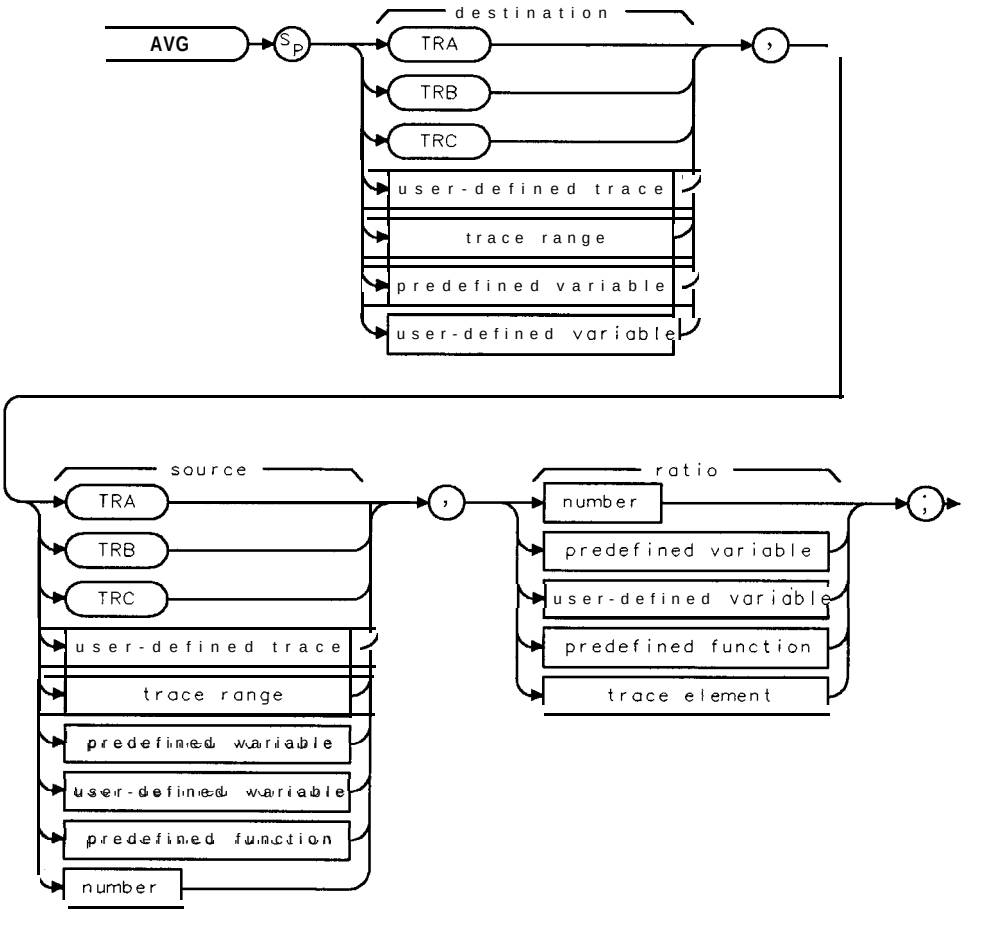


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# AVG
# Average

Averages the source and the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace **defined** by the TRDEF command. | **Any valid trace name.** |
| **User-defined** variable | A variable **defined** by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to **Table** 5-l. | |
| Predefined function | Function that returns a value. Refer to **Table** 5-l. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF when using a user-defined variable. TS when using trace data.
Related Commands: CLRAVG, TS.



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## Example

```
10 OUTPUT 718;"IP;"                  Initializes spectrum analyzer.
20 OUTPUT 718;"SNGLS;"               Activates single-sweep mode.
30 OUTPUT 718;"DET POS;TS;"          Activates the positive-peak detector and updates the
                                     trace.
40 OUTPUT 718;"VIEW TRA;"            Stores results and displays trace A.
50 OUTPUT 718;"DET SMP;"             Activates sample detection.
60 OUTPUT 718;"CLRW TRB;TS;"         Activates trace B and takes a sweep of trace B.
70 OUTPUT 718;"VIEW TRB;"            Displays trace B.
80 OUTPUT 718;"AVG TRA,TRB,2;"       Averages traces B and A with ratio of 2 and stores the
                                     result in trace A.
90 OUTPUT 718;"BLANK TRB;"           Blanks trace B and displays result in trace A.
100 END
```

## Description

The AVG command averages the source and the destination and then stores the result in the destination according to the following algorithm:

$$\text{Average} = \frac{((\text{ratio} - 1) \times \text{destination}) + \text{source}}{\text{ratio}}$$

The results of AVG are invalid if the ratio is equal to zero.

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.



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# AXB
# Exchange Trace A and Trace B

Exchanges trace A and trace B.

## Syntax




XAXB

Equivalent **Softkey**: A **<- -> B**.
Related Commands: **CLRW**, SNGLS, TS, VIEW.
Restrictions: Not available with Analog+ display mode. See "ANLGPLUS" for more information.

## Example

```
10 OUTPUT 718;"IP;"              Initializes spectrum analyze?:
20 OUTPUT 718;"SNGLS;"           Activates single-sweep mode.
30 OUTPUT 718;"DET POS;TS;"      Activates positive-peak detection of trace A.
40 OUTPUT 718;"VIEW TRA;"        Stores results, displays trace A.
50 OUTPUT 718;"DET SMP;"         Activates sample detection.
60 OUTPUT 718;"CLRW TRB;TS;"     Clear-writes trace B and takes sweep.
70 OUTPUT 718;"VIEW TRB;"        Stores results of sweep in trace B.
80 OUTPUT 718;"AXB;"             Exchanges trace A with trace B.
90 OUTPUT 718;"BLANK TRB;"       Blanks trace B, leaving only trace A on screen.
100 END
```

## Description

The AXB command exchanges trace A and trace B, point by point. AXB sets trace A and trace B to the view mode.

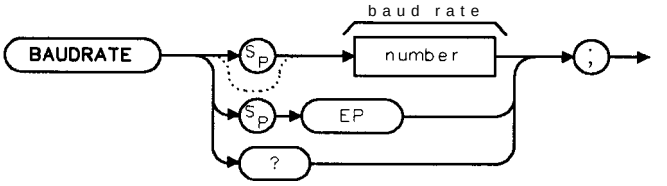


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# BAUDRATE
## Baud Rate of Spectrum Analyzer

Specifies the baud rate of a spectrum analyzer with Option 043 (the RS-232 and parallel interface) installed in it.

### Syntax




XBAUDRATE

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer number. | 4 to 57600. |

Equivalent Softkey: BAUD RATE .
Option Required: Option 043.

### Example

The following example allows you to use a softkey to change the baud rate of the spectrum analyzer to 2400 baud. The softkey (key number 1) can be accessed by pressing (USER/MEAS), User Menus .

```
PRINT #1,"KEYDEF 1,%BAUDRATE 2400;%,$BAUDRATE|2400$;"
```

### Description

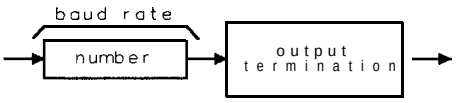
The BAUDRATE command changes the baud rate of the spectrum analyzer to one of the standard baud rates. The standard baud rates are as follows: 300, 1200, 2400, 4800, 9600, 14400, 19200, 38400, and 57600. If you specify a baud rate other than one of the standard baud rates, the nearest standard baud rate will be used.

To communicate with the computer, the baud rates of the spectrum analyzer and the computer must be the same. Because changing the baud rate of the spectrum analyzer within a program ends communication with the computer, you should only use BAUDRATE within a downloadable program or when using the external keyboard to enter programming commands. To reestablish communication with the computer, you must set the baud rate back to the baud rate of the computer.



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## Query Response




QBAUDRATE

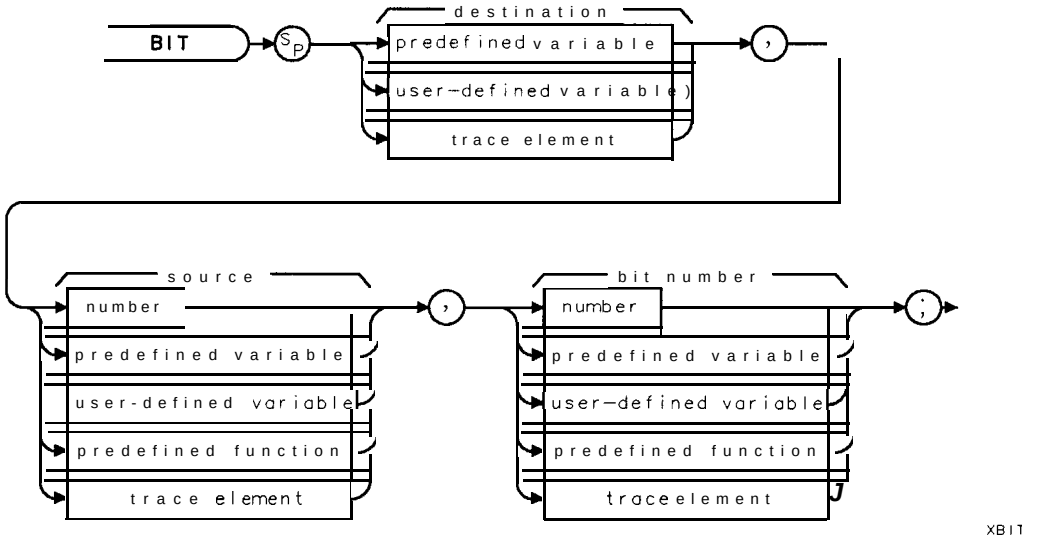


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# BIT
# Bit

Places the state (“1” or “0”) of a bit in the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predeiined variable | A command that acts as a variable. Refer to Table 5-l. | |
| Predefined function | Function that returns a value. Refer to Table 5-l. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Number (source) | Any valid integer number. | 64-bit integer. |
| Number (bit number) | Any valid integer number. | 0 to 63. |

Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: INT, STB.

## Example

```
10 CLEAR 718                          Clears HP-IB bus.
20 OUTPUT 718;"IP;"                   Initializes spectrum analyzer
30 OUTPUT 718;"VARDEF E_RROR,0;"      Defines user-defined variable E_RROR and sets it
                                      equal to 0.
40 OUTPUT 718;"BIT E_RROR,STB,5;"     Stores value of bit 5 of status byte in E_RROR.
50 OUTPUT 718;"E_RROR?;"              Returns value of E_RROR.
60 ENTER 718;Err                      Assigns value to computer variable, Err.
70 IF NOT Err THEN DISP "NO ";        If Err equals zero, displays "NO" on computer
                                      screen.
80 DISP "ERROR PRESENT";              Displays "ERROR PRESENT" on computer screen.
90 END
```



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## Description

The BIT places either a “0” or a “ 1” in the destination. A “0” indicates the bit is off. A “ 1” indicates the bit is on.

**Specifying the bit number:** When you specify the bit number, remember the following:

- The bit number is limited from 0 to 63. If you enter a negative number for the bit number, the bit number defaults to 0. If you enter a number that is greater than 63, the bit number defaults to the remainder of the number divided by 64.
- The least significant bit is bit 0. The most significant bit is bit 63.
- Floating-point numbers are changed to a 64-bit integer before BIT is executed.

The BIT command can be used to determine information about the status byte or a memory card inserted into the spectrum analyzer’s memory card reader. (See “HAVE” for more information about determining information about the memory card.)

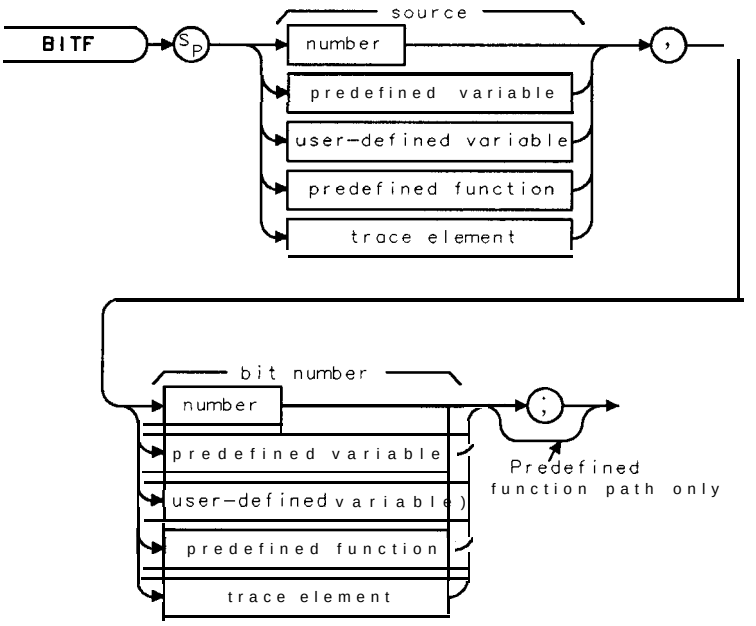


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# BITF
# Bit Flag

Returns the state (“1” or “0”) of a bit.

## Syntax




XBITF

| Item | Description/Default | Range |
|---|---|---|
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-1. | |
| Predefined function | Function that returns a value. Refer to Table 5-1. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Number (source) | Any valid integer number. | 64-bit integer. |
| Number (bit number) | Any valid integer number. | 0 to 63. |

Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: BIT.



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## Example

```
10 CLEAR 718                        Clears HP-IB bus.
20 OUTPUT 718;"IP;"                 Initializes spectrum analyzer
30 OUTPUT 718;"BITF STB,5;"         Determines the value of bit 5 of status byte.
40 ENTER 718;Err                    Assigns value to computer variable, Err:
50 IF NOT Err THEN DISP "NO ";      If Err equals zero, displays "NO " on computer screen.
60 DISP "ERROR PRESENT";            Displays "ERROR PRESENT" on computer screen.
70 END
```

## Description

The value returned by BITF is either a "0" or a " 1. " A "0" indicates the bit is off, a " 1 " indicates the bit is on. Unlike BIT, BITF returns the state of the bit directly; the state of the bit is not stored in a destination.

**Specifying the bit number:** When you specify the bit number, remember the following:

- The bit number is limited from 0 to 63. If you enter a negative number for the bit number, the bit number defaults to 0. If you enter a number that is greater than 63, the bit number defaults to the remainder of the number divided by 64.
- The least significant bit is bit 0. The most significant bit is bit 63.
- Floating-point numbers are changed to a `64-bit integer before` BITF is executed.

The BITF command can be used to determine information about the status byte or a memory card inserted into the spectrum analyzer's memory card reader. (See "HAVE" for more information about determining information about the memory card.)

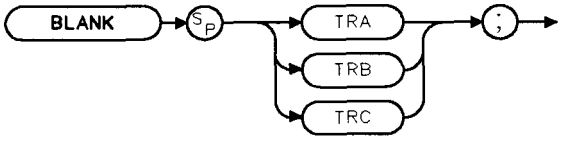


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# BLANK
## Blank Trace

Blanks trace A, trace B, or trace C and stops taking new data into the specified trace.

### Syntax




XBLANK

Equivalent Softkeys: BLANK A , BLANK B , and BLANK C .
Preset State: BLANK TRB, BLANK TRC.
Related Commands: CLRW, MXMH, TRDSP, VIEW.

### Example

```
OUTPUT 718;"BLANK TRA;"
```

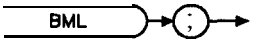


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# BML
# Trace B Minus Display Line

Subtracts display line from trace B and places the result in trace B.

## Syntax




XBML

Equivalent Softkey: B – DL -> B .
Related Commands: BLANK, CLRW, SUB, TS.
Restrictions: Not available with Analog+ display mode. See “ANLGPLUS” for more information.

## Example

```
10 OUTPUT 718;"IP;SNGLS;"        Initializes spectrum analyzer, activates single-sweep mode.
20 OUTPUT 718;"BLANK TRA;"       Blanks trace A.
30 OUTPUT 718;"CLRW TRB;TS;"     Clear-writes trace B, takes sweep.
40 OUTPUT 718;"DL -70DM;"        Sets the display line to -70 dBm.
50 OUTPUT 718;"BML;"             Activates BML function.
60 END
```

## Description

The BML command subtracts the display line from trace B (point by point), and sends the difference to trace B.

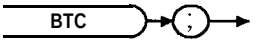


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# BTC
# Transfer Trace B to Trace C

Transfers trace B into trace C.

## Syntax




XBTC

Equivalent **Softkey**: B -> C .
Related Commands: BLANK, CLRW, SNGLS, TS, VIEW.

## Example

```
10 OUTPUT 718;"IP;"                    Initializes spectrum analyzer:
20 OUTPUT 718;"SNGLS;"                 Activates single-sweep mode.
30 OUTPUT 718;"BLANK TRA;"             Blanks trace A.
40 OUTPUT 718;"CF 300 MHZ;SP 1MHZ;"    Sets up measurement range.
50 OUTPUT 718;"CLRW TRB;TS;"           Takes measurement sweep.
60 OUTPUT 718;"BTC;"                   Moves trace B to trace C.
70 OUTPUT 718;"BLANK TRB;VIEW TRC;"    Displays result in trace C.
80 END
```

## Description

The BTC command moves trace B into trace C, then stops updating trace C by placing it in the view mode. Trace B is unchanged by BTC. Trace B must contain a complete sweep of measurement information.



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# BXC
# Trace B Exchange Trace C

Exchanges trace B and trace C.

## Syntax




XBXC

Equivalent Softkey: B <--> C .
Related Commands: BLANK, CLRW, SNGLS, TS.

## Example

```
10 OUTPUT 718;"IP;BLANK TRA"          Initializes spectrum analyzer:
20 OUTPUT 718;"SNGLS;"                Activates single-sweep mode.
30 OUTPUT 718;"DET POS;CLRW TRB;TS;"  Activates positive-peak detection of trace B.
40 OUTPUT 718;"VIEW TRB;"             Stores results and displays trace B.
50 OUTPUT 718;"DET SMP;CLRW TRC;"     Activates sample detection.
60 OUTPUT 718;"TS;"
70 OUTPUT 718;"VIEW TRC;"             Stores results of sweep in trace C.
80 OUTPUT 718;"BXC;"                  Exchanges trace B with trace C.
90 OUTPUT 718;"BLANK TRB;"            Blanks trace B leaving only trace C on screen.
100 END
```

## Description

The BXC command exchanges the contents of traces B and C, then places both traces in the view mode.

To retain all data, trace B and trace C should contain a complete sweep of measurement data before BXC is executed.

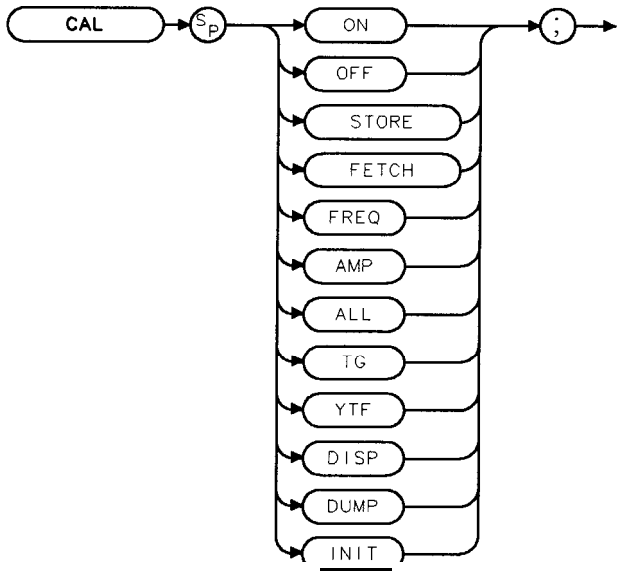


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# CAL
# Calibration

Initiates self-calibration routines.

## Syntax




## Example

OUTPUT 7 18;"CAL FREQ;" *Performs the frequency correction routine.*

## Description

The CAL command controls calibration functions. CAL initiates action according to the CAL parameters. The various parameters correspond to spectrum analyzer softkeys as shown below.

ON turns correction factors on and corresponds to CORRECT ON OFF (ON is underlined). (See also "CORREK.")

**OFF** turns correction factors off and corresponds to CORRECT ON OFF (OFF is underlined). (See also "CORREK.")

**STORE** moves the correction factors to an area of spectrum analyzer memory that is accessed when the spectrum analyzer is powered on. STORE corresponds to CAL STORE . The CAL STORE command cannot be executed if the correction data is not valid. Correction data is valid if CORRECT ON OFF (ON is underlined) causes CORR to be displayed on the spectrum analyzer display. Executing the CAL STORE command with invalid data generates an SRQ 110.

**FETCH** recalls the correction factors from the "working" random-access memory. The "working" random-access memory is the section of memory that is accessed when the spectrum analyzer is turned on. CAL FETCH corresponds to CAL FETCH .



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Note

Execute CAL STORE after successful completion of the self-calibration routines.

Connect a cable between CAL OUT and the spectrum analyzer input before running the CAL FREQ, CAL AMP, or CAL ALL correction routines.

FREQ initiates the frequency correction routine and corresponds to CAL FREQ .

**AMP** initiates the amplitude correction routine and corresponds to CAL AMPTD .

**ALL** initiates frequency and amplitude correction routines. It corresponds to CAL FREQ & AMPTD .

Note

*fir an HP 8592L, HP 8593E, HP 85963 only:* A cable must be connected between COMB OUT and the spectrum analyzer input to use the comb signal for CAL YTF.
*Fbr the HP 85953 only:* Connect the cable between the CAL OUT connector and the spectrum analyzer input.

**YTF** initiates the correction routine for the YIG-tuned filter. The CAL YTF command corresponds to CAL YTF . (HP 8592L, HP 85933, HP 85953, or HP 85963 only.)

**DISP** displays some of the correction factors on the spectrum analyzer display.

**DUMP** returns correction factors to the controller.

**INIT** sets the calibration data back to predetermined values. CAL INIT corresponds to DEFAULT CAL DATA . Before executing CAL INIT, you must set the spectrum analyzer's center frequency -37 Hz to access this function. After CAL INIT has been performed, you should perform CAL YTF for an HP 8592L, HP 85933, HP 85953, or HP 85963.

Note

Before executing the CAL TG command, a cable must be connected between the tracking generator output and the spectrum analyzer input.

**TG** performs the calibration routines if the tracking generator is installed (Option 010 or 011). CAL TG corresponds to CAL TRK GEN .

Refer to the *HP 8590 E-Series and L-Series Spectrum Analyzers User's Guide* for more information about the self-calibration routines, including the correct instrument set-up for each routine.

CAL DISP and CAL DUMP do not return all of the correction factors because the number of characters that can be displayed on the spectrum analyzer screen is limited. CAL DUMP only returns the correction factors (as ASCII values) that would be displayed on the spectrum analyzer screen. Refer to the Service Guide for your spectrum analyzer for more information about displaying calibration data and reinitializing calibration data.

If the calibration data has been corrupted or is obviously inaccurate, use CAL FETCH to retrieve the calibration data that has previously been saved. If the calibration data fetched is corrupt, the following example can be used to set the calibration data back to predetermined values. Execute OUTPUT 718;"CF -37HZ;CAL INIT;", then perform the CAL AMP, CAL FREQ, or CAL ALL calibration routines. Use CAL STORE if the calibration routines have finished successfully.



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| Note | Using the default calibration data may cause the calibration routine to fail. If this occurs, execute "OUTPUT 718; CF -37HZ; " before performing the CAL FREQ or CAL ALL calibration routines. |
|---|---|

The take sweep (TS) and DONE commands can be used to indicate that the correction routine has finished. Query the CORREK command to check that the calibration routines have finished successfully.

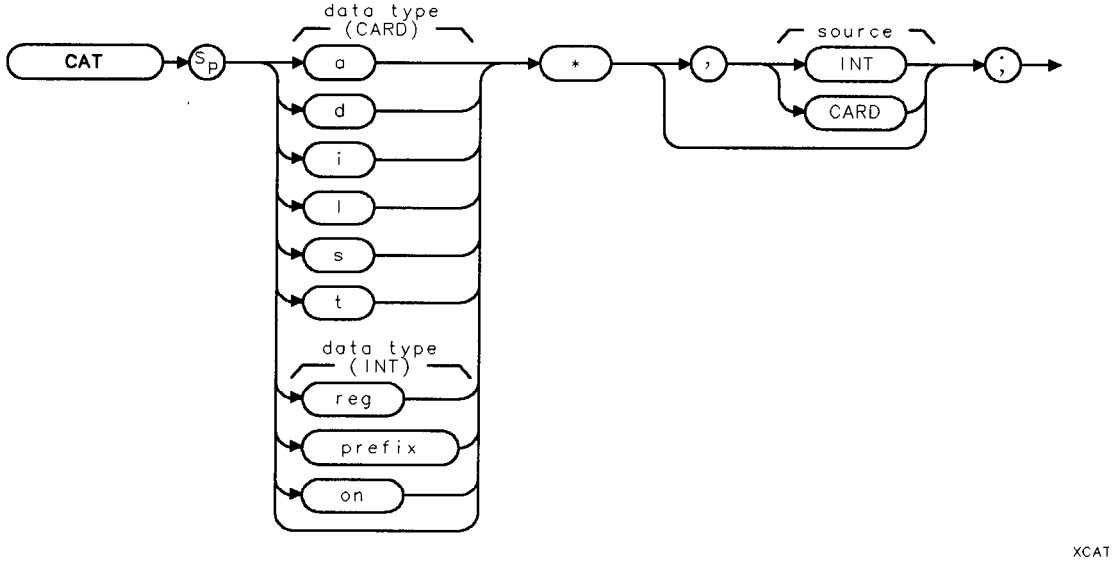


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# CAT
# Catalog

Catalogs either spectrum analyzer memory or the memory card and returns the catalog information to the controller.

## Syntax




Equivalent Softkeys: the functions accessed by Catalog Internal or Catalog Card.
Related Commands: LOAD, MSI, STOR.

## Example

This example returns the catalog information for the states stored on the memory card. Catalog information is sent as individual catalog lines that are separated by a carriage return and a line feed. A carriage return, a line feed, and a line feed with an EOI (equivalent to a carriage return, a line feed, and a line feed) is asserted after the last item.

```
10   DIM User$[2000],Catalog$(1:100)[80]   Dimensions strings to store the catalog
                                           information. User$ stores the entire
                                           string of catalog information. Catalog$
                                           stores the catalog information line by
                                           line (up to 80 lines and 100 characters
                                           long).
20   INTEGER I,Pos_lf                      I and Pos_lf are used to search through
                                           User$ string.
30   OUTPUT 718;"CATs*,CARD;"              The spectrum analyzer sends catalog in-
                                           formation for all the states stored on the
                                           memory card.
40   ENTER 718 USING "#,-K";User$          Reads the catalog information into the
                                           User$ string.
50   I=0
60   WHILE LEN(User$)>1                    Loops until the User$ string is empty.
```



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```
70      I=I+1
80      Pos_lf=POS(User$,CHR$(10))
90      Catalog$(I)=User$[1,Pos_lf-21
100     OUTPUTCRT;Catalog$(I)
120     User$=User$[Pos_lf+1]
130   END WHILE
140   END
```

*Checks for line feeds. CHR$(10) represents the line feed, the ASCII code for a line feed is "10."*

*Extracts catalog line.*

*Displays catalog line.*

## Description

To use the CAT command, you must specify the type of information to be cataloged and either the spectrum analyzer memory or the memory card as the catalog source. After the spectrum analyzer has sent the catalog information to the controller, the spectrum analyzer sends two line feed characters to the controller.

**Specifying the type of information:** The types of information that can be cataloged depend on the source. See the following sections, "Cataloging the Memory Card" and "Cataloging Spectrum Analyzer Memory" for more information.

**Specifying the source:** You can specify the spectrum analyzer memory or the memory card as the source by specifying INT or CARD, respectively. If source (CARD or INT) is omitted, the default is the current mass storage device. See "MSI" for more information about setting the current mass storage device.

---

Note — When CAT is executed from a remote port, the catalog information is sent to the remote port.

---

## Cataloging the Memory Card

When cataloging a memory card, you can specify the type of information to be cataloged by specifying the letter (a, d, 1, i, s, or t) that represents the data type. For example, if you execute "CAT l*,CARD;" all of the limit line files on the memory card will be returned. The letters correspond to the data types are as follows:

a* Amplitude correction files.

d* Downloadable programs.

l* Limit line files.

i* Display files.

s* Saved spectrum analyzer state.

t* Saved spectrum analyzer traces,

The asterisk (*) character is interpreted as a wild card. The asterisk can be used with the data type to catalog all files of that data type, or alone to catalog all files on the memory card.

CAT returns the directory information only if a file has been found.

**What is returned when the memory card is cataloged:** When the memory card is the catalog source, the cataloged information is returned to the computer as a series of strings. Each string contains information about one file that has been saved on the memory card. The information is placed in specific fields within a string as shown in the following table.



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| Information | Position within String | Description |
|---|---|---|
| File name | 1 through 10 | Name of the file. |
| File Type | 11 through 16 | ASCII or binary data (in LIF -2 format). |
| Data Type | 17 through 22 | a = amplitude correction factors, d = downloadable program, 1 = limit line, i = display files s = spectrum analyzer state, t = trace. |
| Start Record | 23 through 30 | Physical record number of the start of file. |
| Length | 31 through 38 | Number of records in the file. |
| Time of creation | 39 through 52 | The time the file was created in year, month, day, hour, minute, second (YYMMDDHHMMSS) format. |

Each string is right-justified within its field, with spaces separating the fields.

## Cataloging Spectrum Analyzer Memory

When cataloging analyzer memory, you can use “prefix”, “reg,” or “on” to specify the type of information to be cataloged.

prefix* Catalogs the programs and variables in spectrum analyzer memory according to the current prefix. (Use Change Prefix or PREFX to change the current prefix.)

reg* Catalogs the contents of the state and trace registers. The center frequency and span of the state registers are displayed; the title and date of the trace registers are displayed.

on* Catalogs the on event commands and their status. See the “Cataloging the on event commands ” for more information.

* Catalogs all the programs and variables stored in spectrum analyzer memory, but does not return the on event commands or the contents of the state and trace registers.

**Cataloging the on event commands:** When the on event programming commands have not been set or an instrument preset has been performed, cataloging the on events displays the status of the on events as UNDEFINED. If the ONEOS, ONSWP, TRMATH, ONMKR, ONSRQ, and ONPWRUP commands have been set, “CAT on*;” displays their status as ACTIVE. When ONCYCLE, ONDELAY, or ONTIME have been set, “CAT on*;” returns the information shown in the following table.

| Programming Command | Description of the Catalog On Event Response |
|---|---|
| ONCYCLE | The entry for ONCYCLE displays the number of seconds left until the event occurs, followed by the number of seconds ONCYCLE was set for. |
| ONDELAY | The entry for ONDELAY displays either a positive or negative number. A positive number indicates the number of seconds left until the event occurs, a negative number indicates the amount of time that has passed (in seconds) since the event. |
| ONTIME | The date (in year, month, and day format) and the time (in 24 hour format) that ONTIME is set for. |



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**CAT Catalog**

If you want to catalog all user-defined variables, user-defined softkeys, or user-defined functions in spectrum analyzer, use the asterisk without "prefix," "reg," or "on" preceding the asterisk. For example "CAT *,INT; ".

Cataloging spectrum analyzer (internal) memory returns the following information:

- MSI device (internal).
- Bytes of spectrum analyzer memory used.
- Total amount of spectrum analyzer memory (in bytes). This number includes the amount of spectrum analyzer memory in use and the amount of spectrum analyzer memory available.
- Name of the stored data and the number of bytes used.

---

Note — The difference between the bytes of spectrum analyzer memory used and the total spectrum analyzer memory available is the amount of spectrum analyzer memory available.

---

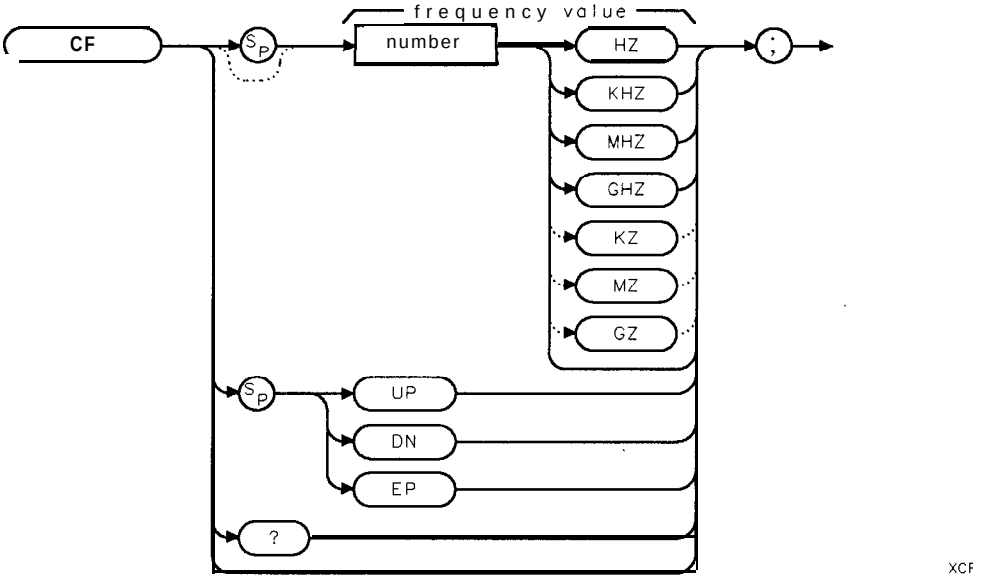


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# CF
# Center Frequency

Specifies the center frequency.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | Frequency range of the spectrum analyzer. |

Equivalent Softkey: CENTER FREQ .

Step Increment: If uncoupled, step size is determined by the SS command. If coupled, step size is 10% of span.

Related Commands: HNLOCK, FA, FB, FOFFSET, FS, MKCF, MKSS, SP, SS.

**Note** Although the spectrum analyzer allows entry of frequencies not in the specified frequency range, using frequencies outside the frequency span of the spectrum analyzer is not recommended and is not warranted to meet specifications.

## Example

OUTPUT 718; "CF 300MHZ; " *Sets the center frequency to 300 MHz.*

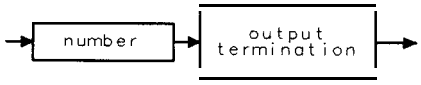


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## Description

The CF command specifies the value of the center frequency.

## Query Response




QQ1



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# CHP
# Channel Power

Performs the channel power measurement.

## Syntax




XCHP

Equivalent Softkey: CHANNEL POWER .
Related Commands: ACPPAR, ACPCONTM, ACPSNGLM, ACPSP, ACPBW, CHPGR, ACPMK.

## Example

```
OUTPUT 718;"CHP;"
```

*Performs the channel power measurement.*

## Description

CHP measures the total power in the specified channel bandwidth (ACPBW). The power spectral density per Hz is also computed and displayed. This value is the average-power spectral density in the specified channel bandwidth.

‘lb use CHP:

1. Set the center frequency to the carrier’s frequency.
2. For best accuracy, set the reference level so that the carrier signal peak is within the first (top) division of the screen graticule.
3. Select the channel bandwidth with the ACPBW command.
4. Select the channel spacing with the ACPSP command. (For the channel power measurement, ACPSP is only used to set the center frequency step size.)
5. If you want the spectrum analyzer settings to be set automatically, ensure that ACPPAR is set to 1. If you want to set the spectrum analyzer settings manually, set ACPPAR to 0. See “ACPPAR” for more information about selecting the spectrum analyzer settings manually.
6. If the spectrum analyzer is in the continuous-sweep mode, use the single sweep command (SNGLS) to select the single-sweep mode.
7. Execute the CHP command.
8. Query ACPERR to determine if there is a setup error for the CHP measurement. See the following table for more information about ACPERR.
9. If no error occurred, query the CHPWR variable for the numeric results of the CHP measurement. See the following table for more information about CHPWR.
10. If no error occurred, query trace A (TRA) for the trace results of the CHP measurement.

**Measurement Results:** The results of the CHP command are stored in the variable and trace described in the following table.



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**CHP Measurement Results**

| Variable or Trace | Description | Units |
|---|---|---|
| ACPERR | A variable that indicates setup errors for the CHP measurement. The value of ACPERR indicates the following:<br>■ If no errors occurred, ACPERR is 0.<br>■ If ACPERR is 1, channel bandwidth > frequency span.<br>■ If ACPERR is 2, the channel bandwidth < frequency span/100. | |
| CHPWR | A variable that contains the channel power. | Determinded by AUNITS command. Default unit is dBm. |
| CHPSD | A variable that contains the average channel power spectral density per Hz. | Determinded by AUNITS command. Default unit is dBm/Hz. |
| TRA | TRA is trace A. Trace A contains the swept RF spectrum. | Determined by the trace data format (TDF) command. |

## Restrictions

Executing ACPE exits the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), the FFT menu measurements (FFTAUTO, FFTCONTS, FFTSNGLS), gate utility functions (GDRVUTIL), TO1 measurement (TOI), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), or peak zoom (PKZOOM).

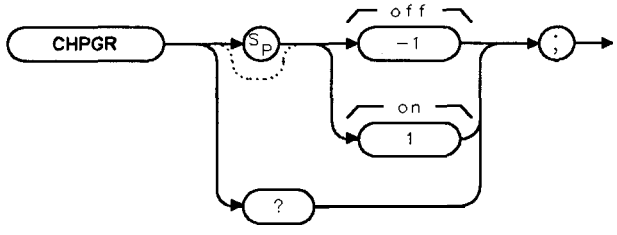


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# CHPGR
# Channel Power Graph On or Off

Determines if the channel power graph function is enabled or disabled.

## Syntax




xchpgr

Equivalent Softkey: PWRGRAPH ON OFF
Related Commands: CHP

## Example

```
10 OUTPUT 718; "CHP;"
20 OUTPUT 718;"MOV CHPGR,1;"
```

*Performs the channel power measurement.*
*Enables the power graph function and creates a graph of the* channel *power as a function* of *frequency.*

## Description

Setting CHPGR to 1, does the following:

- Turns off the display of the channel-power numeric results.
- Generates a graph of the channel power as a function of frequency.
- Places the graph in trace C
- Adds the GRPH MKR ON OFF softkey to the menu.
- If in continuous measurement mode, the channel power graph will be updated at the end of every sweep.

Setting the CHPGR to -1, does the following:

- Turns off the display of the channel-power graph in trace C.
- Calculates and displays the channel-power numeric results.
- Removes the GRPH MKR ON OFF softkey from the menu.
- Turns off the channel power graph marker.
- If in continuous measurement mode, the numeric results will be updated at the end of every sweep.

When the graph is generated, it represents the power in the channel bandwidth (set by the ACPBW command). The results of CHPGR are not defined for frequencies where the graph is drawn below the bottom graticule line.



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# CLRAVG
# Clear Average

Restarts video averaging.

## Syntax




XCLRAVG

Related Commands: AMB, CLRW, MINH, MXMH, VAVG.

## Example

```
OUTPUT 718;"IP;"          Initializes the spectrum analyzer:
OUTPUT 718;"VAVG 100;"    Initializes video averaging.
WAIT 30
OUTPUT 718;"CLRAVG;"      Restarts video averaging.
```

## Description

The CLRAVG command restarts the VAVG command by resetting the number of averaged sweeps to one. The video averaging routine resets the number of sweeps, but does not stop video averaging. Use “VAVG OFF;” to stop video averaging.

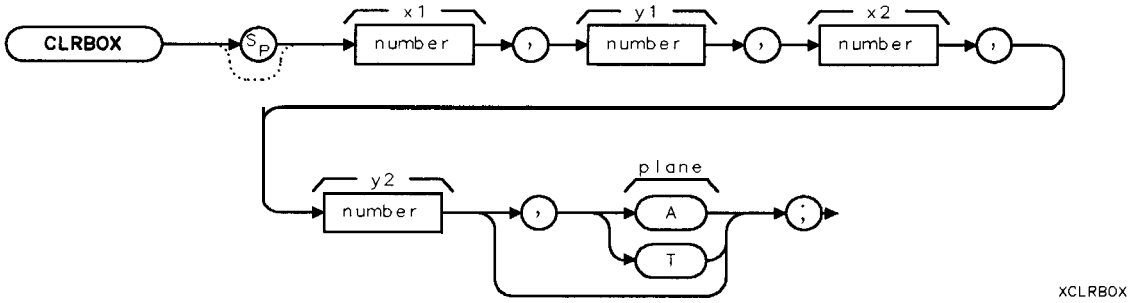


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# CLRBOX
# Clear Box

Clears a rectangular area on the spectrum analyzer display.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer number. | For xl or x2, -40 to 471.<br>For yl or y2, -22 to 233. |

Related Commands: CLRDSP.

## Example

The following programming line results in the spectrum analyzer display shown in Figure 5-2.

OUTPUT718;"CLRBOX 1,1,200,200,A;" *Clears the annotation and graticule from the rectangular area of 1,1 to 200,200.*

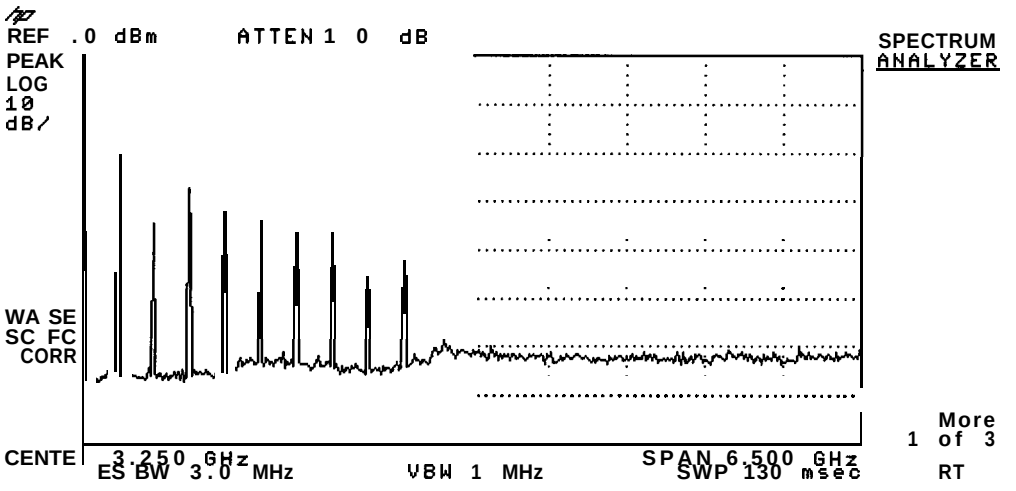



**Figure 5-2. Using the CLRBOX Command**



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## Description

lb use CLRBOX, you must specify the rectangular area of the box. You can also specify whether the annotation or trace planes are to be cleared.

**Specifying the rectangular area of the box**

You specify the rectangular area by specifying the coordinates of the lower left corner (xl, yl) and the upper right corner (x2, y2) of the rectangle in display units. (The cleared area includes the xl, yl, x2, and y2 coordinates).

**Specifying the annotation or trace plane**

You can specify whether the annotation or the traces are to be cleared by specifying an "A" for the annotation plane or a "T" for the trace plane. If you specify the annotation plane, everything but the trace display will be cleared. If you specify the trace plane, the trace display will be cleared. (The cleared trace display can be overwritten if the spectrum analyzer is in the clear-write mode, however.) If you do not specify the annotation or trace plane, both the annotation and trace planes are cleared.

CLRBOX affects only the spectrum analyzer display and printing of the spectrum analyzer display. CLRBOX does *not* change the plot of the spectrum analyzer display; the area that is cleared by CLRBOX will still be plotted.

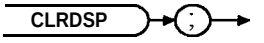


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# CLRDSP
# Clear Display

Erases user-generated graphics and text,

## Syntax




XCLRDSP

Related Commands: CLRBOX, DA, DRAWBOX, DSPLY, PA, PD, PR, PU, TEXT.

## Example

```
OUTPUT 718;"CLRDSP;BLANK TRA;BLANK TRB;
GRAT OFF;TH OFF;DL OFF;"
OUTPUT 718;"CLRW TRA;GRAT ON;ANNOT ON;"
```

*Blanks the spectrum analyzer screen, except for trace C and annotation.*
*Reinstates the display of trace A, the graticule, and the annotation.*

## Description

The CLRDSP command removes all user-created graphics and text from the spectrum analyzer screen and memory. CLRDSP also removes the graphics and text from the display list. See "DA" for more information about the display list.

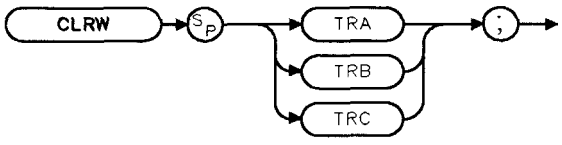


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# CLRW
# Clear Write

Clears the specified trace and enables trace data acquisition.

## Syntax




XCLRW

**Equivalent Softkeys:** CLEAR WRITE A, CLEAR WRITE B, and CLEAR WRITE C.
Preset State: CLRW TRA.
Related Commands: BLANK, DET, MINH, MXMH, VAVG, VIEW.
Restrictions: CLRW TRB and CLRW TRC are not available with Analog+ display mode. See "ANLGPLUS" for more information.

## Example

```
OUTPUT 718;"CLRW TRA;"
```

## Description

The CLRW command places the indicated trace in the clear-write mode. Data acquisition begins at the next sweep. (See "TS" for more information about data acquisition.)

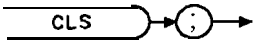


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# CLS
# Clear Status Byte

Clears all status bits.

## Syntax




XCLS

Related Commands: RQS, SRQ, STB.

## Example

OUTPUT 7 18 ; "CLS ;"

## Description

The CLS command clears all the status bits in the status byte. (See "SRQ" for more information on the status byte.)

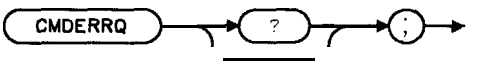


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# CMDERRQ
# Command Error Query

The CMDERRQ command returns the current buffer of illegal commands and then clears the illegal-command buffer from the spectrum analyzer.

## Syntax




xcmderrq

## Example

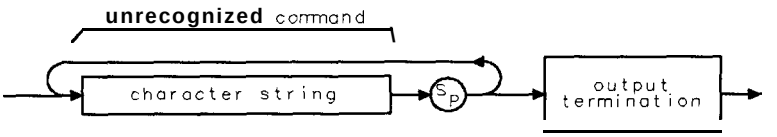
```
OUTPUT 718;"CMDERRQ;"     Initiates the command.
ENTER 718;A$              Gets the response from the spectrum analyzer.
DISP A$                   Displays the response
```

## Description

Executing the CMDERRQ command does the following:

- Returns the most recently stored illegal or unrecognized command characters.
- Returns up to 45 characters of an illegal command or commands.
- Erases the illegal command buffer.

## Query Response




qcmderrq



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# CNF
# Confidence Test

Performs the confidence test.

## Syntax




XCNF

Equivalent Softkey: CONF TEST .

## Example

```
OUTPUT 718;"CNF;"
```

## Description

The CNF command initiates a confidence test of the resolution bandwidth, video bandwidth, and step gain.

**Note** Connect a cable between CAL OUT and the spectrum analyzer input before executing the CNF command.

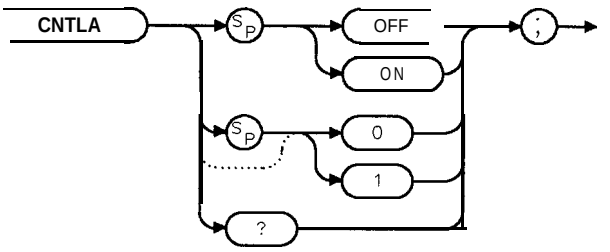


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# CNTLA
## Auxiliary Interface Control Line A

Sets the control line A of the auxiliary interface high or low.

### Syntax




XCNTLA

Equivalent Softkey: CNTL A 0 1 .
Related Commands: CNTLB, CNTLC, CNTLD, CNTLI.

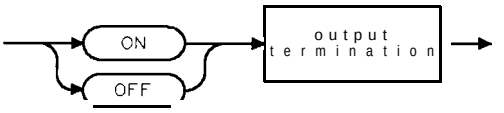
### Example

```
OUTPUT 718 ; "CNTLA ON; "   Sets control line A high.
OUTPUT718;"CNTLA?;"         Queries the state of control line A.
ENTER 718;A$                Gets the response from the spectrum analyzer.
DISP A$                     Displays the response.
```

### Description

CNTLA ON sets control line A to high, CNTLA OFF sets it to low (the auxiliary interface connector outputs use transistor-transistor logic).

### Query Response




QQ2

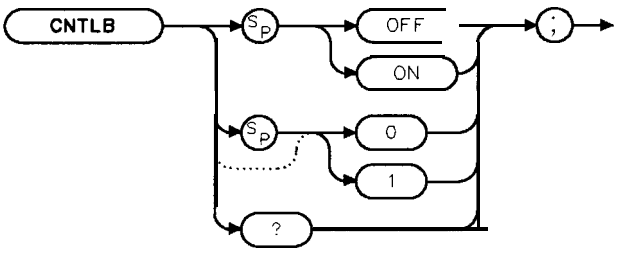


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# CNTLB
# Auxiliary Interface Control Line B

Sets the control line B of the auxiliary interface high or low.

## Syntax




XCNTLB

Equivalent Softkey: CNTL B 0 1 .
Related Commands: CNTLA, CNTLC, CNTLD, CNTLI.

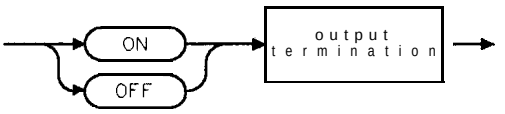
## Example

```
OUTPUT 718;"CNTLB ON;"      Sets control line B high.
OUTPUT 718;"CNTLB?;"        Queries the state of control line B.
ENTER 718;A$                Gets the response from the spectrum analyzer.
DISP A$                     Displays the response.
```

## Description

CNTLB ON sets control line B to high, CNTLB OFF sets it to low (the auxiliary connector outputs use transistor-transistor logic).

## Query Response




QQ2

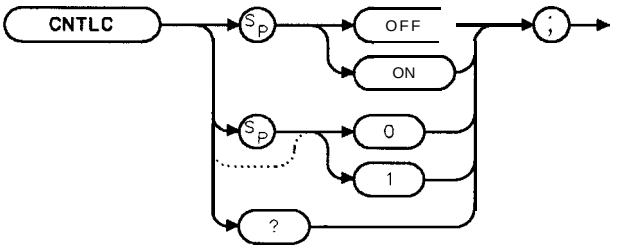


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# CNTLC
# Auxiliary Interface Control Line C

Sets the interface control line C of the auxiliary interface high or low.

## Syntax




XCNTLC

Equivalent Softkey: CNTL C 0 1 .
Related Commands: CNTLA, CNTLB, CNTLD, CNTLI.

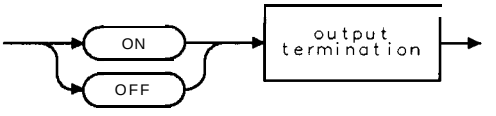
## Example

```
OUTPUT 718;"CNTLC ON;"     Sets control line C high.
OUTPUT 718;"CNTLC?;"       Queries the state of control line C.
ENTER 718;A$               Gets the response from the spectrum analyzer.
DISP A$                    Displays the response.
```

## Description

CNTLC ON sets control line C to high, CNTLC OFF sets it to low (the auxiliary interface connector outputs use transistor-transistor logic).

## Query Response




QQ2

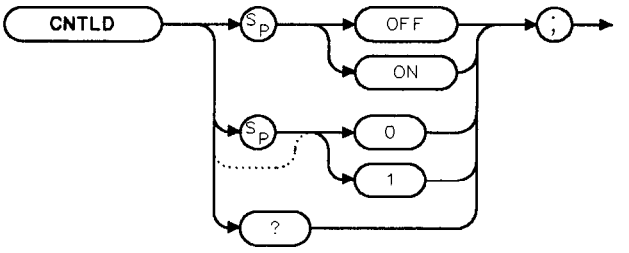


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# CNTLD
# Auxiliary Interface Control Line D

Sets the interface control line D of the auxiliary interface high or low.

## Syntax




XCNTLD

Equivalent Softkey: CNTL D 0 1 .
Related Commands: CNTLA, CNTLB, CNTLC, CNTLI.

## Example

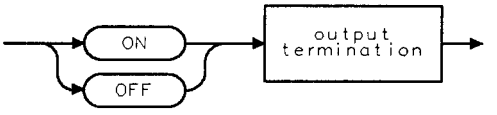
```
OUTPUT 718 ; "CNTLD ON ;"
OUTPUT 718;"CNTLD?;"
ENTER 718;A$
DISP A$
```

*Sets control line D high.*
*Queries the state of control line D.*
*Gets the response from the spectrum analyzer.*
*Displays the response.*

## Description

CNTLD ON sets control line D to high, CNTLD OFF sets it to low (the auxiliary connector outputs use transistor-transistor logic).

## Query Response




QQ2

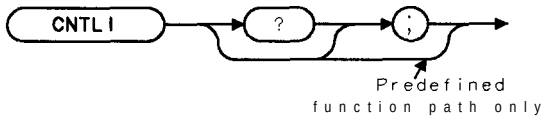


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# CNTLI
# Auxiliary Interface Control Line Input

Returns a " 1" when the interface control line I of the auxiliary interface is high, and "0" if the line input is low.

## Syntax




XCNTL )

Equivalent Softkey: DISPLAY CMTL I .

Related Commands: CNTLA, CNTLB, CNTLC, CNTLD.

## Example

```
OUTPUT 718;"CNTLI;"     Gets the status of control line I.
ENTER 718;A
DISP A                  Displays status.
```

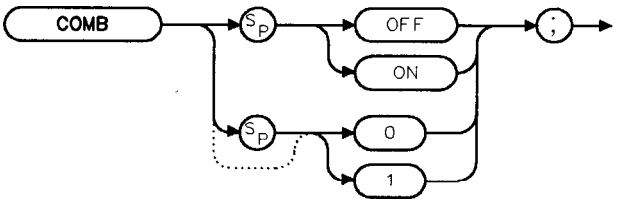


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# COMB
# Comb

Turns on or off the comb generator.

## Syntax




XCOMB

Equivalent **Softkey**: COMB GEN ON OFF .
Model Required: HP 8592L, HP 85933, or HP 85963.

## Example

```
OUTPUT 718;"COMB ON;" Turns on the comb generator.
```

## Description

To use the comb signal, a cable must be connected from the COMB OUT connector to the spectrum analyzer input.

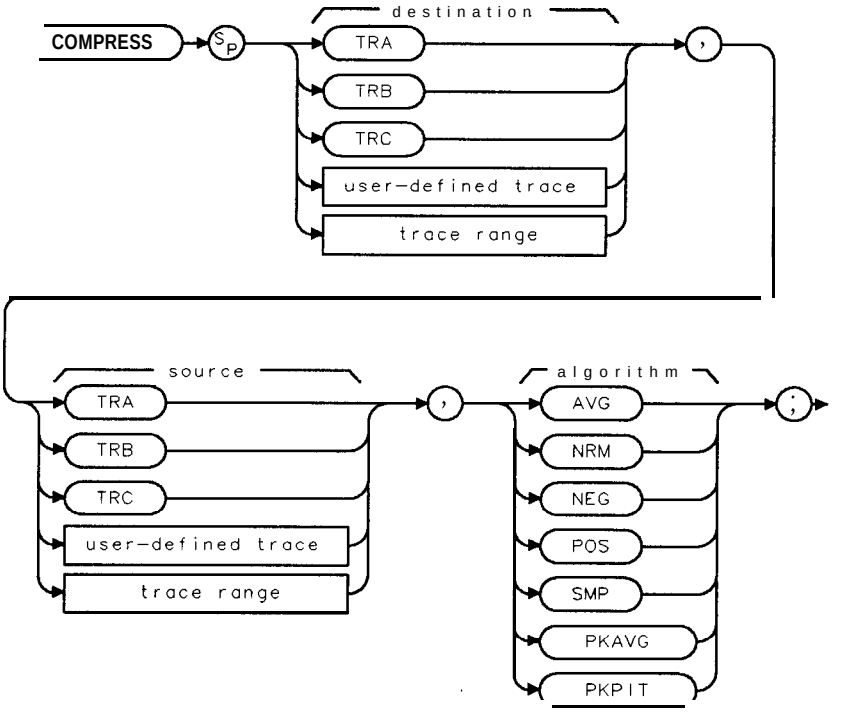


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# COMPRESS
## Compress Trace

Reduces the number of trace elements while retaining the relative frequency and amplitude characteristics of the trace data.

### Syntax




XCOMPRESS

| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | **A** trace defined by the TRDEF command | Any valid trace name. |
| Trace Range | A segment of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using user-defined trace. TS when using trace data.



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## Example

This example compresses trace B into "C-0MPTRAC" using the positive (POS) algorithm.

```
10 OUTPUT 718;"IP;"                                  Initializes spectrum analyzer.
20 OUTPUT 718;"TRDEF C_OMPTRAC,100;"                 Creates a trace called C_OMPTRAC with
                                                     a length of 100 elements.
30 OUTPUT 718 ;"BLANK TRA;SNGLS;"                    Blanks trace A, activates single-sweep
                                                     mode.
40 OUTPUT 718;"CLRW TRB;TS;"                         Measures with trace B.
50 OUTPUT 718;"COMPRESS C_OMPTRAC,TRB,POS;"          Compresses trace B into C-OMFTRAC.
60 OUTPUT 718;"BLANK TRB;"                           Blanks trace B.
70 OUTPUT 718;"MOV TRA,C_OMPTRAC;"                   Moves C_OMPTRAC into trace A.
80 OUTPUT 718;"VIEW TRA;"                            Displays the result.
90 END
```

## Description

The COMPRESS command stores a compressed copy of the source trace into a smaller destination trace. The source trace is divided into the same number of intervals as there are points in the destination trace, and the data within each interval are compressed into the value for the corresponding destination trace point. The algorithm used to compress the data is given as an parameter to the command.

The algorithms available are as follows:

AVERAGE (AVG) — The average of the points within an interval is used.

NORMAL (NRM) — NRM computes the compressed value of the interval by using a rosenfell algorithm. The rosenfell algorithm is a mathematical operation defined in spectrum analyzer firmware. The algorithm compresses a locally continuously rising or falling signal into the peak value detected in each interval. If the detected signal is not continuously rising or falling, then the data value alternates between minimum and maximum in the compressed interval. This shows the peak-to-peak noise variations. The rosenfell option is useful for accurately displaying noise, because peak detection can give misleading representation of noise.

NEGATIVE (NEG) — The lowest value in each interval is used.

POSITIVE (POS) — Specifying POS selects the highest point in the interval as the compressed value.

SAMPLE (SMP) Specifying SMP selects the last point in the interval as the compressed value.

PEAK AVERAGE (PKAVG) — The PKAVG algorithm selects the difference between the peak and the average value of the interval as the compressed value.

PEAK PIT (PKPIT) — The PKPIT algorithm returns the difference between the positive and the negative peaks within the interval.

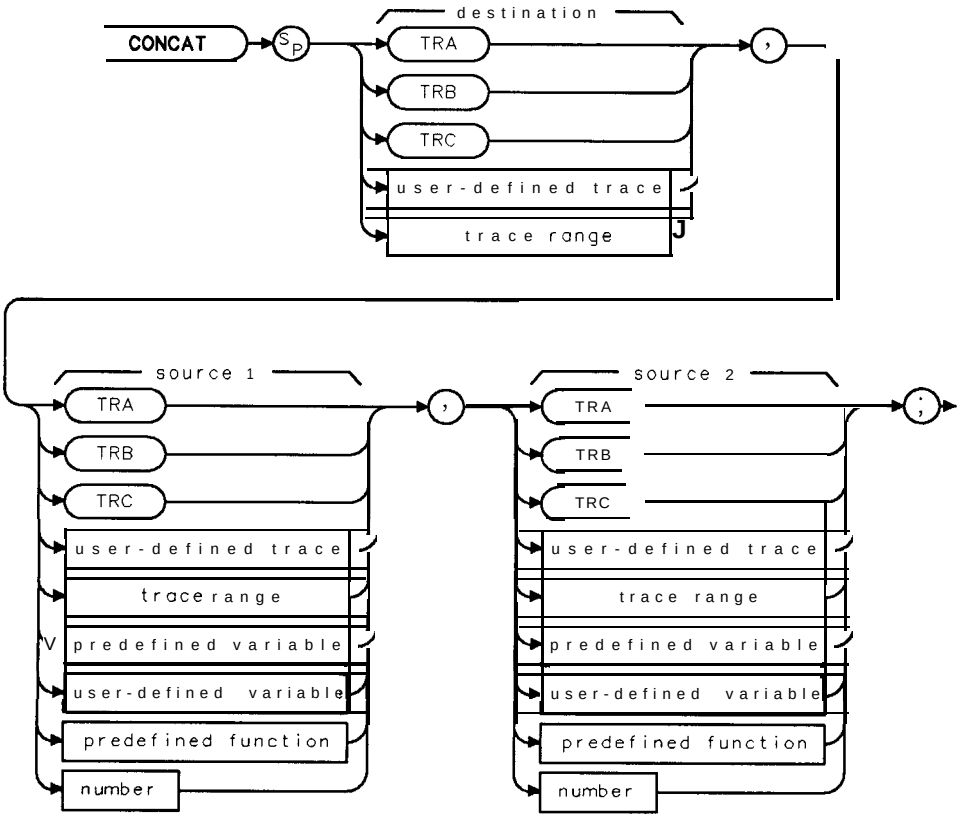


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# CONCAT
## Concatenate

Combines two traces.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-l. | |
| Predefined function | Function that return a value. Refer to Table 5-l. | |
| Trace Range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF when using a user-defined variable. TS when using trace data.
Related Commands: MOV, VIEW.



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## Example

```
10 OUTPUT 718;"IP;"                                   Initializes the spectrum analyzer:
20 OUTPUT 718;"SNGLS;"                                Activates the single-sweep mode.

30 OUTPUT 718;"TS;VIEW TRA;"                          Stores and displays trace A.
40 OUTPUT 718;"CLRW TRB;TS;"                          Takes a measurement sweep
                                                      with trace B.
50 OUTPUT 718;"CONCAT TRC,TRA[1,200],TRB[201,401];"   Concatenates the last half of
                                                      trace B to the first half of
                                                      trace A.
60 OUTPUT 718;"BLANK TRA;BLANK TRB;"                  Blanks trace A and trace B.
70 OUTPUT 718;"VIEW TRC;"                             Displays the result.
80 END
```

## Description

The CONCAT command concatenates source 2 to the end of source 1, then stores the result in the destination. If the destination length is less than the length of source 1 and source 2, the list is truncated. For example, executing "CONCAT TRA[1,15],TRB[3,6],TRB[7,207];" results in trace A elements 1 to 4 being replaced by trace B elements 3 to 6, and trace A elements 5 to 15 being replaced by trace B elements 7 to 17. Trace B elements 18 to 207 are ignored. If necessary, reduce trace lengths with the COMPRESS command.

If the length of the destination is greater than the length of source 1 and source 2, the last value is repeated. For example, executing "CONCAT TRA[1,15],TRB[3,6],TRB[7,9];" results in trace A elements 1 to 4 being equal to trace B elements 3 to 6, trace A elements 5 and 6 being replaced by trace B elements 7 and 8, and trace A elements 7 to 15 being replaced by trace B element 9.

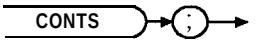


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# CONTS
## Continuous Sweep

Sets the spectrum analyzer to the continuous sweep mode.

### Syntax




XCONTS

Equivalent **Softkey: SWEEP CONT** SGL (when CONT is underlined).
Preset State: CONTS.
Related Commands: SNGLS, ST, TM.

### Example

OUTPUT 718; "CONTS;"

### Description

The CONTS command sets the spectrum analyzer to continuous sweep mode. In the continuous sweep mode, the spectrum analyzer takes its next sweep as soon as possible after the current sweep (as long as the trigger conditions are met). A sweep may temporarily be interrupted by data entries made from the front panel or over the remote interface.

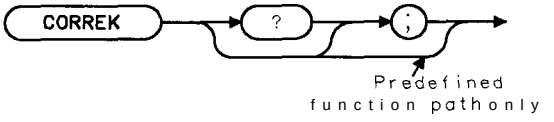


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# CORREK
# Correction Factors On

Returns a “1” if the correction factors are on, a “0” if they are off.

## Syntax



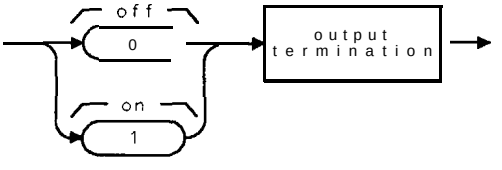

XCORREK

Equivalent Softkey: CORRECT ON OFF .
Related Commands: CAL.

## Example

```
OUTPUT 718;"CORREK;"
ENTER 718;A
DISP A
```

## Query Response




QQ3

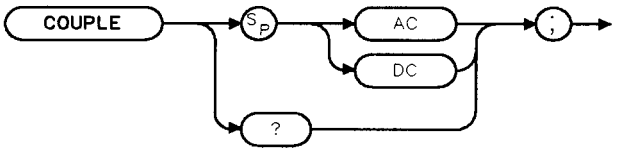


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# COUPLE
## Couple

Selects direct-current (dc) coupling or alternating-current (ac) coupling.

### Syntax




XCOUPLE

Equivalent **Softkey**: COUPLE **AC** DC .
Model Required: HP 85943, HP 85953, or HP 85963.
Preset State: AC
Related Commands: Il?

### Example

```
OUTPUT 718;"COUPLE DC;"
```

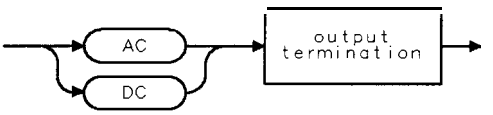
### Description

**Caution** Do not use dc coupling if there is *any* dc voltage at the spectrum analyzer input. Do not exceed the power stated on the spectrum analyzer input. See the specifications for the spectrum analyzer in the Calibration Guide for your spectrum analyzer for more information.

If there is no dc voltage at the spectrum analyzer input, dc coupling is useful for observing low frequency signals at the spectrum analyzer input. Use ac coupling when there is dc voltage at the spectrum analyzer input (ac coupling blocks the dc voltage and allows only the ac voltage at the spectrum analyzer input).

When used as a predefined variable, COUPLE returns a “0” if COUPLE has been set to DC. A “ 1 ” if COUPLE has been set to AC.

### Query Response




OCOUPLE

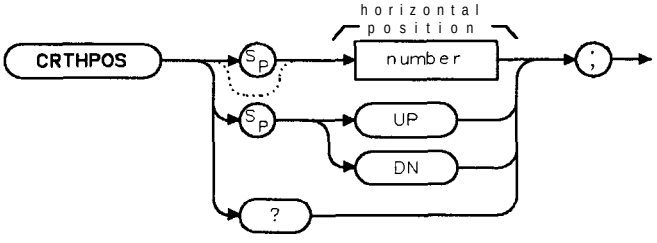


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# CRTHPOS
# Horizontal Position of CRT Display

Specifies the horizontal position of the text and graticule on the spectrum analyzer's display.

## Syntax




XCRTHPOS

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer number. | 1 to 34. |

Equivalent Softkey: CRT HORZ POSITION .
Default Value: 10.
Step Increment: by 1.
Related Commands: CRTVPOS, SYNCMODE.

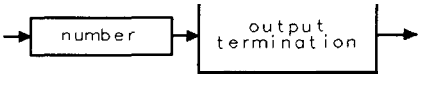
## Example

```
OUTPUT 718;"CRTHPOS 15;"
```

## Description

The CRTHPOS command specifies the horizontal position of the information on the spectrum analyzer's display. Each CRTHPOS number represents four screen pixels. (The spectrum analyzer display is 512 screen pixels wide by 256 screen pixels high.) Execute CAL STORE to store the current CRTHPOS value as the default value of the horizontal position.

## Query Response




QQ1

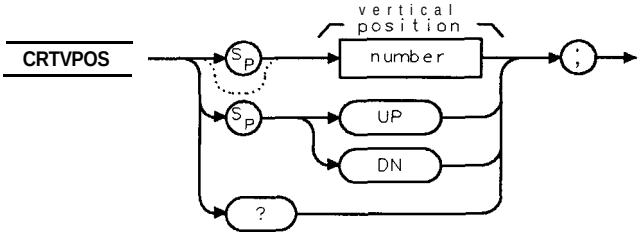


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# CRTVPOS
# Vertical Position of CRT Display

Specifies the vertical position of the text and graticule on the spectrum analyzer's display.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer number. | 10 to 58. |

Equivalent Softkey: CRT VERT POSITION .
Default Value: 48.
Step Increment: by 1.
Related Commands: CRTHPOS, SYNCMODE.

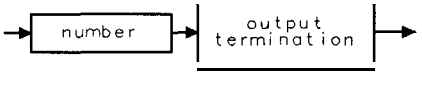
## Example

```
OUTPUT 718;"CRTVPOS 50;"
```

## Description

The CRTVPOS command specifies the vertical position of the information on the spectrum analyzer's display. Each CRTVPOS number represents four screen pixels. (The spectrum analyzer display is 512 screen pixels wide by 256 screen pixels high.) Execute CAL STORE to store the current CRTVPOS value as the default value of the vertical position.

## Query Response



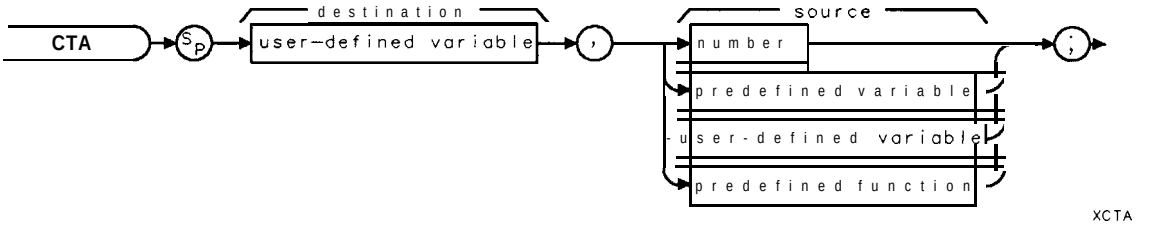



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# CTA
# Convert to Absolute Units

Converts the source values from measurement units to the current absolute amplitude units and then stores the result in the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Number | Any valid integer number. | -32,768 to +32,767. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-1. | |
| Predefined function | Function that return a value. Refer to Table 5-l. | |

Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: AUNITS, LG, LN, RL.

## Example

```
10 OUTPUT 718;"VARDEF C_ONLV,0;"      Declares a variable called C_ONLV.
20 OUTPUT 718;"LG;"                   Puts the spectrum analyzer in log mode.
30 OUTPUT 718;"RL -10DB;"             Changes the reference level.
40 OUTPUT 718;"CTA C_ONLV, 8000;"     Stores -10 in C_ONLV.
50 OUTPUT 718;"RL -20DB;"             Changes the reference level.
60 OUTPUT 718;"CTA C_ONLV,8000;"      Stores -20 in C_ONLV.
70 OUTPUT 718;"C_ONLV?;"
80 ENTER 718;A
90 DISP A
100 END
```



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**CTA Convert to Absolute Units**

## Description

The result of the CTA command depends on the reference level, the current amplitude units, and the amplitude scale (log or linear).

Measurement units are the internal binary data representation of measured results. The internal binary data representation is 16-bit amplitude values that are stored in traces. The values range from -32,768 to 32,767. The value of 8000 corresponds to an amplitude equal to the reference level. In log mode, each count represents 0.01 dBm. A signal 0.01 dBm above the reference level is at 8001, and a signal 1.0 dBm below the reference level is at 8000 minus 100, or 7900. In linear mode, 8000 is the reference level and 0 is the 0 volt level. If the reference level is at 80 mV, each count would represent 0.080 divided by 8000 or 10 $\mu$V, but a reference level of 2.4 volts would represent 2.4 divided by 8000 or 300 $\mu$V per count.

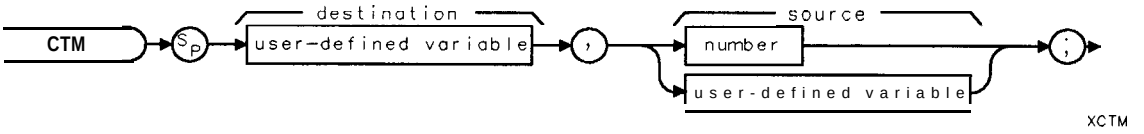


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# CTM
# Convert to Measurement Units

Converts the source values to measurement units and places the result in the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined variable | A variable defined by VARDEF or ACTDEF commands | Any valid variable name. |
| Number | A number expressed in integer, decimal, or exponential form. | Real number range. |

Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: AUNITS, CTA, LG, LN, RL.

## Example

```
OUTPUT 718;"VARDEF A_MPV,0;"      Declares a variable called A_MPV.
OUTPUT 718;"LG;"                  Pats the spectrum analyzer in log mode.
OUTPUT 718;"RL -10DB;"            Changes the reference level.
OUTPUT 718;"CTM A_MPV,-10;"       Stores 8000 in A_MPV.
OUTPUT 718;"DSPLY A_MPV,13.5;"    Displays A_MPV.
```

## Description

The result of the CTM command depends on the reference level, the current amplitude units, and the amplitude scale (log or linear).

Measurement units are the 16-bit amplitude values stored in traces. The values range from -32,768 to 32,767. The value of 8000 corresponds to an amplitude equal to the reference level. In log mode, each count represents 0.01 dBm. A signal 0.01 dBm above the reference level is at 8001, and a signal 1.0 dBm below the reference level is at 8000 minus 100, or 7900. In linear mode, 8000 is the reference level and 0 is the 0 volt level. If the reference level is at 80 mV, each count would represent 0.080 divided by 8000 or 10 $\mu$V, but a reference level of 2.4 volts would represent 2.4 divided by 8000 or 300 $\mu$V per count.

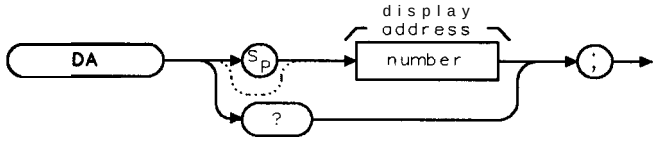


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# DA
# Display Address

Accesses the current address of the display list.

## Syntax




XDA

| Item | Description/Default | Range |
|---|---|---|
| Number | Any integer number. | 0 to 16383. |

Preset State: 0.
Related Commands: DSPLY, GR, LB, PA, PD, PR, PU, TEXT.

## Example

This example allows you to display a message on the spectrum analyzer display, blank the message, and then display another message on the spectrum analyzer display.

```
OUTPUT 718;"VARDEF D_ADDRESS,0;"
```
*Defines a variable called D-ADDRESS.*

```
OUTPUT 718;"CLRDSP;"
```
*Erases the display list and clears all text and graphics from the spectrum analyzer display.*

```
OUTPUT 718;"PUPA 100,180;TEXT %Measurement%;"
```
*Displays "Measurement" on the spectrum analyzer display. The text is also added to the display list.*

```
OUTPUT 718;"MOV D_ADDRESS,DA;"
```
*Saves the value of the display address by moving the display address into D-ADDRESS.*

```
OUTPUT 718;"PUPA 100,100;TEXT %Signal found%;"
```
*Displays text on the spectrum analyzer display. The text is also saved in the display list, and the display address is increased. (The display address is increased proportionally to the length of the displayed text.)*

*You can add code for continuing the measurement here.*

```
OUTPUT 718;"PUPA 100,100;TEXT %                %;"
```
*Blanks the message "Signal found" on the analyzer screen and adds the blank spaces to the display list.*



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```
OUTPUT 718;"MOV DA,D_ADDRESS;"
OUTPUT 718;"PUPA 100,120;TEXT %Done%;"
```

*Restores the display address. Displays the message "Done" on the analyzer screen, and replaces the text "Signal found" and the blank spaces that were in the display list. The text "Measurement" remains on the spectrum analyzer display and in the display list.*

## Description

The DA command allows you to access the current address of the display list. The display list is a buffer that contains all of the text and graphics that have been displayed on the spectrum analyzer screen with the DSPLY, GR, LB, or TEXT commands.

**How the display list works:** Every time you use a programming command to display text or graphics on the analyzer display, the text or graphics is also entered into the display list. While you can change or erase what is displayed on the analyzer screen, the list for screen graphics accumulates *all* of the text and graphics. For example, if you execute the following programming lines:

```
OUTPUT 718;"PUPA 100,100;TEXT %Signal found%;"
OUTPUT 718;"PUPA 100,100;TEXT %          %;"
OUTPUT 718;"PUPA 100,100;TEXT %Done%;"
```

the text "Signal found" would be displayed on the analyzer screen, and then be erased by the blank spaces, and then "Done" would be displayed. The display list would save the text "Signal found," the blank spaces, and the text "Done," in separate (and sequential) locations in the display list.

The display list is important because the contents of the display list are used to restore the screen text when the annotation or graticule is turned off and then turned back on, or when the screen display is plotted. When the screen text is restored on the spectrum analyzer display, or the screen display is plotted, the *entire* display list is used. Because the entire display list is used, there can be some text "flashing" on the spectrum analyzer display or the plot can contain unwanted text. The DA command can be used to avoid this situation.

**What the DA command does:** The DA command allows you to save and then restore the current address of the display list, thus controlling where text is written in the display list. For example, if you want your program to display the messages "Signal found," and "Done," and you want only the messages that are currently displayed on the spectrum analyzer screen to be stored in the display list, you would do the following:

1. Save the display address in a variable.
2. Execute the commands that display the first message on the spectrum analyzer display.

When you want to change the message, you would do the following:

1. Execute the commands that put blank spaces over the message (to clear the message from the analyzer display). You do not need to use blank spaces the clear the previous message if the number of characters in the new message is equal to or greater than the original message.
2. Copy the display address from the variable back into DA (this recalls the previous display address).
3. Execute the commands that display the new message on the spectrum analyzer display.



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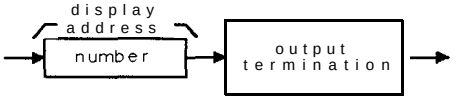
Note Assigning random values to the display address can have undesirable effects.

**Restrictions:** You cannot alter earlier entries to the display list without rewriting all subsequent entries in the display list. For example, the display list, with three messages in it, could be represented as follows:

```
Display List Contents:   <first message>   <second message>   <third message>
Display Address:         ↑                 ↑                 ↑
```

Because the display address is proportional to the length of the text, you could not change the second message without affecting the display address of the third message. In this case you should rewrite both the second and third message.

## Query Response




QDA

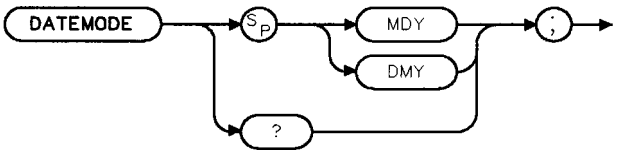


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# DATEMODE
## Date Mode

Allows you to set the format for displaying the real-time clock in either the month, day, year format or the day, month, year format.

### Syntax




XDATEMODE

Equivalent **Softkey: DATEMODE** MDY DMY .

### Example 1

```
OUTPUT 718;"DATEMODE DMY;"
OUTPUT 718;"DATEMODE?;"
ENTER 718;A$
DISP A$
```

*Sets the **date mode** to **day**, month, yearformat.*
*Queries the **format** of the display of the real-time clock.*

### Example 2

```
OUTPUT 718;"VARDEF T_EMP,0;"
OUTPUT 718;"DATEMODE DMY;"
OUTPUT 718;"MOV T_EMP,DATEMODE?;"

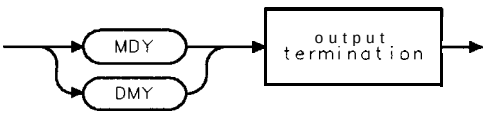
OUTPUT 718;"T_EMP?;"
ENTER 718;A
DISP A
```

*Creates a variable.*
*Sets the **date mode** to **day, month,** year **format.***
*Queries the format of the display of the real-time clock **as** a **predefined** variable.*
*Gets the result.*

### Description

When used as a predefined variable, **DATEMODE** returns a "0" if **DATEMODE** has been set to MDY. A **"** 1 **"** if **DATEMODE** has been set to DMY. See example 2.

### Query Response




ODATEMODE

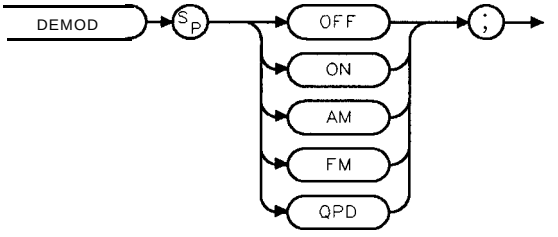


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# DEMOD
# Demodulation

Turns the demodulator on or off, and selects between AM, FM, or quasi-peak demodulation,

## Syntax




XDEMOD

Equivalent Softkey: DEMOD ON OFF is similar.

Option Required: Option 102, 103, or 301.
Related Commands: DET, FMGAIN, HAVE, MKPAUSE, SP, SPEAKER, SQLCH.
Restrictions: Not available with Analog+ display mode. See "ANLGPLUS" for more information.

## Example

This example demonstrates FM demodulation in a span greater than zero.

```
10 OUTPUT 718;"IP;FA 90MHZ;"          Sets start frequency.
20 OUTPUT 718;"FB 110MHZ;"            Sets stop frequency.
30 OUTPUT 718;"TS;MKPK HI;MKCF;"      Places marker on the highest peak and brings the
                                      peak to center frequency.
40 OUTPUT 718;"DEMOD ON;DEMOD FM;"    Turns on FM demodulation.
50 OUTPUT 718;"MKPAUSE 500MS;"        Turns on marker pause. The detector switches
                                      automatically to the FMV detector during the
                                      dwell time.
60 END
```

## Description

Execute "DEMOD ON;" to turn on the demodulator. "DEMOD AM;", "DEMOD FM;", or "DEMOD QPD;" selects the demodulation mode, but does not turn on the demodulator.

For AM or FM demodulation in nonzero frequency spans, use MKPAUSE to set the dwell time of the marker.

Quasi-peak demodulation (QPD) is available with Option 103. See the Option 103 Manual Supplement for more information about operating the quasi-peak detector remotely.

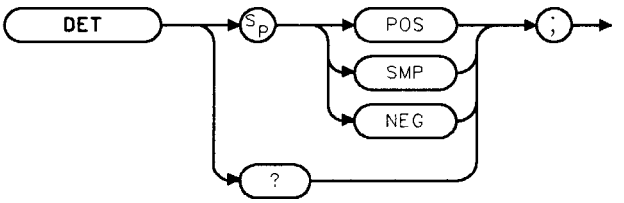


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# DET
# Detection Mode

Selects the spectrum analyzer detection mode.

## Syntax




Equivalent Softkey: DETECTOR PK SP NG or DETECTOR SMP PK.
Preset State: DET POS.
Related Commands: DEMOD, MEANTH, TV.

## Example

```
10 OUTPUT 718;"IP;"                  Initializes the spectrum analyzer.
20 OUTPUT 718;"SNGLS;"               Activates single-sweep mode.
30 OUTPUT 718;"DET POS;TS;"          Activates the positive-peak detection of trace A.
40 OUTPUT 718;"VIEW TRA;"            Stores results in trace A.
50 OUTPUT 718;"DET SMP;"             Activates sample detection for trace B.
60 OUTPUT 718;"CLRW TRB;TS;"         Measures with trace B.
70 OUTPUT 718;"VIEW TRB;"            Stores results in trace B.
80 OUTPUT 718;"AVG TRA,TRB,2;"       Averages trace A and B with a ratio of 2, and stores
                                     the results in trace A.
90 OUTPUT 718;"BLANK TRB;"           Blanks trace B, leaving only averaged results on screen.
100 END
```

## Description

The DET command selects the type of spectrum analyzer detection (positive-peak, sample, or negative) and accesses service-diagnostic detection functions.

**POS** enables positive-peak detection, which displays the maximum video signal detected over a number of instantaneous samples for a particular frequency.

**SMP** enables sample detection, which uses the instantaneous video signal value. Video averaging and noise-level markers, when activated, activate sample detection automatically.

**NEG** enables negative peak detection in sweep times of less than or equal to 200 ms. The negative peak detector is available with Option 101 or Option 301 only.



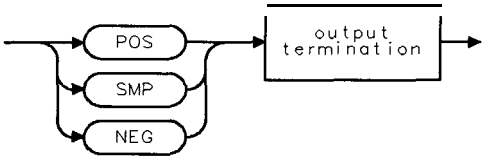
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### DET Detection Mode

When used as a predefined variable, DET returns a number. The number that is returned corresponds to the DET parameter as shown in the following table.

| DET Parameter Setting | Value DET Returns |
|---|---|
| SMP | 0 |
| POS | 1 |
| NEG | 49 |

## Query Response



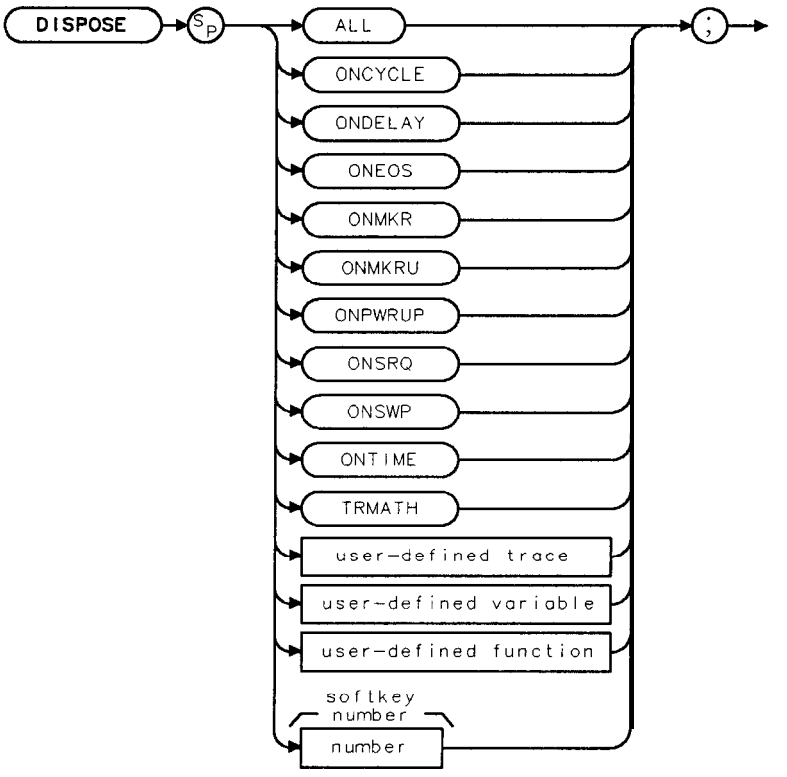



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# DISPOSE
# Dispose

Frees spectrum analyzer memory that was previously allocated for user-defined operands.

## Syntax




xdispose

| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by the VARDEF or ACTDEF commands. | Any valid variable name. |
| User-defined function | A subroutine defined by the FUNCDEF command. | Any valid function name. |
| Number | Any valid softkey number. | 1 to 6, 601 to 1200. |

Equivalent Softkey: DISPOSE ALL and DISPOSE USER MEM are equivalent.

Prerequisite Commands: TRDEF when using a user-defined trace. VARDEF or ACTDEF when using a user-defined variable.

Related Commands: ERASE, KEYCMD, KEYDEF, KEYLBL, LIMIDEL, ONCYCLE, ONMKRU, ONPWRUP, ONDELAY, ONEOS, ONMKR, ONSRQ, ONSWP, ONTIME, TRMATH.



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## Example

| | |
|---|---|
| `OUTPUT 718;"VARDEF T_EMP,10;"` | *Defines a variable for use in a program. When the variable is no longer needed, it can be deleted using the DISPOSE command* |
| `OUTPUT 718;"DISPOSE T_EMP;"` | *Deletes T_EMP from spectrum analyzer memory.* |

## Description

Using the ONCYCLE, ONDELAY, ONEOS, ONMKR, ONMKRU, ONSRQ, ONSWP, ONTIME, TRMATH, TRDEF, VARDEF, FUNCDEF, ACTDEF, KEYDEF, KEYENH, or KEYCMD programming commands create a trace, variable, function, softkey, or "on-event" function that remains in the spectrum analyzer's memory until you delete it with the DISPOSE command, or execute the ERASE command. With the DISPOSE command, you can select which item is to be deleted (for example, executing "DISPOSE ONMKR; " would delete any ONMKR functions that you have created). Or, if you execute DISPOSE ALL, all of the traces, variables, functions, softkeys, and "on-event" functions that you have created will be deleted from spectrum analyzer memory. Executing "DISPOSE ALL;" or the ERASE command frees all available spectrum analyzer memory (except the state registers and predefined traces), to make the total available user-allotted memory the maximum size.

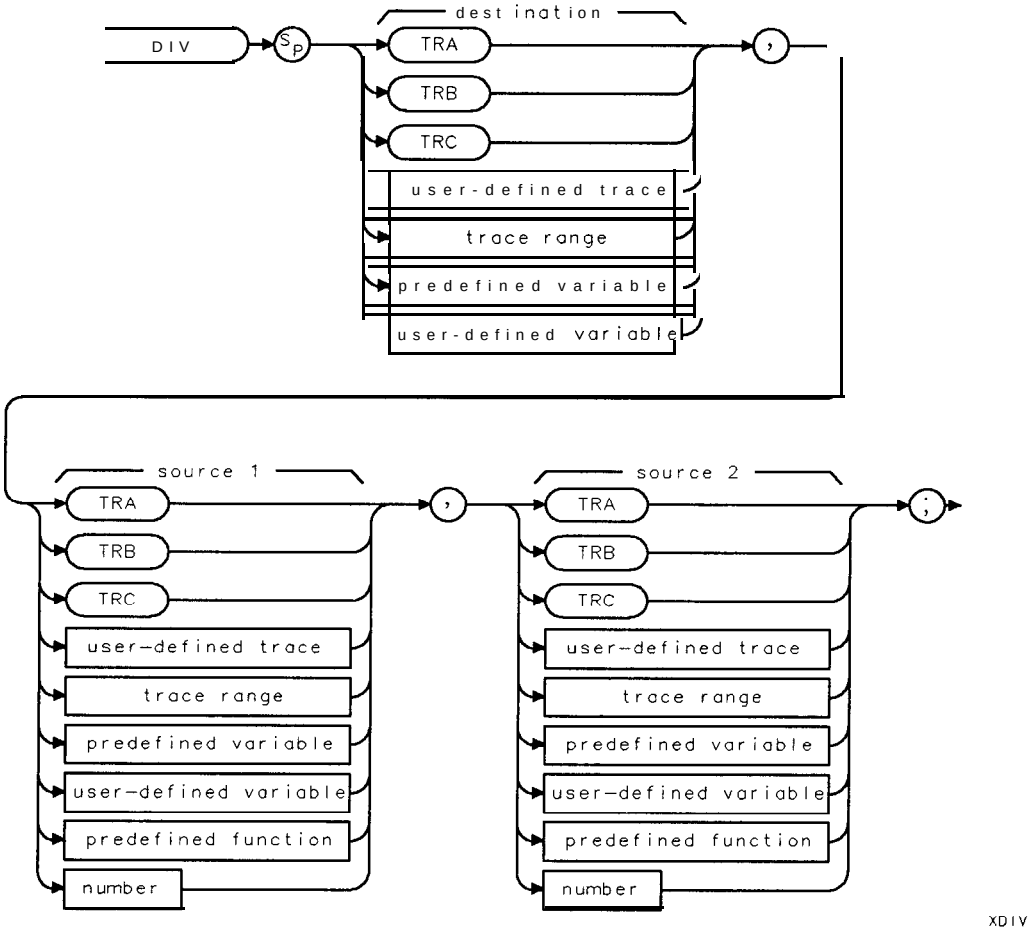


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# DIV
# Divide

Divides source 1 by source 2 and places the result in the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| **User-defined** trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| **Predefined** variable | A command that acts as a variable. Refer to Table 5-l. | |
| Predefined function | Function that returns a value. Refer to Table 5-l. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF when using a user-defined variable. TS when using trace data.
Related Commands: MPY, SNGLS, TS.



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## Example

```
OUTPUT 718;"IP;"                 Initializes the spectrum analyzer.
OUTPUT 718;"SNGLS;"              Activates single-sweep mode.
OUTPUT 718;"TS;"                 Updates trace information.
OUTPUT 718;"DIV TRB,TRA,2;"      Divides trace A by two and places it in trace B.
OUTPUT 718;"VIEW TRB;"           Displays the result.
```

## Description

Integer values are used when a trace is either the destination or one of the sources. If trace data is used both as the source and the destination, the DIV function is done with 32-bit arithmetic on 16-bit integer data. If a user-defined variable or predefined variable is used as either the source or the destination, the DIV function is done in floating-point format. If a real number is used as a source, but the destination is an integer value, the result is truncated. If a trace is used as a source, be sure the trace contains a complete sweep of measurement information before executing DIV.

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

The results of the DIV function are invalid if source 2 is equal to zero.

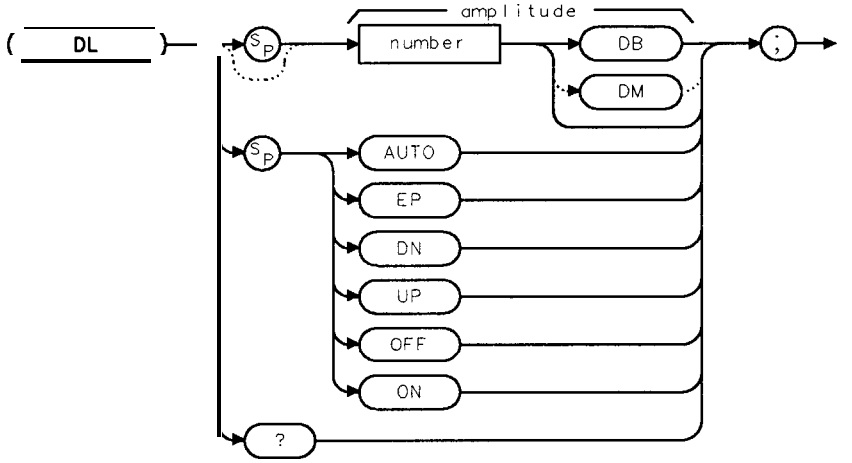


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# DL
# Display Line

Defines the level of the display line in the active amplitude units and displays the display line on the spectrum analyzer screen.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default units are dBm. | Dependent on the reference level. |

Equivalent Softkey: DSP LINE ON OFF .
Preset State: DL OFF
Step Increment: 1 major division.
Related Commands: AUNITS, AUTO, LG, LN, NRL, RL, ROFFSET, TH.

## Example

```
OUTPUT 718;"AUNITS DBM;"    Changes the active amplitude units to dBm.
OUTPUT 718;"DL ON;"         Turns on the display line.
OUTPUT 718;"DL -5DM;"       Changes display line to -5 dBm.
```

## Description

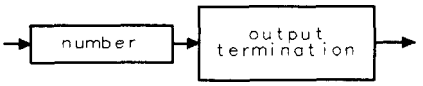
Activating video trigger mode activates the display line. The AUTO command and "DL OFF; " turn off the display line. See "AUNITS" for more information on changing the active amplitude units.



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**DL Display Line**

## Query Response




QQ1



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# DN
# Down

Reduces the active function by the applicable step size.

## Syntax




XDN

Related Commands: See the list of active functions listed in the description for DN.

## Example

```
OUTPUT 718;"SS 1MHZ;CF 1GHZ;DN;"   Setscenterfrequency to 1 GHz.
OUTPUT718;"SP40MHZ;MKPK;DN;"       Decreases the frequency span.
```

## Description

Before executing DN, be sure that the function to be decreased is the active function. For example, the second line of the programming example decreases the span, because marker peak (MKPK) is not an active function.

The active functions are ACPBW, ACPSP, AT, CF, CRTHPOS, CRTVPOS, DL, DOTDENS, FA, FB, FMGAIN, GD, GL, LG, MKA, MKD, MKFCR, MKN, MKPAUSE, MKPX, ML, NDB, NRL, RB, RCLS, ROFFSET, RL, RLPOS, SAVES, SAVRCLN, SETDATE, SETTIME, SP, SQLCH, SRCALC, SRCAT, SRCPOFS, SRCPSWP, SRCPWR, SRCTK, SS, ST, TH, TVLINE, VB, VBR, and user-defined active function specified by the ACTDEF command.

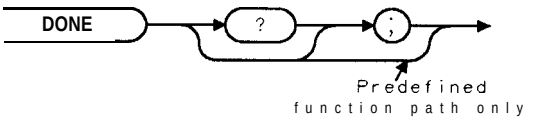


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## DONE
## Done

Allows you to determine when the spectrum analyzer has separated the spectrum analyzer commands and has started to execute all commands prior to and including DONE. The spectrum analyzer returns a value of "1" when **all** commands in a command string entered before DONE have been started.

### Syntax




XDONE

Related Commands: TS.

### Example

```
OUTPUT 718;"IP;SNGLS;CF 1GHZ;SP 1GHZ;DONE;"
```

*Because TS does not precede the DONE command in this line, the center frequency and span values are set before DONE returns a "1." Functions coupled to SP, such as RB, have not been changed, and there is no trace data associated with the new frequency settings.*

```
ENTER 718;Done
DISP Done
```

### Example 2

```
OUTPUT 718;"IP;SNGLS;CF 1GHZ;SP 1GHZ;TS;DONE;"
```

*Because the take sweep (TS) must be completed before the DONE command is executed, the autocoupled functions and trace data have been changed before the DONE command is executed.*

```
ENTER 718;Done
```

*Stores 1 in computer variable, called Done.*

```
DISP Done
```



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## Description

As shown by the example, if a take sweep (TS) precedes the DONE command, DONE is executed after all the preceding commands have been completed. Use a take sweep (TS) to ensure all previous commands have completed before DONE returns a "1."

## Query Response




QDONE

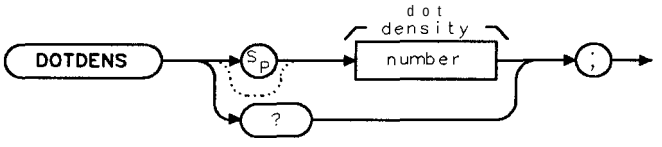


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# DOTDENS
## Dot Density

Sets the dot density value in the Analog+ display mode.

### Syntax




XDOTDENS

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer number. | 1 to 40. |

Equivalent Softkey: ANALOG+ ON OFF .
Option Required: Option 101 or 301.
Preset State: 15.
Related Commands: ANLGPLUS.

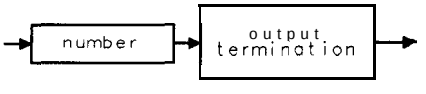
### Example

```
OUTPUT 718;"ANLGPLUS ON;"      Turns on the Analog+ display mode.
OUTPUT 718;"DOTDENS 40;"       Sets the dot density to 40.
```

### Description

The dot density value can be set from 1 to 40 dots per trace element. This command is specific to the Analog+ display mode; see “ANLGPLUS” for more information about the Analog+ display mode.

### Query Response




QQ1

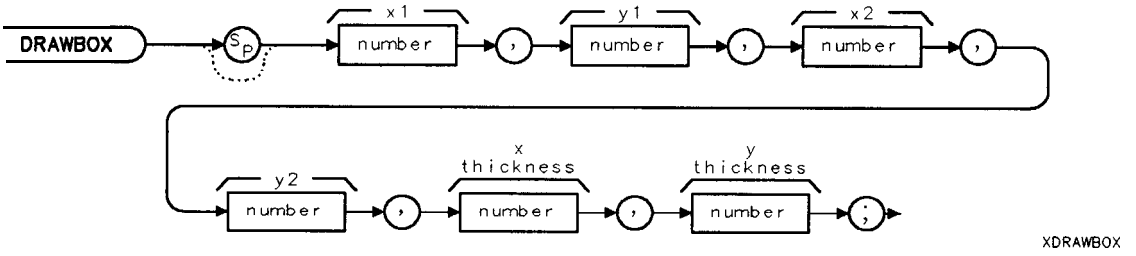


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# DRAWBOX
## Draw Box

Draws a rectangular box on the spectrum analyzer display.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer number. | For xl or x2, -40 to 471.<br>For yl or y2, -22 to 233.<br>For x thickness, 1 to x2 – xl, for y thickness, 1 to y2 – yl. |

Related Commands: CLRDSP.

### Example

The following programming line results in the spectrum analyzer display shown in Figure 5-3.

```
OUTPUT 718;"DRAWBOX 1,1,200,200,10,5;"
```

*Draws a box from 1,1 to 200,200. The box has horizontal borders that are 10 display units wide, and a vertical borders that are 5 display units wide.*

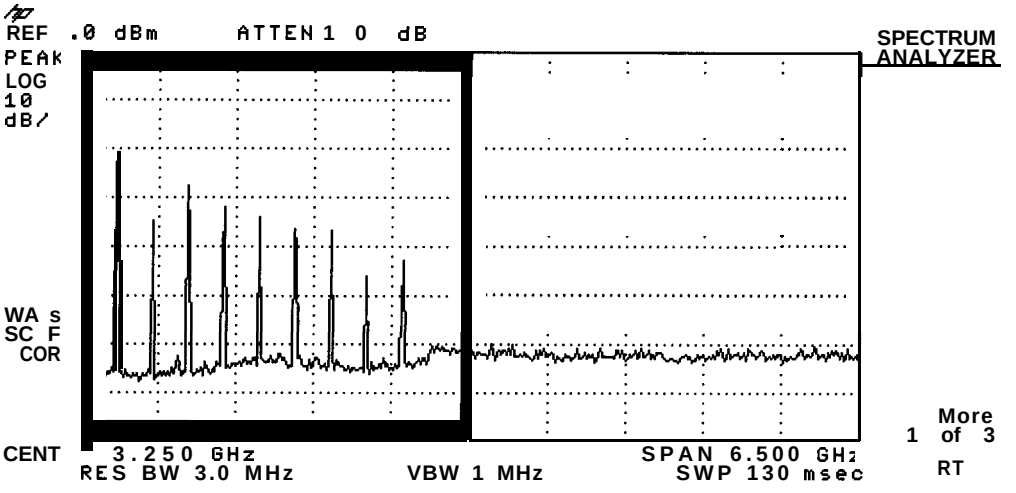



**Figure 5-3. Using the DRAWBOX Command**



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## Description

You must specify the rectangular area and the thickness of the horizontal and vertical borders of the box.

**Specifying the rectangular area: You** specify the rectangular area by specifying the coordinates of the lower left corner (xl, yl), and the upper right corner (x2, y2) of the rectangle in display units. If you select a value of x2 that is equal to xl, the result will be a vertical line instead of a box, and the border will be on the right side of the line. If y2 is equal to yl, a horizontal line will be drawn instead of a box, and the border will be below the line.

**Specifying the border thickness:** The value of x thickness allows you to specify the width of the horizontal borders, and the value of y thickness allows you to specify the width of the vertical borders. If you select a thickness value that is equal to or greater than half of x2 minus xl or greater than half of y2 minus yl, the result will be a solid box.

DRAWBOX affects only the spectrum analyzer display and printing of the spectrum analyzer display. DRAWBOX does *not* change the plot of the spectrum analyzer display; the rectangular box drawn by DRAWBOX will not be plotted. The rectangular box can be erased by executing CLRDSP.

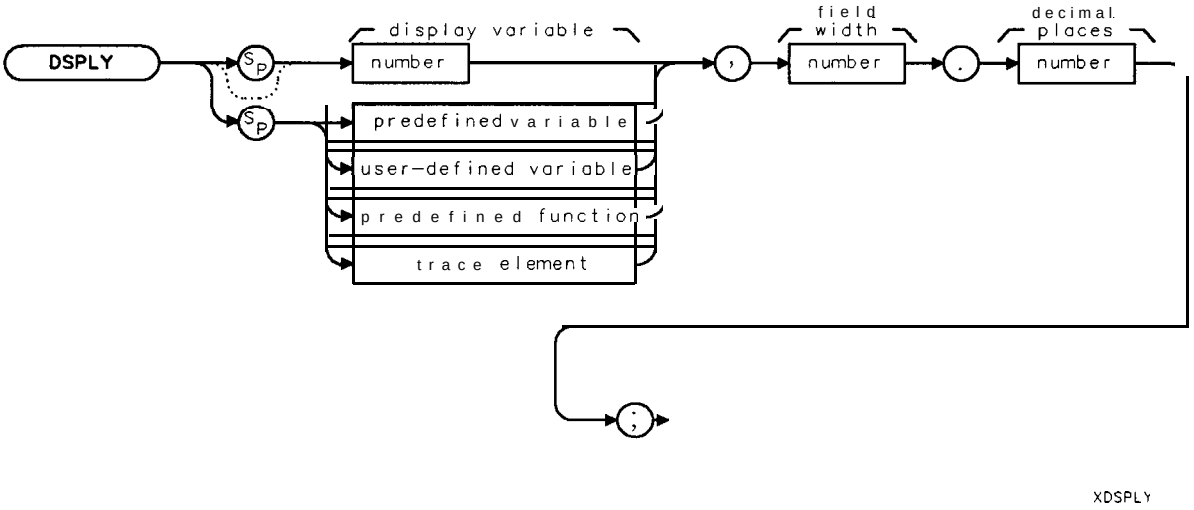


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# DSPLY
# Display

Displays the value of a variable on the spectrum analyzer screen.

## Syntax




"Field width" specifies the number of digits displayed, including sign and decimal point. (Places to the right of the decimal point are limited by the decimal places field.) For example, the number 123.45 has a field width of 7 (even though the sign is not displayed) and 2 decimal places.

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | Real number range. |
| Number (field width or decimal places) | Any integer number. | Integer number range. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-1. | |
| Predefined function | Function that returns a value. Refer to Table 5-1. | |
| Trace element | An element of trace A. trace B. trace C. or a user-defined trace. | |

Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: DA, PA, PD, PR, PU.



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## Example

```
OUTPUT 718;"CF 300MHZ;"
OUTPUT 718;"PU;PA 50,150;DSPLY CF,
13.3;"
```

Sets *center frequency to 300 MHz.*
*Center frequency is displayed to three decimal places in a field width of 13.*

## Description

The DSPLY command displays the value of a variable anywhere on the spectrum analyzer display. Use the PU, PR, and PA commands to position the variable on the screen. (You do not have to specify the PU or PD commands; DSPLY can display the data independent of PU or PD commands.)

The coordinates given relate to the lower left corner of the first character. For example, "PU;PA 50,100;DSPLY CF,13.3;" would display the center frequency with the first digit to the right and above the point represented by 50, 100. (Position the pen before executing the DSPLY command.)

If the number to be displayed is larger than the field width, the number is displayed in scientific notation.

The DSPLY command also places the value of the variable in the display list. See "DA" for more information about the display `list.`

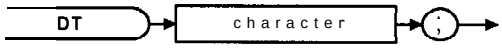


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# DT
# Define Terminator

Defines any character as a label terminator. The label terminator is only used with the LB command.

## Syntax




XDT

| Item | Description/Default | Range |
|---|---|---|
| Character | Any valid character. | |

Related Commands: LB.

## Example

OUTPUT 718; **"DT@;"**

*Defines the "@" symbol as the text terminator:*

OUTPUT 718; **"CF 600MHZ;"**

*Sets center frequency to 600* MHz.

OUTPUT 718;"PU;PA **100,100;LB** CAL OUT 2ND HARMONICORL **0DM;"**

*Displays the label "CAL, OUT 2ND HARMONIC" on the spectrum analyzer screen then executes the RL command.*

## Description

The DT command is used by the LB command to separate text from spectrum analyzer commands.



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# EE
# Enable Entry

Sends the controller the values entered on the spectrum analyzer numeric keypad by the operator.

## Syntax




xEE

Related Commands: RQS.

## Example

The following example works with both RS-232 and HP-IB interfaces; however, the address (718) must be changed for RS-232 operation.

The program polls the spectrum analyzer for its status byte.

```
10 PRINTER IS 1                                  Outputs to the computer screen.
20 DISP "Enter new value with spectrum analyzer
number pad and terminate with units key"
30 OUTPUT 718;"RQS 2;CF EE;"                     Sets up SRQ mask, then uses the
                                                 enable entry mode.
40 REPEAT                                        Polls the spectrum analyzer until
                                                 entry is complete.
50   OUTPUT 718;"STB?;"                          Asks the spectrum analyzer for
                                                 status byte.
60   ENTER 718;A
70 UNTIL BIT(A,1)=1                              Does REPEAT UNTIL loop until
                                                 user presses a terminating key.
80 DISP                                          Asks for entry.
90 OUTPUT 718;"?;"
100 ENTER 718;New_value
110 PRINT "You entered the value of ";
    New-value                                    Displays value.
120 OUTPUT 718;"HD;"                             Turns off enable entry mode.
130 END
```



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## Description

Unlike enter parameter (EP), EE does not terminate the entry mode when the operator completes an entry.

The EE command is used generally in the following sequence of events:

1. A program loop prevents the controller from using the entered value until the operator signals that the entry is complete.
2. The operator makes a data entry, which is stored in the spectrum analyzer internal data register.
3. The operator indicates completion of the entry.
4. The controller reads the value of the entry and continues to the next program step.



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# EK
# Enable Knob

Allows data entry with the front-panel knob when the spectrum analyzer is under remote control.

## Syntax




XEK

## Example

```
1  PRINTER IS 1
10 OUTPUT 718;"MKN;EK;"
20 PRINT "USE KNOB TO PLACE MARKER"
30 PRINT "PRESS CONTINUE WHEN DONE"
40 PAUSE


100 END
```

*Activates a marker and enables the front-panel knob.*

*While the program pauses, the operator positions a marker on a signal that needs further analysis.*

*Prompts user*

*The operator positions a marker on a signal that needs further analysis.*

*Insert analysis program here.*

## Description

With the EK command, the knob is functional, but other front-panel functions remain inoperative. Moving the knob changes the active function. If no function is active, moving the knob has no effect.

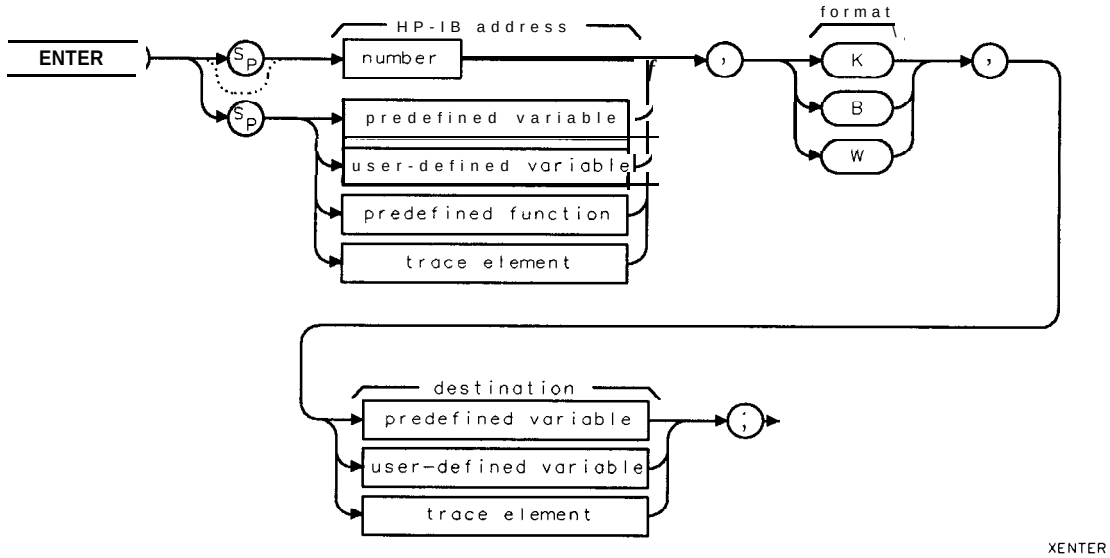


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# ENTER
# Enter From HP-IB

Allows the spectrum analyzer to receive data from other devices on the HP-IB.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer number. | 0 to 30. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-1. | |
| Predefined function | Function that returns a value. Refer to Table 5-l. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: FUNCDEF, OUTPUT, RELHPIB.
Required Options: Option 041.

## Example

**Note** The plotter is at address 5 and the spectrum analyzer is at address 18. (The program is only valid for HP 9000 Series 200 and 300 computers.)

The example uses the spectrum analyzer to send the ASCII code for OP; (output parameter) to the plotter. The ENTER command is used to receive the coordinates from the plotter. Program lines 110 to 140 display the coordinates on the spectrum analyzer screen. Softkey 1 is programmed to display the plotter coordinates. Softkey 1 can be accessed by pressing (MEAS/USER), User Menus .



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Note — Disconnect the computer before pressing **softkey** 1 or execute ABORT 7, LOCAL 7 from the computer. To execute the P-OP function, the spectrum analyzer must be the only controller on the HP-IB.

```
10 OUTPUT 718;"VARDEF P_ONEX,1,VARDEF P_ONEY,1;"
```
*Declares the variables used to hold the plotter coordinates.*

```
20 OUTPUT 718;"VARDEF P_TWOX,1;VARDEF P_TWOY,1;"
```
*Declares the variables used to hold the plotter- coordinates.*

```
30 OUTPUT 718;"FUNCDEF P_OP,@";
```
*Defines a function called P_OP.*

```
40 OUTPUT 718;"OUTPUT 5,B,79;";
```
*Sends ASCII code for "O".*

```
50 OUTPUT 718;"OUTPUT 5,B,80;";
```
*Sends ASCII code for "P".*

```
60 OUTPUT 718;"OUTPUT 5,B,59;";
```
*Sends ASCII code for ";".*

```
70 OUTPUT 718;"ENTER 5,K,P_ONEX;";
```
*Gets plotter coordinates from plotter:*

```
80 OUTPUT 718;"ENTER 5,K,P_ONEY;";
```
*Gets Y coordinutefrom plotter.*

```
90 OUTPUT 718;"ENTER 5,K,P_TWOX;";
```
*Gets Xcoordinutefrom plotter:*

```
100 OUTPUT 718;"ENTER 5,K,P_TWOY;";
```
*Gets Y coordinate from plotter*

```
110 OUTPUT 718;"PU;PA 200,190;DSPLY P_ONEX,10.2;";
```
*Displays coordinate on spectrum analyzer screen.*

```
120 OUTPUT 718;"PU;PA 200,180;DSPLY P_ONEY,10.2;";
```
*Displays coordinate on spectrum analyzer screen.*

```
130 OUTPUT 718;"PU;PA 200,170;DSPLY P_TWOX,10.2;";
```
*Displays coordinate on spectrum analyzer screen.*

```
140 OUTPUT 718;"PU;PA 200,160;DSPLY P_TWOY,10.2;";
```
*Displays coordinate on spectrum analyzer screen.*

```
150 OUTPUT 718;"RELHPIB;";
```
*Releases spectrum analyzer control of the HP-IR*

```
160 OUTPUT 718;"@;"
```
*Marks the end of the function, P_OP.*

```
170 OUTPUT 718;"KEYDEF 1,P_OP,!DSP OP;!;"
```
*Assigns the P-OP function to softkey 1.*

```
180 END
```

## Description

Use the ENTER command to request data from an HP-IB device. The ENTER command causes the spectrum analyzer to assume controller capabilities on HP-IB. The RELHPIB command may be used to disable these capabilities. The returned data is formatted according to the format specified in the format field:

K: Free field. ASCII real number format.

B: One-byte binary.

W: One-word (2 bytes) binary.



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# EP
# Enter Parameter Function

Sends values entered on the spectrum analyzer number keyboard to the present active function value. EP must be invoked each time a new value is entered.

## Syntax




XEP

Related Commands: See the list of active functions listed in the description for El?

## Example

```
OUTPUT 718;"ST;EP;"
```

*The sweep time can be entered by using the front-panel keys.*

## Description

The EP command allows the user to enter a value manually through the numeric keypad. When the value is terminated by a unit or ENTER key on the spectrum analyzer, the spectrum analyzer will be ready to execute more remote commands.

**Note** Because the EP command uses the current active function, confirm that the desired function is active before executing the EP command.

The active functions are ACPBW, ACPSP, AT, BAUDRATE, CF, CRTHPOS, CRTVPOS, DL, DOTDENS, FA, FB, FFTSTOP, FMGAIN, FOFFSET, GD, GL, LG, MKA, MKD, MKFCR, MKN, MKPAUSE, MKPX, ML, M4, NDB, NRL, PREAMPG, PRNTADRS, RB, RCLS, ROFFSET, RL, RLPOS, SAVES, SAVRCLN, SETDATE, SETTIME, SP, SQLCH, SRCAT, SRCPOFS, SRCPSTP, SRCPSWP, SRCPWR, SRCTK, SS, ST, TH, TIMEDATE, TVLINE, VB, VBR, and user-defined active function specified by the ACTDEF command.



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# ERASE
## Erase

Clears trace A and trace B, disposes of the contents of the user memory, and resets the state registers and the spectrum analyzer to the instrument preset state.

### Syntax




XERASE

Related Commands: DISPOSE, ONCYCLE, ONDELAY, ONEOS, ONMKR, ONPWRUP, ONSRQ, ONSWP, ONTIME, PSTATE, TRDEF, TRMATH, VARDEF.

### Example

```
OUTPUT 718;"ERASE;"
```

### Description

The ERASE command erases *all* of the user memory by performing a DISPOSE ALL, moving zeros into the trace elements of trace B, and performing an instrument preset (IP). If PSTATE is set to OFF, ERASE clears the state registers also. All user-defined functions, traces, variables, softkeys, and on-event algorithms are erased. (The on-event algorithms are ONCYCLE, ONDELAY, ONEOS, ONMKR, ONMKRU, ONSRQ, ONSWP, ONTIME, and TRMATH.)

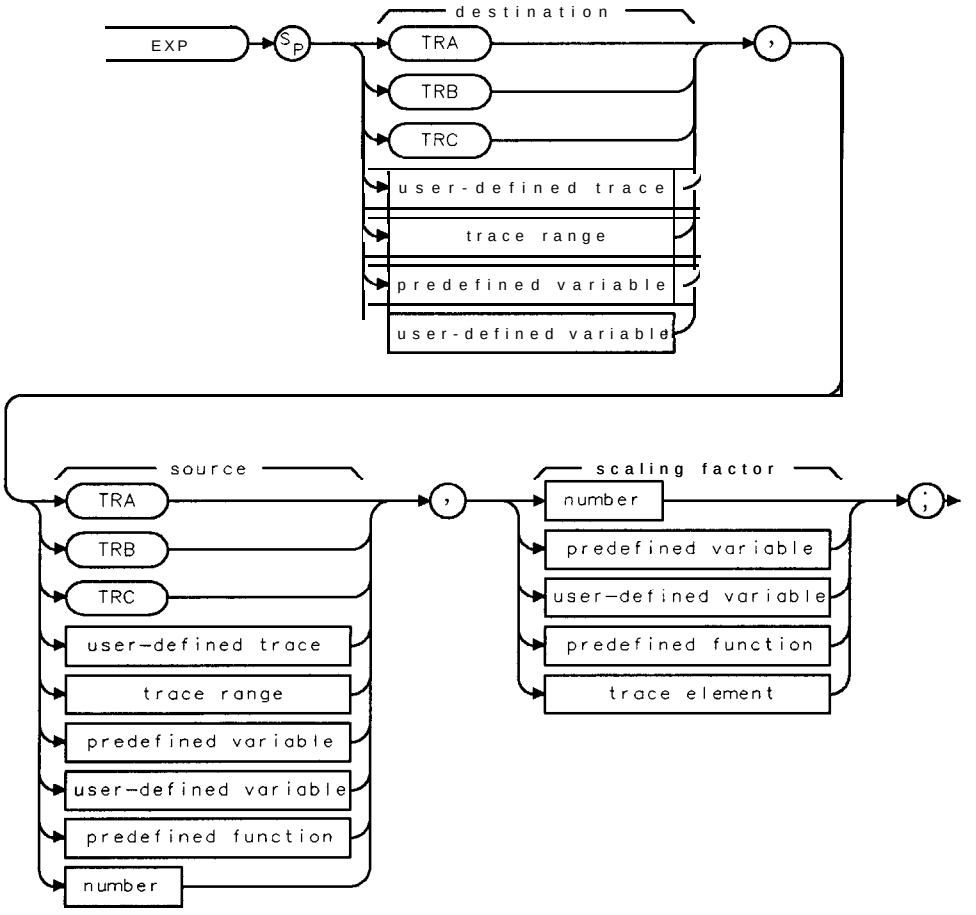


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# EXP
# Exponent

Places the exponential of the source in the destination. The EXP command is useful for converting log values to linear values.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predeflned variable | A command that acts as a variable. Refer to Table 5-l. | |
| Predefined function | Function that returns a value. Refer to Table 5-1. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF when using a user-defined variable. TS when using trace data.
Related Commands: FUNCDEF, LOG.



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## Example 1

This example converts the marker amplitude to power units.

```
10 OUTPUT 718;"IP;"                  Initializes the spectrum analyzer
20 OUTPUT 718;"SNGLS;"               Activates the single-sweep mode.
30 OUTPUT 718;"VARDEF P_MW,0;"       Initializes variable P_MW to 0.
40 OUTPUT 718;"TS;MKPK HI;"          Finds highest peak of sweep.
50 OUTPUT 718;"EXP P_MW,MKA,10;"     Divides the marker amplitude by 10, raises the
                                     value of the marker amplitude to the power of 10,
                                     and stores the results in P_MW.
60 OUTPUT 718;"P_MW?;"               Returns the value of P_MW to computer
70 ENTER 718;Number                  Assigns value to computer variable.
80 DISP Number;"mW"                  Displays result on the computer screen.
90 END
```

## Example 2

This example finds the natural exponential of a number and uses the LOG command to return the original source value of the EXP function.

```
10 OUTPUT 718;"VARDEF E_XP,0;"          Dejlnes a variable called E-XI?
20 OUTPUT 718;"EXP E_XP,2,2.30259;"     Finds the natural exponential of 2.
30 OUTPUT 718;"E_XP?;"                  Returns the natural exponent of 2.
40 ENTER 718;Value
50 PRINT Value                          Prints the value of the exponential.
60 OUTPUT 718;"LOG E_XP,E_XP,2.30259;"  Uses the log function on the exponential
                                        value.
70 OUTPUT 718;"E_XP?;"                  The log of the exponential value is ap-
                                        proximately 2.
80 ENTER 718;Logvalue
90 PRINT Logvalue                       Prints value.
100 OUTPUT 718;"VARDEF E_XPY,0;"        Declares a variable called E_XPY.
110 OUTPUT 718;"EXP E_XPY,-5,2.30259;"  Finds the natural exponential of -5.
120 OUTPUT 718;"E_XPY?;"                Returns the value of the natural exponen-
                                        tial of -5.
130 ENTER 718;Value2
140 PRINT Value2                        Prints the value of the exponential.
150 OUTPUT 718;"LOG E_XPY,E_XPY,2.30259;"  Uses the log function on the exponential
                                        value.
160 OUTPUT 718;"E_XPY?;"                The log of the exponential value is ap-
                                        proximately -5.
170 ENTER 718;Logval
180 PRINT Logval
190 END
```



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## Description

The EXP command first divides the source by the scaling factor, then uses the quotient as an exponent of 10:

$10^{source/scaling\ factor}$ is placed into the destination.

The EXP command can be used to evaluate a natural exponential function by using 2.30259 as the scaling factor. Because EXP and LOG are inverse functions, the EXP command has a scaling factor that may be used to "undo" the scaling factor of the LOG command. (See example 2.)

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

See "LOG" for more information on the scaling factor.

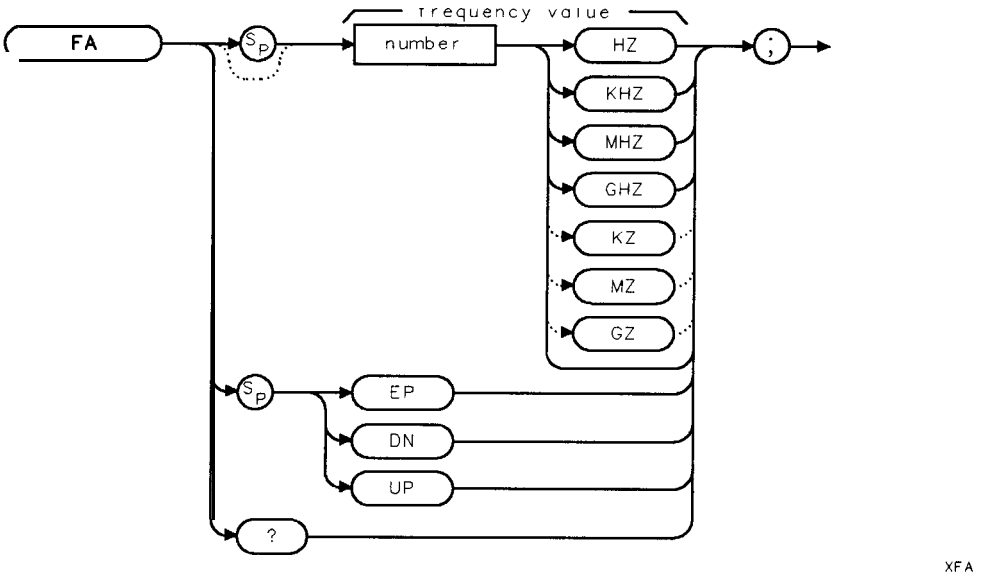


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# FA
## Start Frequency

Specifies the start frequency.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | Frequency range of the spectrum analyzer. |

Equivalent **Softkey**: START FREQ .
Step Increment: Frequency span divided by 10.
Related Commands: CF, FB, FOFFSET, FS, HNLOCK, HNUNLK, MKF, **SP**.

### Example

```
OUTPUT718;"FA 88MHZ;FB 108MHZ;"
```
*Sets the start frequency to 88 MHz, the stop frequency to 108 MHz.*

```
OUTPUT 718;"FA?;"
```
*Returns the start frequency.*

```
ENTER 718;Freq
```
*Stores the response from the spectrum analyzer*

```
DISP Freq
```
*Displays the frequency on the computer screen.*



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## Description

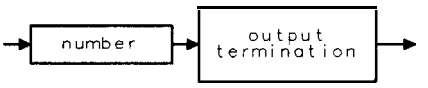
The FA command specifies the start frequency value. The start frequency is equal to the center frequency minus the span divided by two (FA = CF – SP/2).

---

Note — Changing the start frequency changes the center frequency and span. *For the HP 8592L, HP 8593E, HP 8595E, HP 85963 only:* The start frequency may be limited by the harmonic band, if harmonic band locking is used.

---

## Query Response




QQ1

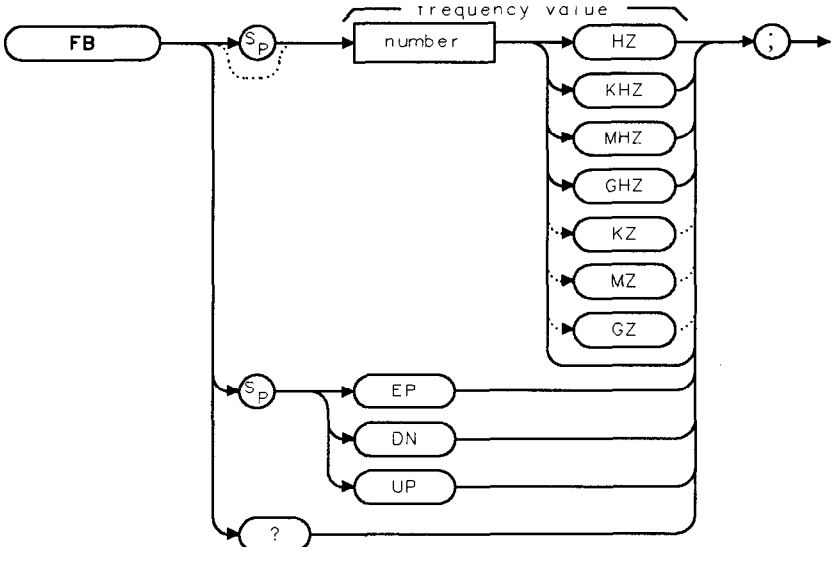


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# FB
# Stop Frequency

Specifies the stop frequency.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | Frequency range of the spectrum analyzer. |

Equivalent **Softkey**: STOP FREQ .

Step Increment: Frequency span divided by 10.

Related Commands: CF, FA, FOFFSET, FS, HNLOCK, MKF, SP.

## Example

```
OUTPUT 718;"FA 88MHZ;FB 108MHZ;"
```
*Sets the start frequency to 88 MHz, the stop frequency to 108 MHz.*

```
OUTPUT 718;"FB?;"
```
*Returns the stop frequency.*

```
ENTER 718;Freq
```
*Stores the response from the spectrum analyzer.*

```
DISP Freq
```
*Displays the frequency on the computer screen.*



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## Description

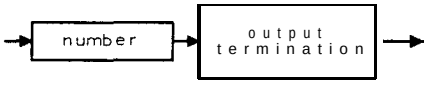
The FB command specifies the stop frequency value. The stop frequency is equal to the center frequency plus the span divided by two (FA = CF + SP/2).

---

Note — Changing the stop frequency changes the center frequency and span. *For the HP 8592L, HP 85933, HP 8595E,* or *HP 8596E only:* The stop frequency may be limited by the harmonic band, if harmonic band locking is used.

---

## Query Response




QQ1

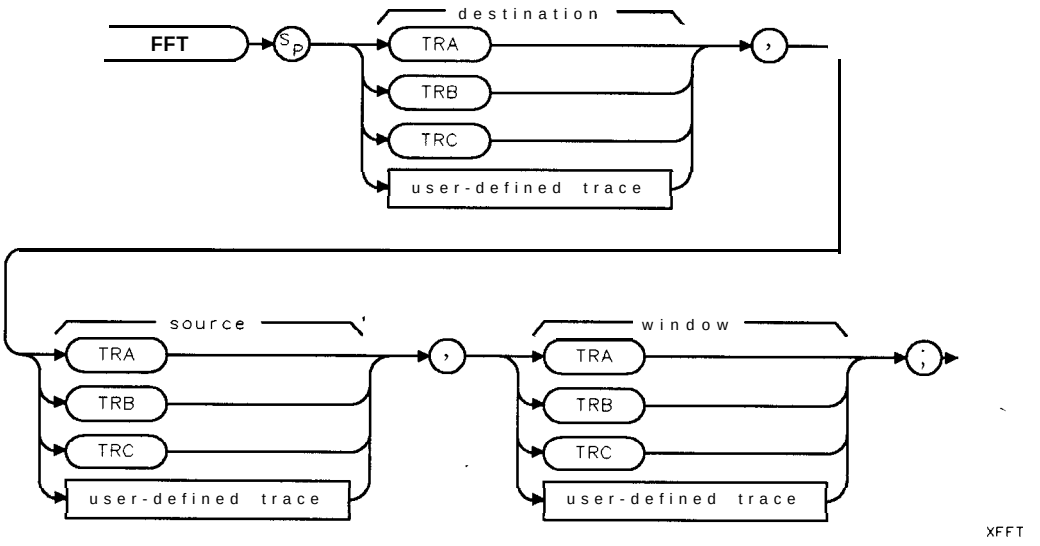


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# FFT
# Fast Fourier Transform

Performs a discrete fast Fourier transform on the source trace array and stores the result in the destination array.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |

Prerequisite Commands: TWNDOW.
Related Commands: MKREAD, TWNDOW.
Restrictions: Not available with Analog+ display mode. See “ANLGPLUS” for more information.

## Example

```
OUTPUT718;"IP;SNGLS;"
OUTPUT 718;"CF 300MHZ;TS;MKPK HI;MKTRACK ON;"

OUTPUT 718;"CONTS;SP 200KHZ;RB 100KHZ;"

OUTPUT 718;"MKTRACK OFF;SP OHZ;"

OUTPUT 718;"MKPK HI;MKRL;LN;SNGLS;"
OUTPUT 718;"ST 800MS;TS;"

OUTPUT 718;"TWNDOW TRB,FLATTOP;"
```

*Initializes spectrum **analyzer**.*
*Tunes center frequency to the carrier and **decreases** span.*
*Changes resolution bandwidth to capture modulation.*
*Reduces span to zero Hz to **demodulate** carrier*
*Changes to linear amplitude **scale**.*
*Sets sweep time to correspond to modulation **frequency**, the executes FFT function.*
*The TWNDOW must be **defined** before using the **FFT function**.*



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```
OUTPUT 718;"FFT TRA,TRA,TRB;VIEW TRA;"
```
*Executes the **FFT function** with the trace window* function.

```
OUTPUT 718;"MKPK HI;"
```
*Finds the highest signal.*

```
OUTPUT 718;"MKD;"
```
*Activates the **marker delta function.***

```
OUTPUT 718;"MKPK NR;"
```
*Finds the **next** peak to the right.*

```
OUTPUT 718;"MKREAD FFT;"
```
*Selects the **FFT** marker to display the marker delta value as a frequency instead of time value.*

```
OUTPUT 718;"MKF?;"
```
*Finds the **difference** between the two peaks.*

```
ENTER 718;A
DISP A
```
*Displays **the frequency difference.***

## Description

FFT weights the source trace with the function in the window trace (the window trace is described below). The transform is computed and the results are placed in the destination trace. Unlike FFTAUTO and FFTCONTS, FFT performs the FFT measurement only once. Use FFTAUTO or FFTCONTS if you want the FFT measurement to be performed at the end of every measurement sweep.

The spectrum analyzer should be in linear mode when using the FFT command. The FFT results are displayed on the spectrum analyzer in logarithmic scale. For the horizontal dimension, the frequency at the left side of the graph is 0 Hz, and at the right side is Fmax.

Fmax can be calculated using a few simple equations and the sweep time of the spectrum analyzer. The sweep time divided by the number of trace array elements containing amplitude information is equal to the sampling period. The reciprocal of the sampling period is the sampling rate. The sampling rate divided by two yields Fmax.

For example, let the sweep time of the spectrum analyzer be 20 ms and the number of trace elements be 400. The sweep time (20 ms) divided by 400 equals 50 $\mu$s, the sampling period. The sample rate is 1/50 $\mu$s. Fmax equals 1/50 $\mu$s divided **by 2,** or 10 kHz.

FFT is designed to be used in transforming zero span information into the frequency domain. Performing FF'T on a frequency sweep (when the frequency span is greater than zero) will not provide time-domain results.

The windowing function stored in the window trace may be selected with the trace window (TWNDOW) command or you can store your own values in that trace. The trace window function modifies the contents of a trace array according to one of three built-in algorithms: UNIFORM, HANNING, or FLATTOP. See Figure 5-4, Figure 5-5, and Figure 5-6. The TWNDOW command multiplies a trace array with one of these windows.

**Selecting a window:** The amplitude and frequency uncertainty of the Fourier-transformed display depends on both the choice of trace windows and the spectrum analyzer sweep time. Amplitude uncertainty is maximum when the spectral component falls midway between the filter shapes. Passbands that are flatter in shape, like the FLATTOP filter, contribute less amplitude uncertainty, but frequency resolution and sensitivity are compromised.

The UNIFORM window algorithm has the least frequency uncertainty and greatest amplitude uncertainty. The UNIFORM window does not contain time-domain weighing and leaves the data alone. Use the UNIFORM window for transforming noise signals or transients that decay within one sweep time period. The UNIFORM window yields the best frequency resolution, but also produces the highest side lobes for periodic signals.



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The FLATTOP window has the greatest frequency uncertainty of the windows, but it has outstanding side lobe suppression and amplitude flatness. Use FLATTOP to transform periodic signals.

The HANNING window is a traditional passband window found in most real-time spectrum analyzers. The HANNING window offers a compromise between the FLATTOP and UNIFORM windows. Use the HANNING window when transforming periodic or random data.

The values in the window trace range from -32,768 to 32,767 and are treated as fractional numbers. No offset is used. When FFT is called, the average window value is computed and used to correct the results in absolute units.

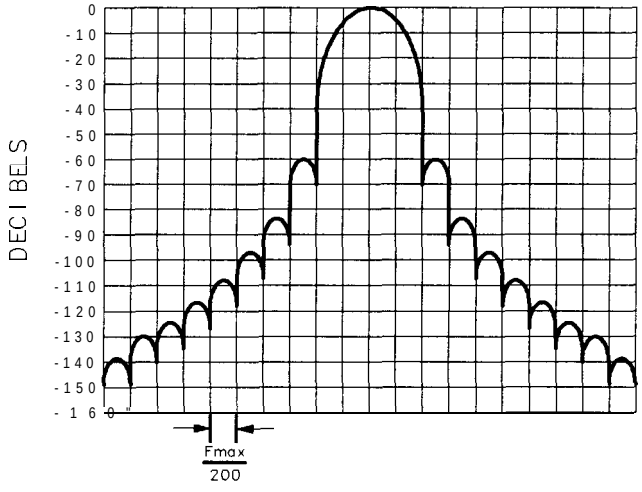
The Fourier transforms of the window functions (created with TWNDOW) are shown below. Use the graphs to estimate resolution and amplitude uncertainty of a Fourier transform display. Each horizontal division of the graphs equals l/sweep-time or Fmax/200, and represents two trace array elements.

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

---

Note — TWNDOW should always be set before FFT is executed. Execute MKREAD FFT to read the marker value as a frequency value instead of time value.

---




cu115e

**Figure 5-4. Hanning Filter Window**



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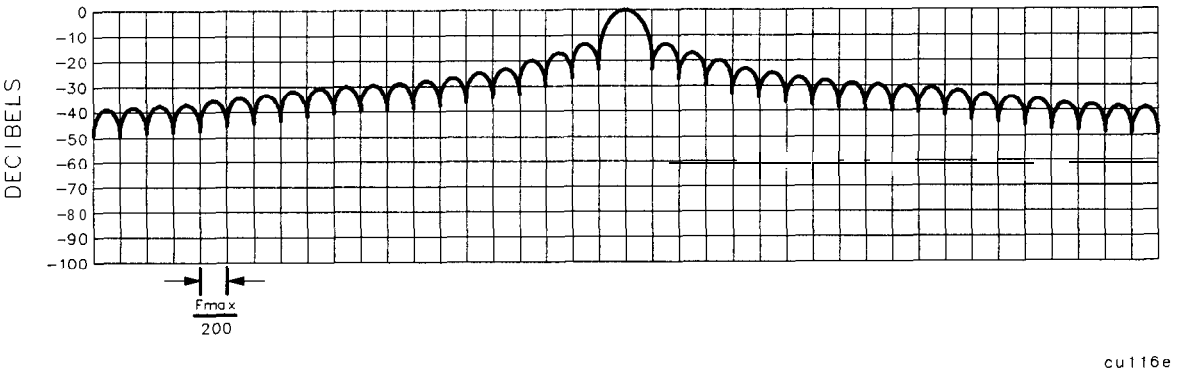



**Figure 5-5. Uniform Filter Window**

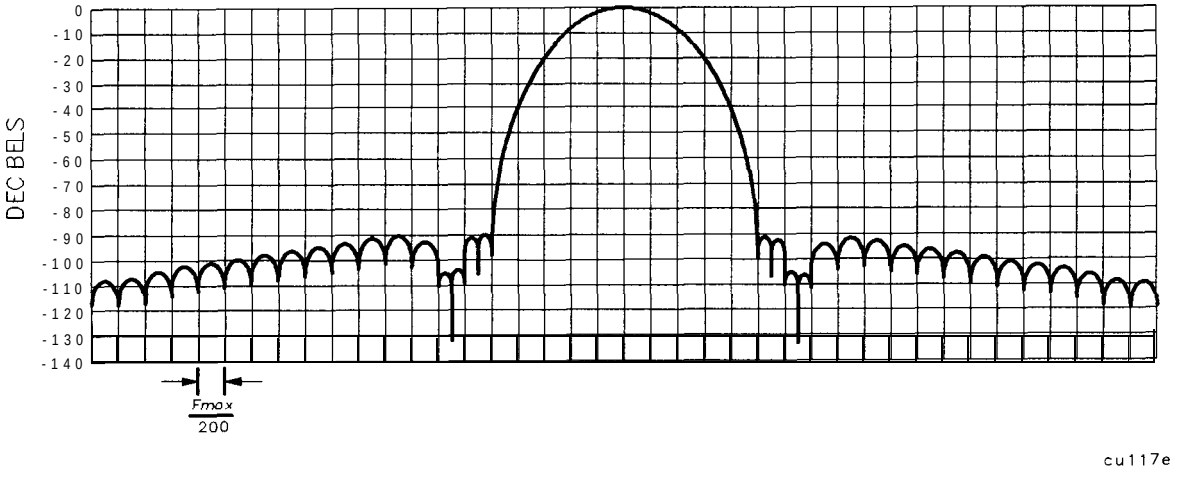



**Figure 5-6. Flat Top Filter Window**



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# FFTAUTO
# Marker to Auto FFT

Performs a fast Fourier transform (FFT) on the signal on which the marker is placed.

## Syntax




XFFTAUTO

Equivalent Softkey: MARKER -> AUTO FFT .

Prerequisite Commands: Use a marker command to place a marker on the signal of interest. See Table 5-4 for a list of the marker commands.

Related Commands: FFTCONTS, FFTOFF, FFTSNGLS.

## Example

This example can be used to perform an FFT continuously on an amplitude modulated signal at 100 MHz.

| | |
|---|---|
| OUTPUT718;"RL ODB;" | *Sets reference level to 0 dBm.* |
| OUTPUT 718;"CF 100MHZ;" | *Sets the center frequency to 100 MHz.* |
| OUTPUT 718;"SP 10MHZ;" | *Decreases the frequency span.* |
| OUTPUT 718;"MKPK HI;" | *Places the marker on a signal (this example assumes that there is only one signal present).* |
| OUTPUT718;"FFTAUTO;" | *Zoom in on the signal, and then does an FFT continuously on the modulated signal.* |

## Description

FFTAUTO uses the marker's position to determine which signal is to be measured. FFIAUTO centers the signal and, if the frequency span of the spectrum analyzer is greater than zero, decreases the frequency span to zero before performing an FFT on the signal. When the FFT is performed, the spectrum analyzer does the following:

- Changes to the continuous sweep mode.
- Changes to the linear amplitude scale.
- If the current detector is the peak detector, changes to the sample detector.
- If the initial frequency span was greater than 0 Hz, the spectrum analyzer adjusts the signal peak to within 0.5 division of the top graticule.
- Does an FFT on trace A and then places trace A in both the clear-write and store-blank modes. (When the spectrum analyzer is in both the clear-write and store-blank modes, the trace data is still taken from the spectrum analyzer input during every measurement sweep, but the trace is *not* shown on the spectrum analyzer display.)
- Places the results of the FFT in trace B, and then changes trace B to the view mode.

FFTAUTO performs the FFT on the signal at the end of every sweep. After executing FFTAUTO, you should adjust the values for the resolution bandwidth, video bandwidth, and sweep time according to the highest modulation frequency of interest. The resolution bandwidth should be about ten times greater than the highest modulation frequency of interest, and the video bandwidth should be about 10 times higher than the highest modulation frequency of interest. The sweep time should be set according to the chart shown in



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"Measuring Amplitude Modulation with the Fast Fourier Transform Function" in Chapter 4 of the *HP 8590 E-Series and L-Series Spectrum Analyzers* User's Guide. You can use the results of the FFTCLIP command to determine if the FFT data is valid.

**Restrictions**

Executing FFTAUTO turns off the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), gate utility functions (GDRVUTIL), TO1 measurement (TOI), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), peak zoom (PKZOOM), power menu measurements (ACP, ACPE, CHP, and OBW), and Analog+ display mode (ANLGPLUS).

FFTAUTO uses the following when performing an FFT:

- The flat top filter window. (See "FFT" for more information about the flat top filter window.)
- Trace B and trace C. If you want to save the trace data that is in trace B or trace C, you should save the trace data before executing FFTAUTO, FFTCONTS, or FFTSNGLS. (See "SAVET" for more information about saving trace data.)
- The FFTMKR command to turn on the FFT markers (you can use the MKA or MKF to determine the amplitude or frequency of the marker).

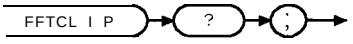


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# FFTCLIP
# FFT Signal Clipped

Indicates if the FFT results are valid.

## Syntax




XFFTCL IP

Prerequisite Commands: FFTAUTO, FFTSNGLS, FFTCONTS.
Related Commands: FFTSTAT.

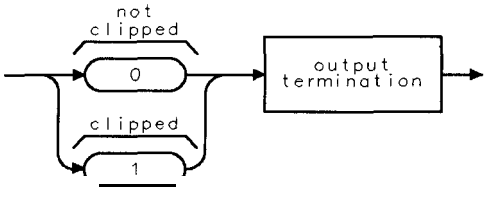
## Example

```
OUTPUT718;"FFTCONTS;"      Starts the FFT.
OUTPUT718;"FFTCLIP?;"      Queries FFTCLIP.
ENTER718;Fftclipped        Returns the value of FFTCLII?
```

## Description

Whenever you use FFTAUTO, FFTCONTS, or FFTSNGLS to perform an FFT on a signal, you can use the FFTCLIP command to determine if the FFT data is valid. If the current measurement sweep resulted in a trace that is above the top graticule line on the spectrum analyzer display, the input trace (trace A) has been "clipped," and the FFT data is not valid. If the input trace is not clipped, the FFT data is valid.

## Query Response




QFFTCL IP



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# FFTCONTS
# FFT Continuous Sweep

Performs a fast Fourier transform (FFT) continuously on the current signal.

## Syntax




XFFTCONTS

Equivalent Softkey: CONTINUS FFT .
Prerequisite Commands: LN, Sl?
Related Commands: FFTOFF, FFTSNGLS.

## Example

| | |
|---|---|
| OUTPUT 718; "SP OHZ; " | *Sets the spectrum analyzer to zero span.* |
| OUTPUT 718; "LN;" | *Changes the amplitude scale to linear:* |
| OUTPUT 718; "FFTCONTS;" | *Starts the continuous FFT.* |

## Description

You should change the frequency span to 0 Hz and the amplitude scale to linear before executing FFTCONTS. When FFTCONTS is executed, the spectrum analyzer does the following:

- Changes to the continuous sweep mode.
- If the current detector is the peak detector, changes to the sample detector.
  Does an FFT on trace A. Trace A is then placed in both the clear-write and store-blank modes. (When the spectrum analyzer is in both the clear-write and store-blank modes, the trace data is still taken from the spectrum analyzer input during every measurement sweep, but the trace is *not* shown on the spectrum analyzer display.)
- Places the results in trace B (trace B is placed in the view mode).

You can use the results of the FFTCLIP command to determine if the FFT data is valid. If you want to view the input data (trace A), execute "TRDSP TRA,ON;".

**Restrictions**
Executing FFTCONTS turns off the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), gate utility functions (GDRVUTIL), TO1 measurement (TOI), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), peak zoom (PKZOOM), power menu measurements (ACP, ACPE, CHP, and OBW), or Analog+ display mode (ANLGPLUS).

FFTCONTS uses the following when performing an FFT:

- The flat top filter window. See "FFT" for more information about the flat top filter window.
- Trace B and trace C. If you want to save the trace data that is in trace B or trace C, you should save the trace data before executing FFTAUTO, FFTCONTS, or FFTSNGLS. (See "SAVET" for more information about saving trace data.)
- The FFTMKR command to turn on the FFT markers (you can use the MKA or MKF to determine the amplitude or frequency of the marker).

You should execute the FFTOFF command when you are finished using the FFT measurement.

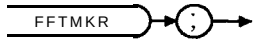


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# FFTMKR
# FFT Markers

Activates the FFT markers and displays the FFT annotation on the spectrum analyzer display.

## Syntax




XFFTMKR

Equivalent Softkey: FFT MARKERS .
Related Commands: FFTCONTS, FFTOFF, FFTSNGLS, FFTPCTAM, FFTPCTAMR, MKA, MKF.

## Example

```
OUTPUT 718;"RCLT TRA,1;"      Recalls the FFT trace.
OUTPUT 718;"FFTMKR;"          Activates the FFT markers.
```

## Description

If the spectrum analyzer is not performing an FFT measurement, the FFTMKR command displays the FFT annotation below the last graticule on the spectrum analyzer display, and activates the marker in the FFT readout mode. (FFTMKR uses the current sweep time to determine the FFT stop frequency that is displayed.) If the spectrum analyzer is already performing an FFT, executing FFI'MKR activates only the FFT markers. You need to execute FFTOFF to exit out of the FFT measurement and return to normal spectrum analyzer operation.

**Restrictions**
Executing FFTMKR turns off the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), gate utility functions (GDRVUTIL), TO1 measurement (TOI), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), peak zoom (PKZOOM), power menu measurements (ACP, ACPE, CHP, and OBW), and Analog+ display mode (ANLGPLUS).

The purpose of the FFTMKR command is to allow you to restore the FFT annotation when you recall FFT trace data (the FFT annotation is not saved when you save trace data). The percent AM readout can also be restored by executing the FFTPCTAM command after FFTMKR. (See "FFI'PCTAM" for more information about the percent AM measurement.)

You can use the MKF or MKA commands to determine the amplitude or frequency of an FFT marker.



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# FFTMM
# FFT Marker to Midscreen

Changes the FFT midscreen frequency of the spectrum analyzer to the frequency of the FFT marker.

## Syntax




XFFTMM

Equivalent Softkey: MARKER -> MID SCRN .
Prerequisite Commands: FFTAUTO, FFTSNGLS, FFTCONTS.
Related Commands: FFTMS, MKA, MKF.

## Example

| | |
|---|---|
| OUTPUT 718;"FFTCONTS;" | *Starts the continuous FIT.* |
| OUTPUT 718;"MKPK HI;" | *Finds the signal with the highest amplitude (usually the signal at 0 Hz).* |
| OUTPUT 718;"MKPK NH;" | *Finds the signal with the next highest amplitude (usually the dominant modulation frequency).* |
| OUTPUT 718;"FFTMM;" | *Moves the signal to FFT midscreen.* |

## Description

FFTMM is performed only if the spectrum analyzer is performing a FFT measurement. Changing the FFT midscreen frequency of the spectrum analyzer also changes the FFT stop frequency of the spectrum analyzer. Because the FFT stop frequency is limited by sweep time of the spectrum analyzer, it may not be possible to change the FFT midscreen frequency to the frequency of the FFT marker. If the FFTMM command does not move the signal to the FFT midscreen frequency, you should check if the FFT stop frequency is limited by the sweep time range or the sweep time increments for your spectrum analyzer. The FFT stop frequency is related to the sweep time as follows:

$$FFT\ stop\ frequency = \frac{400}{(Sweep\ time\ x\ 2)}$$



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# FFTMS
# FFT Marker to FFT Stop Frequency

Changes the FFT stop frequency of the spectrum analyzer to the frequency of the **FFT** marker.

## Syntax




XFFTMS

Equivalent **Softkey**: MARKER -> FFT STOP.
Prerequisite Commands: FFTAUTO, FFTSNGLS, FFTCONTS.
Related Commands: **FFTMM**, MKA, MKF.

## Example

| | |
|---|---|
| `OUTPUT 718;"FFTCONTS;"` | *Starts the continuous **FFT**.* |
| `OUTPUT 718;"MKPK HI;"` | *Finds the signal with the highest amplitude (usually the signal at 0 Hz).* |
| `OUTPUT 718;"MKPK NH;"` | *Finds the signal with the next highest amplitude (usually the dominant modulation frequency).* |
| `OUTPUT 718;"FFTMS;"` | *Changes the **FFT** stop **frequency** to the signal frequency.* |

## Description

FFTMS is performed only if the spectrum analyzer is performing a FFT measurement. If a marker is on a signal, FFTMS will move that signal to the right side of the graticule. **FFTMS** is useful because moving the signal toward the FFT stop frequency increases the frequency resolution of the **FFT** measurement. For best results, the signal of interest should be placed slightly left of the **FFT** stop frequency (the signal should not touch the right side of the graticule). If the signal is placed at the FFT stop frequency, small variations in acquired data can cause large changes in the displayed amplitude of the signal which do not reflect the actual signal amplitude.

Because the FFT stop frequency is limited by sweep time of the spectrum analyzer, it may not be possible to change the FFT midscreen frequency to the frequency of the FFT marker. If the FFTMS command does not move the signal to the **FFT** stop frequency, you should check if the FFT stop frequency is limited by the sweep time range or sweep time increments for your spectrum analyzer. The FFT stop frequency is related to the sweep time as follows:

$$FFT\ stop\ frequency = \frac{400}{(Sweep\ time\ x\ 2)}$$



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# FFTOFF
# FFT Off

Exits the fast Fourier transform (FFT) measurement and FFT settings.

## Syntax




XFFTOFF

Equivalent Softkey: FFT OFF .
Prerequisite Commands: FFTAUTO, FFTSNGLS, FFTCONTS, FFTMKR.
Related Commands: FFTMKR, FFTAUTO, FFTCONTS, FFTSNGLS.

## Example

```
OUTPUT718;"FFTCONTS;"    Starts the continuous FFT.
OUTPUT718;"FFTOFF;"      Turns off the FFT.
```

## Description

The FFTOFF command aborts any of the FFT functions (FFTAUTO, FFTCONTS, FFTMKR, or FFTSNGLS) and returns the spectrum analyzer display back to normal.

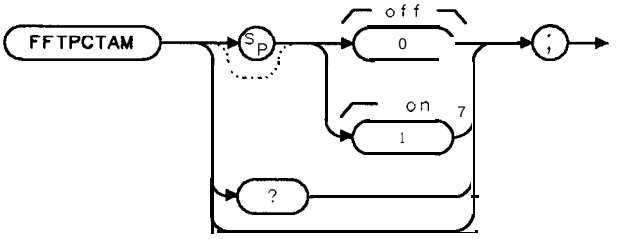


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# FFTPCTAM
# FFT Percent Amplitude Modulation

Turns on or off the percent AM function.

## Syntax




XFFTPCTAM

Equivalent **Softkey:** FFTPCTAM is equivalent to using **% AM ON** OFF during an FFT measurement.
Prerequisite Commands: FFTCONTS, **FFTMKR**, FFTSNGLS, **FFTAUTO**.
Related Commands: FFTPCTAMR.

## Example

```
OUTPUT718;"FFTCONTS;"          Starts the FFT.
OUTPUT 718;"MOV FFTPCTAM,1;"   Turns on the percent AM function.
```

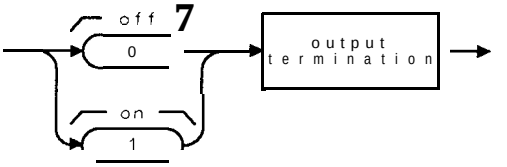
## Description

The **FFTPCTAM** command turns the percent AM function on or off. The percent AM modulation is calculated using only the largest single frequency of modulation.

FFTPCTAM can be executed on FFT trace data even if an FFT measurement is not being performed, as long as the **FFT** marker (FFTMKR) is invoked. For example, you can restore the percent AM readout of a recalled **FFT** trace by executing the FFTMKR command, and then the FFTPCTAM command.

You can execute the FFTPCTAM command two different ways. You can either execute the FFTPCTAM command directly (for example, `"FFTPCTAM 1; "`) or use the MOV command to move the 1 or 0 into the FFTPCTAM command (for example, **`"MOV FFTPCTAM,1;"`**). If you use the MOV command, no text is displayed in the active function area during command execution.

## Query Response




QFFTPCTAM

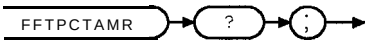


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# FFTPCTAMR
# FFT Percent Amplitude Modulation Readout

Returns the percent of amplitude modulation (AM).

## Syntax




XFFTPCTAMR

Prerequisite Commands: FFTCONTS, FFTMKR, FFTSNGLS, FFTAUTO, FFTPCTAM.
Related Commands: FFTPCTAM.

## Example

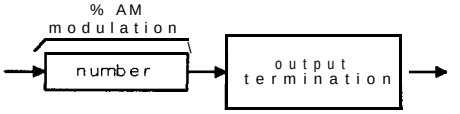
```
OUTPUT718;"FFTCONTS;"          Starts the FFT.
OUTPUT 718;"MOV FFTPCTAM,1;"   Turns on the percent AM function.
OUTPUT718;"FFTPCTAMR?;"        Queries the percent AM reading.
ENTER 718;Percentam            Gets the percent AM reading.
```

## Description

FFTPCTAMR returns either a positive real number, a “0,” or a “-1” as follows:

| | |
|---|---|
| A real number | If the a valid signal could be measured, FFTPCTAMR returns a real number that represents the percent AM of the FFT signal (the percent AM is calculated using only the largest single frequency of modulation). |
| 0 | If no modulation was detected, FFTPCTAMR returns a “0.” |
| -1 | If the FFT input was above the top graticule (clipped), FFTPCTAMR returns a “−1.” |

## Query Response




QFFTPCTAMR

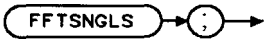


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# FFTSNGLS
## FFT Single Sweep

Changes the spectrum analyzer's sweep mode to single sweep mode (if necessary), and then performs a fast Fourier transform (FFT) on trace A.

### Syntax




XFFTSNGLS

Equivalent **Softkey**: SINGLE FFT .
Prerequisite Commands: LN, Sl?
Related Commands: FFI'CONTS, **FFTOFF**.

### Example

```
OUTPUT 7 18,"SP OHZ;"      Sets the spectrum analyzer to zero span.
OUTPUT  7 18;"LN;"         Changes the amplitude scale to linear:
OUTPUT 718;"FFTSNGLS;"     Performs the FFT.
```

### Description

You should change the frequency span to 0 Hz and the amplitude scale to linear before executing FFTSNGLS. How FFTSNGLS performs the FFT depends on the current sweep mode, the trace status of trace A, and if FFTSNGLS is already active.

- If the spectrum analyzer is in the single-sweep mode or trace A is in the view mode when **FFTSNGLS** is first executed, the spectrum analyzer does an FFT on trace A without updating the contents of trace A.
- If the spectrum analyzer is in the continuous-sweep mode when FFTSNGLS is executed, the spectrum analyzer changes to the single sweep mode, and then does an FFT on trace A.
- If the spectrum analyzer is currently performing the FFTSNGLS command, a take sweep is performed and then an **FFT** is performed on trace A.

FFTSNGLS does the following when performing an FFT:

- If the current detector is the peak detector, the detector is changed to the sample detector.
- Places trace A in both the clear-write and store-blank modes. (When the spectrum analyzer is in both the clear-write and store-blank modes, the trace data is still taken from the spectrum analyzer input during every measurement sweep, but the trace is *not* shown on the spectrum analyzer display.)
- Places the results of the FFT in trace B, and then changes trace B to the view mode.

**Restrictions**

Executing FFTSNGLS exits the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), gate utility functions (GDRVUTIL), TO1 measurement (TOI), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), peak zoom (PKZOOM), power menu measurements (ACP, ACPE, CHP, and OBW), and Analog+ display mode (ANLGPLUS).

You can use the results of the FFTCLIP command to determine if the FFT data is valid.



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FFTSNGLS uses the following when performing an FFT:

- The flat top filter window. See "FFT" for more information about the flat top filter window.
- Trace B and trace C. If you want to save the trace data that is in trace B or trace C, you should save the trace data before executing FFIAUTO, **FFTCONTS**, or FFTSNGLS. (See "SAVET" for more information about saving trace data.)
- The FFTMKR command to turn on the **FFT** markers (you can use the MKA or MKF to determine the amplitude or frequency of the marker).

You should execute the FFTOFF command when you are finished using the **FFT** measurement.

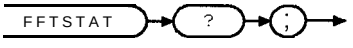


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# FFTSTAT
# FFT Status

Returns the status of the spectrum analyzer's FFT measurement functions.

## Syntax




XFFTSTAT

Prerequisite Commands: FFI'AUTO, FFTSNGLS, FFTCONTS, FFTMKR.
Related Commands: FFTCLIP.

## Example

```
OUTPUT718;"FFTCONTS;"      Starts the FFT.
OUTPUT718;"FFTSTAT?;"      Queries FFTSTAT.
ENTER718;Fftstatus         Returns the value of FFTSTAT.
```

## Description

FFTSTAT returns either a "0," a " 1," or a "2" as follows:

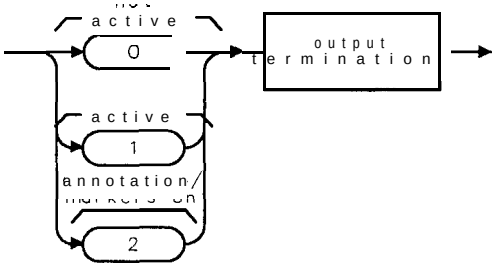
0 If the spectrum analyzer is not performing an FFT measurement, FFTSTAT returns a "0."

1 If the spectrum analyzer is performing an FFT measurement, FFTSTAT returns a " 1. "

2 If the spectrum analyzer is not performing an FFT measurement but the FFT markers and FFT annotation are on, FFTSTAT returns a "2."

FFTSTAT returns a "0" if FFTOFF has been executed.

## Query Response




QFFTSTAT

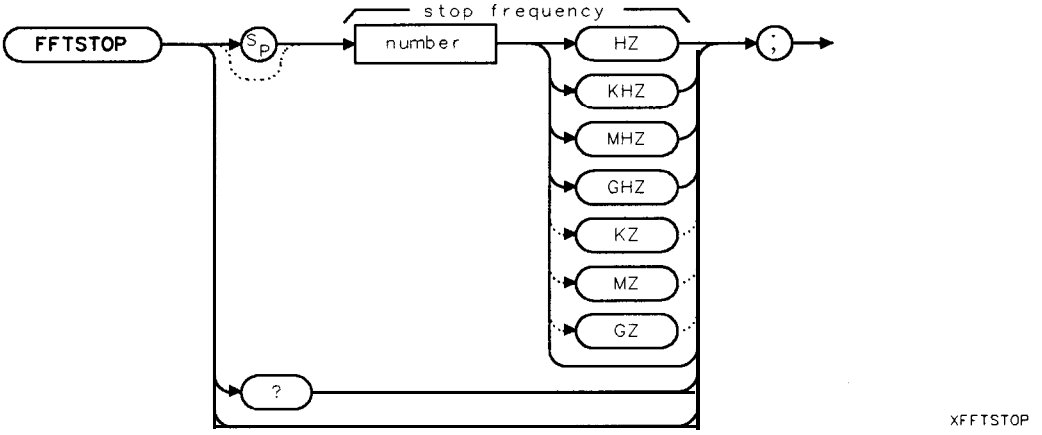


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# FFTSTOP
# FFT Stop Frequency

Sets the FFT stop frequency of the FFT measurement.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | Range is limited by the range of the sweep time for the spectrum analyzer. |

Prerequisite Commands: FFTAUTO, FFTSNGLS, FFTCONTS.
Related Commands: ST.

## Example

```
OUTPUT 718 ; "FFTCONTS ;"        Starts the FFT.
OUTPUT 718; "FFTSTOP 1KHZ;"      Sets the FFT stop frequency to 1 kHz.
```

## Description

To change the FFT stop frequency, FFTSTOP changes the sweep time of the spectrum analyzer as follows:

$$FFT\ stop\ frequency = \frac{400}{(Sweep\ time \times 2)}$$

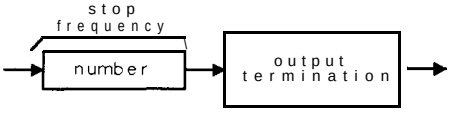
You can execute the FFTSTOP command two different ways. You can either execute the FFTSTOP command directly (for example, "FFTSTOP 1; ") or use the MOV command to move the 1 or 0 into the FFTSTOP command (for example, "MOV FFTSTOP, 1; "). If you use the MOV command, no text is displayed in the active function area during command execution.



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**FFTSTOP FFT Stop Frequency**

Query Response




QFFTSTOP

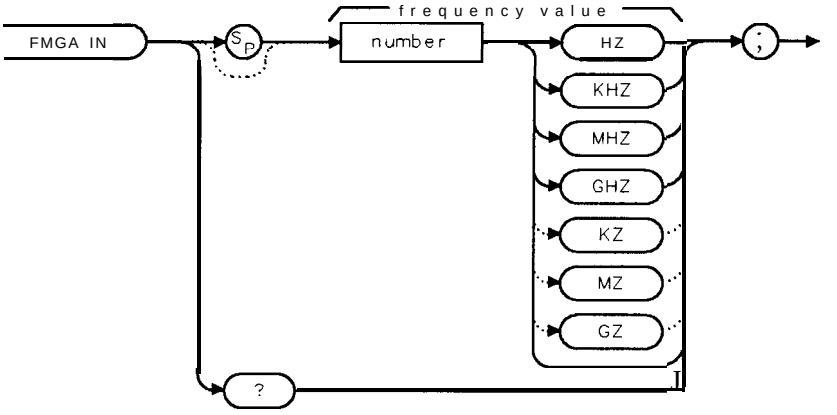


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# FMGAIN
# FM Gain

Sets the total FM frequency deviation for full screen demodulation.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | 10 kHz to 500 kHz. |

Equivalent Softkey: FM GAIN .
Option Required: Option 102, 103, or 301.
Preset Value: 100 kHz.
Related Commands: DEMOD, SPEAKER, SQLCH.

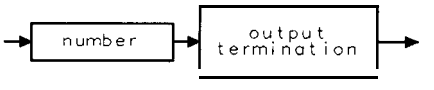
## Example

```
OUTPUT 718;"FMGAIN 10KHZ; "
```
*Sets the FM gain.*

## Description

The center of the display (the fourth graticule) represents zero frequency deviation from the spectrum analyzer center frequency. The top graticule and the bottom graticule represent a positive or negative value of FM gain frequency deviation from the spectrum analyzer center frequency. The value of FMGAIN divided by four yields the FM gain per division.

## Query Response



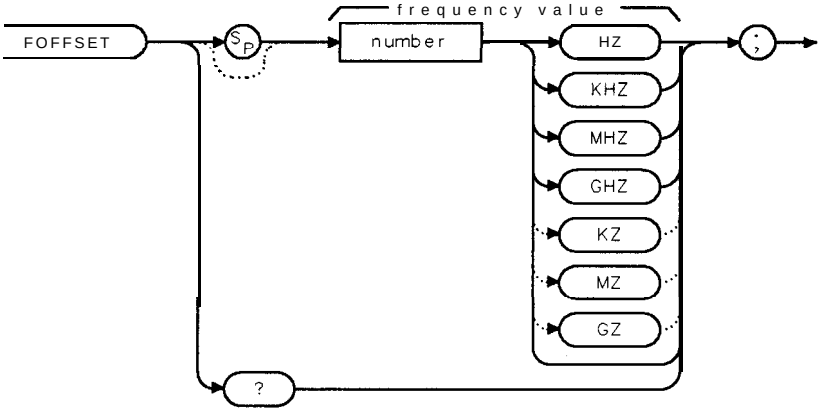



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# FOFFSET
## Frequency Offset

Specifies the frequency offset for all absolute frequency readouts such as center frequency.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | |

Equivalent Softkey: FREQ OFFSET .
Preset State: 0 Hz.
Related Commands: CF, FA, FB, MKN, MKF, MKSP, MKSS.

### Example

```
10 OUTPUT 718;"IP;FA 200MZ;"
20 OUTPUT 718;"FB 1GZ;"
30 OUTPUT 718;"TS;MKPK HI;"
40 OUTPUT 718;"MF;"
50 ENTER 718;A
60 PRINT A
70 OUTPUT 718;"FOFFSET 500MZ;"
80 OUTPUT 718;"TS;MF;"

90 ENTER 718;A
100 PRINT A

110 END
```

*Initializes spectrum analyzer. Sets start frequency.*
*Sets stop frequency.*
*Places marker on signal peak.*
*Finds frequency of marker.*

*Prints frequency of marker.*
*Adds a frequency offset.*
*The frequency of the marker now is the frequency of the signal peak plus the frequency offset.*

*The displayed frequency is 500 MHz greater than the frequency displayed in line 60.*



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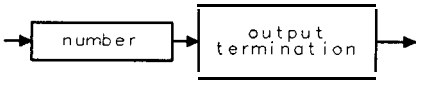
## Description

The FOFFSET command selects a value that offsets the frequency scale for all absolute frequency readouts (for example, center frequency). Relative values such as span and marker delta are not offset.

After execution, the FOFFSET command displays the frequency offset in the active function readout. When an offset is in effect, it is displayed beneath the bottom graticule line on the spectrum analyzer screen.

Execute “FOFFSET 0;” or “IP;” to turn off the offset.

## Query Response




QQ1

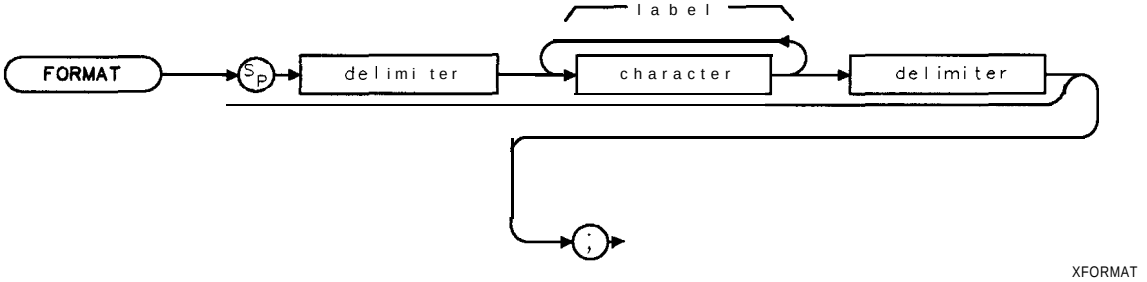


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# FORMAT
# Format Card

Formats the memory card.

## Syntax




XFORMAT

Equivalent **Softkey**: FORMAT CARD .

| Item | Description/Default | Range |
|---|---|---|
| Character | Any valid character. | 0 to 6 characters long, A through Z and the underscore (the underscore cannot be the **first** character of the label). |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |

Option Required: An HP 8590L or HP 8592L needs to have Option 003 installed in the spectrum analyzer to use the FORMAT command.

## Example

```
OUTPUT 718;"FORMAT %MYCARD%;"
```
*Formats a memory card with the label "MYCARD."*

## Description

The memory card if formatted with the LIF format. If a label is not specified, the label defaults to HP859X.



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# FS
# Full Span

Sets the frequency span of the spectrum analyzer to full span.

## Syntax




XFS

Equivalent **Softkey:** FULL SPAN .
Related Commands: CF, FA, FB, HNLOCK, SP, SS.

## Example

OUTPUT 7 18 ; "FS **;"** *Puts the spectrum analyzer in full-span mode.*

## Description

The FS command selects both the start frequency and the stop frequency according to the frequency span of the spectrum analyzer. Resolution bandwidth, video bandwidth, and sweep time are all set to autocoupled.

| Spectrum Analyzer Model | start Frequency | stop Frequency |
|---|---|---|
| HP 8590L or HP 85913 | 0 Hz | 1.8 GHz |
| HP 8592L* or HP 8593E* | 2.750 GHz | 22 GHz |
| HP 85943 | 0 Hz | 2.9 GHz |
| HP 8595E* | 0 Hz | 6.5 GHz |
| HP 85963' | 0 | 12.8 GHz |

*In harmonic unlock.

In harmonic lock, "FS;" sets both the center frequency and the span according to the harmonic band shown in the following table.

**Center Frequency and Span Setting**

| Harmonic Band | Center Frequency | Span |
|---|---|---|
| 0 | 1.45 GHz | 2.9 GHz |
| 1 | 4.638 GHz | 3.6 GHz |
| 2* | 9.4 GHz | 6.8 GHz |
| 3† | 15.9 GHz | 7.0 GHz |
| 4† | 20.55 GHz | 2.9 GHz |

* HP 8592L, HP 8593E, or HP 8596E only.
† HP 8592L or HP 8593E only.

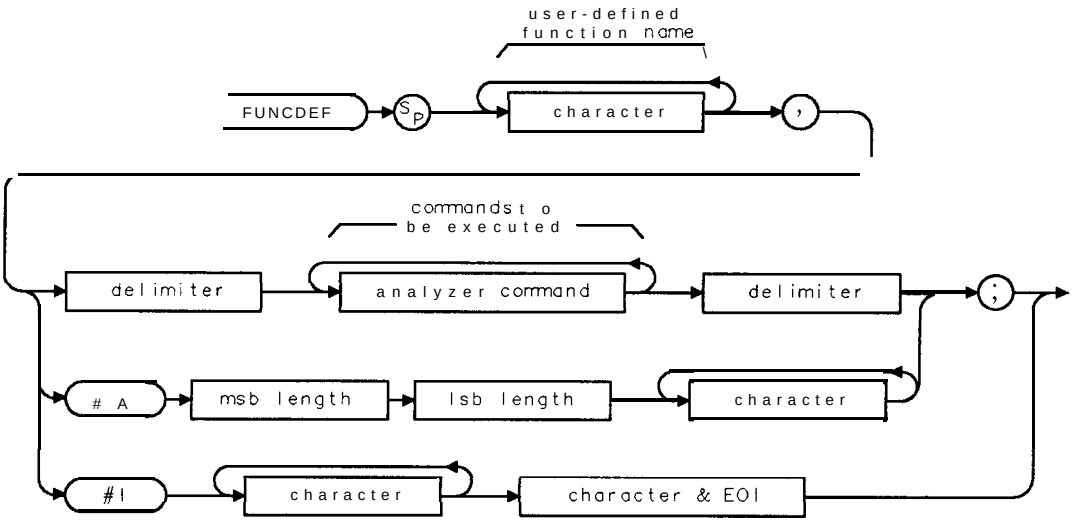


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# FUNCDEF
# Define Function

Defines a routine consisting of spectrum analyzer commands, assigns the routine a label, and stores the routine and its label in the user memory.

## Syntax




XFUNCDEF

| Item | Description/Default | Range |
|---|---|---|
| **Character** (function name) | **Any** valid character. | 2 to 11 characters long, A through Z and the underscore (the underscore should be used as the second character of the label). |
| **Delimiter** | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ' \| \ @ = / ^ $ % ; ! ' : " & |
| **Analyzer** command | Any valid spectrum analyzer command. | |
| **Msb** length | Most significant byte of a two-byte word that describes the number of bytes transmitted. | |
| **Lsb** length | Least significant byte of a two-byte word that describes the number of bytes transmitted. | |
| **Character** (data) | Any valid character. | |
| **Character &** EOI | Any valid character and END. | |

Restriction: User-defined function name cannot be a reserved word (see Table 5-2).
Related Commands: ABORT, DISPOSE, KEYDEF, RETURN.



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## Example

Connect CAL OUT to the spectrum analyzer input.

```
10 OUTPUT 718;"IP;"                          Initializes spectrum analyzer
20 OUTPUT 718;"VARDEF H_SPAN,0;"             Defines user-defined variable with an
                                             initial value of 0.
30 OUTPUT 718;"FUNCDEF S_HIFT,@";            Creates user-defined function, called
                                             SHIFT. Shift divides the span by two
                                             and adds the results to the center fre-
                                             quency. The "@" delimits the definition.
40 OUTPUT 718;"DIV H_SPAN,SP,2;";            Puts half of span value into H_SPAN.
50 OUTPUT 718;"ADD CF,CF,H_SPAN;";           Adds H-SPAN to Cl?
60 OUTPUT 718;"@;"                           Marks the end of the FUNCDEF declaration.
70 OUTPUT 718;"KEYDEF 1,S_HIFT,%SHIFT_UP%;"  Assigns the function S_HIFT to the
                                             user-defined softkey, called SHIFT_UP.
80 OUTPUT 718;"CF 300MHZ;"                   Displays the calibrator signal.
90 OUTPUT 718;"SP 1MHZ;";
100 LOCAL 718                                Returns control to local mode.
110 END
```

The semicolons at the end of lines 30, 40, and 50 in the example suppress BASIC's carriage return and line feed. Adding the semicolons at the end of the lines of a FUNCDEF declaration saves memory (because the carriage returns and line feeds are not stored in the FUNCDEF).

## Description

The FUNCDEF command can be used to create a user-defined function. Note that a user-defined function does not return a value like functions do in many programming languages. To use the FUNCDEF command, you must specify the function label and the list of commands it executes. Once a user-defined function is created, it is stored in spectrum analyzer memory. The user-defined function can be executed by invoking the function name within the definition of a user-defined softkey, another user-defined function, or a computer program. To delete the function from spectrum analyzer memory, use the DISPOSE command. (See Chapter 4 for more information about creating and using a FUNCDEF).

The ABORT, IF/THEN/ELSE/ENDIF, REPEAT/UNTIL, or RETURN commands are useful commands for altering the user-defined function's operation.

The following are general rules and limitations of FUNCDEF:

- Do not use existing function names or secondary keywords (reserved words) as labels for user-defined functions. See Table 5-2 for a list of reserved words.
- Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.
- The maximum number of nested FUNCDEF declarations is 40. (Nested FUNCDEF declarations is when one FUNCDEF calls another FUNCDEF.) See the programming example for the ABORT command for an example of nesting FUNCDEF declarations.
- Avoid using the POWERON LAST, SAVE STATE, and RECALL STATE programming commands within the function. These commands save and recall a state that, within a user-defined function, may only partially recall the saved state.

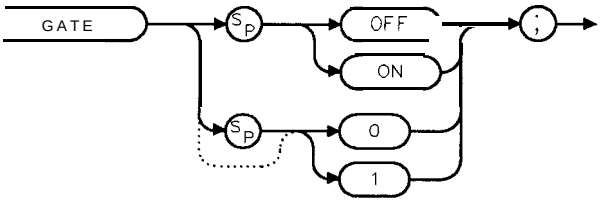


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# GATE
# Gate

Turns on or off the time-gating.

## Syntax




XGATE

Equivalent Softkey: GATE ON OFF .
Option Required: Option 105.
Preset State: GATE OFF'.
Related Commands: GATECTL, GD, GDRVUTIL, GL, GP.

## Example

Connect the HI SWEEP IN/OUT connector to the GATE TRIGGER INPUT. Connect the CAL OUT to the spectrum analyzer input.

```
10    OUTPUT 718;"IP;"                    ! Performs an instrument preset.
20    OUTPUT 718;"CF 300MHZ;SP 0HZ;ST 200MS;"
                                          ! Sets the center frequency, span, and
                                          ! sweep time.
30    OUTPUT 718;"GD 66MS;GL 66MS;"       ! Sets the gate delay and gate length.
40    OUTPUT 718;"GATECTL EDGE;"          ! Sets the gate triggering for the edge
                                          ! of the trigger input signal.
50    OUTPUT 718;"GP POS;"                ! Triggers on the positive edge of the
                                          ! trigger input signal.
60    OUTPUT 718;"GATE ON;"               ! Turns on the gating.
70    END
```

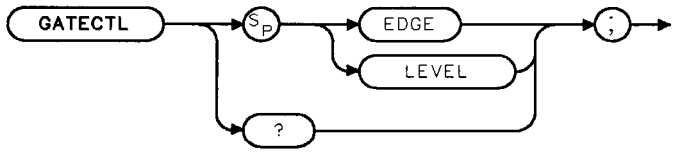


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# GATECTL
# Gate Control

Selects between the edge and the level mode for Option 105, the time-gated spectrum analysis capability.

## Syntax




XGATECTL

Equivalent Softkey: GATE CTL EDGE LVL .
Option Required: Option 105.
Preset State: GATECTL EDGE.
Related Commands: GATE, GD, GL, GP.

## Example

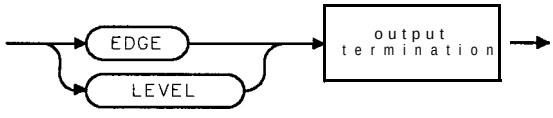
OUTPUT 718;"GATECTL LEVEL;"

## Description

In the edge mode, a trigger input starts the delay timer that triggers the gate timer. The gate polarity (GP), gate delay time (GD), and gate time length (GL) are operational in the edge mode, but not in the level mode. In the level mode, the gate follows the trigger input level.

When used as a predefined variable, GATECTL returns a "0" if GATECTL has been set to EDGE, a " 1 " if GATECTL has been set to LEVEL.

## Query Response




QCATECTL



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# GC
# Gate Preset

Presets Option 105, the time-gated spectrum analysis capability.

## Syntax




XGC

Option Required: Option 105.
Related Commands: GATE, GATECTL, GD, GL, GP.

## Example

```
OUTPUT 718;"GC;"
```

## Description

The GC command sets the following time-gated spectrum analysis functions:

- GATE to OFF.
- GATECTL to EDGE.
- GP to POS.
- The gate delay (GD) and gate length (GL) time values are set to 1 $\mu$s.

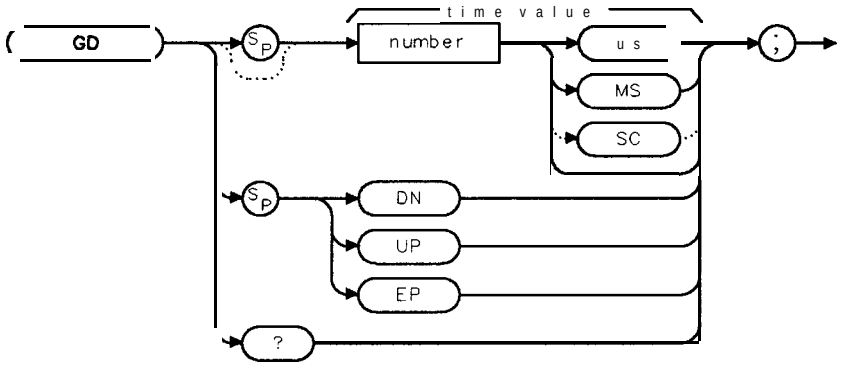


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# GD
# Gate Delay

Sets the delay time from when the gate trigger occurs to when the gate opens.

## Syntax




XGD

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is seconds. | 1 μs to 65.5 ms |

Equivalent Softkey: GATE DELAY .
Option Required: Option 105.
Preset State: 1 μs.
Related Commands: GATE, GATECTL, GC, GL.

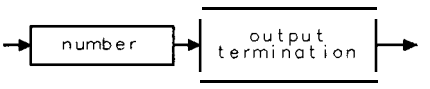
## Example

OUTPUT 718; "GD 1US;"

## Description

GD applies only if GATECTL is set to EDGE.

## Query Response




QG1



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# GDRVCLPAR
# Clear Pulse Parameters

Clears the pulse parameters (pulse width, pulse repetition interval, and reference edge) for a time-gate measurement by setting the pulse parameters to 0.

## Syntax




XGDRVCLPAR

Equivalent **Softkey: CLEAR PARAM** .

Option Required: Option 105. Option 101 is recommended.
Related Commands: GDRVPWID, GDRVPRI, GDRVREFE, GDRVST, GDRVVBW, GDRVRBW.

## Example

```
OUTPUT718;"GDRVCLPAR;"
```
*Clears all the pulse parameters.*

## Description

GDRVPWID, GDRVPRI, GDRVREFE are the programming commands that can be used to set the pulse width, pulse repetition interval, and reference edge, respectively.

GDRVCLPAR also turns off the resolution bandwidth to pulse width coupling, video bandwidth to gate length coupling, and sweeptime to pulse repetition interval coupling.

The GDRVCLPAR command is a gate utility function (see “GDRVUTIL” for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the `COMMAND ERROR:` message and an SRQ 140.

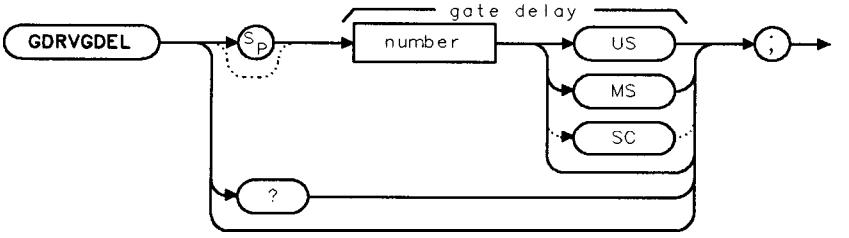


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# GDRVGDEL
# Gate Delay for the Frequency Window

For the frequency window only, GDRVGDEL sets the time delay from when the gate trigger occurs to when the gate is opened.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is seconds. | 1 μs to 65 ms. |

Equivalent Softkey: GDRVGDEL is equivalent to GATE DELAY when using the gate utility (GATE UTILITY ) functions.

Option Required: Option 105. Option 101 is recommended.
Preset Value: 1 μs
Related Commands: GDRVUTIL, GDRVGLEN, GD, GL.

## Example

```
OUTPUT 718;"MOV GDRVGDEL,1US;"
```
*Sets the gate marker delay to 1 μs.*

## Description

If the frequency window is currently the active window, GDRVGDEL updates the gate position markers and the position of the gate. If the time window is currently active, only the gate position markers are updated.

You can execute the GDRVGDEL command two different ways. You can either execute the GDRVGDEL command directly (for example, "GDRVGDEL 1MS ;") or use the MOV command to move the value for the time delay into the GDRVGDEL command (for example, "MOV GDRVGDEL, 1MS;"). If you use the MOV command, no text is displayed in the active function area during command execution.

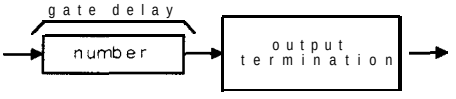
The GDRVGDEL command is a gate utility function (see "GDRVUTIL" for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the COMMAND ERROR: message and an SRQ 140.



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## Query Response

GDRVGDEL? returns the last value entered for GDRVGDEL. To determine the current gate delay, query the gate delay (GD) command.




QGDRVGDEL

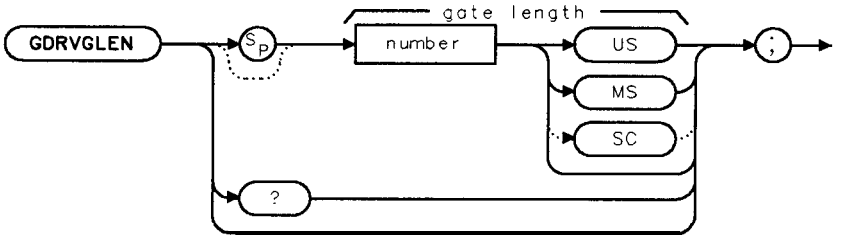


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# GDRVGLEN
# Gate Length for the Frequency and Time Windows

Adjusts the gate length in both the time and frequency windows.

## Syntax




XGDRVGLEN

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is seconds. | 1 μs to 65 ms. |

Equivalent Softkey: GDRVGLEN is equivalent to **GATE LENGTH** when using the gate utility (GATE UTILITY ) functions.

Option Required: Option 105. Option 101 is recommended.
Preset Value: 1 μs.
Related Commands: GDRVUTIL, GDRVGDEL, GD, GL.

## Example

```
OUTPUT 718;"MOV GDRVGLEN,1US;"
```

*Sets the gate marker to a length of 1 μs.*

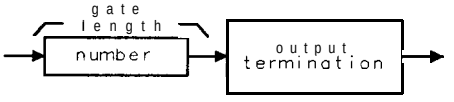
## Description

You can execute the GDRVGLEN command two different ways. You can either execute the GDRVGLEN command directly (for example, `"GDRVGLEN 1MS ;"`) or use the MOV command to move the value for the gate length delay into the GDRVGLEN command (for example, `"MOV GDRVGLEN , 1MS ;"`). If you use the MOV command, no text is displayed in the active function area during command execution.

The GDRVGLEN command is a gate utility function (see "GDRVUTIL" for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the `COMMAND ERROR:` message and an SRQ 140.

## Query Response

GDRVGLEN? returns the last value entered for GDRVGLEN. lb determine the current gate time length, query the gate length (GL) command.




QGDRVGLEN

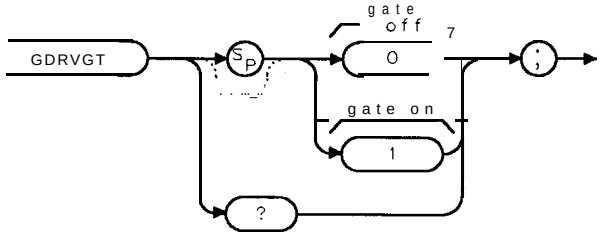


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# GDRVGT
# Window Gate Control

Turns on or off the gate in the frequency window.

## Syntax




XGDRVGT

Equivalent **Softkey**: GDRVGT is equivalent to GATE ON OFF when using the gate utility (GATE UTILITY ) functions.
Option Required: Option 105. Option 101 is recommended.
Related Commands: GDRVUTIL, GATE.

## Example

```
OUTPUT 718;"MOV GDRVGT,1;"
```

*Turns on the gate in the frequency window.*

## Description

Before executing GDRVGT, you should do the following:

1. Ensure there is a trigger pulse connected to the GATE TRIGGER INPUT connector on the rear panel of spectrum analyzer. The gate utility functions do not work if there is not a trigger input.
2. Ensure that the GATE OUTPUT connector and the EXT TRIG INPUT connector are connected together.

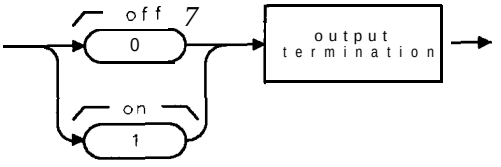
If the time window is the active window, turning on the gate with GDRVGT makes the frequency window the active window. The GDRVGT command is a gate utility function (see "GDRVUTIL" for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the `COMMAND ERROR:` message and an SRQ 140.

You can execute the GDRVGT command two different ways. You can either execute the GDRVGT command directly (for example, `"GDRVGT 1; "`) or use the MOV command to move the 1 or 0 into the GDRVGT command (for example, `"MOV GDRVGT,1;"`). If you use the MOV command, no text is displayed in the active function area during command execution.



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## Query Response




QGDRVGT

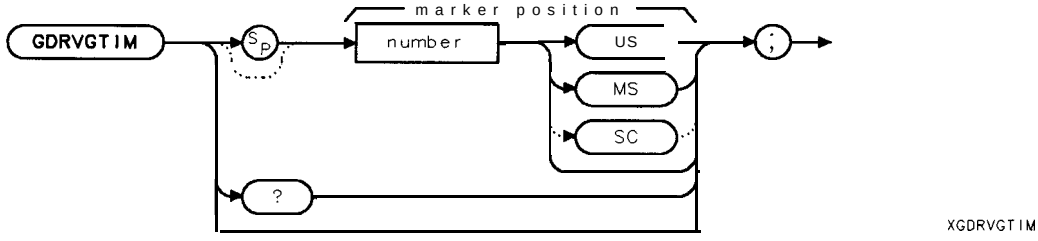


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# GDRVGTIM
# Gate Trigger to Marker Position for the Time Window

Activates the gate trigger marker, and then places it at the given value in the time window. The trigger marker readout shows the time between the gate trigger edge and the current marker position.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is seconds. | 0 to the sum of the sweep time and sweep delay (GDRVSWDE). |

Equivalent Softkey: GDRVGTIM is similar to TRIG MKR ON OFF .
Option Required: Option 105. Option 101 is recommended.
Initial Value: 0.
Related Commands: GDRVUTIL.

## Example

```
OUTPUT 718;"MOVGDRVGTIM,10MS;"
```

*Places the gate trigger marker 10 ms after the start of the sweep.*

## Description

If the frequency window is the active window, executing GDRVGTIM makes the time window the active window.

Once you enter a value into GDRVGTIM, that value is retained until you change it, or execute DISPOSE ALL. Pressing PRESET or turning the spectrum analyzer off does not change the value of GDRVGTIM.

You can execute the GDRVGTIM command two different ways. You can either execute the GDRVGTIM command directly (for example, "GDRVGTIM 1MS;") or use the MOV command to move the value for the time delay into the GDRVGTIM command (for example, "MOV GDRVGTIM, 1MS;"). If you use the MOV command, no text is displayed in the active function area during command execution.

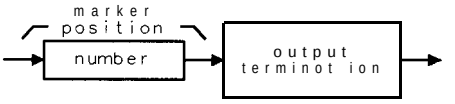
The GDRVGTIM command is a gate utility function (see "GDRVUTIL" for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the COMMAND ERROR: message and an SRQ 140.



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## Query Response

GDRVGTIM? returns the last value entered for GDRVGTIM. If you want the current value for the gate trigger marker, make the marker active with MKACTV, and then use MKF?.



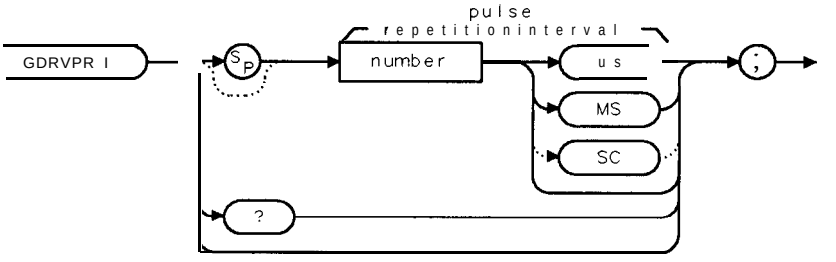



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# GDRVPRI
# Pulse Repetition Interval

Enters the specified value as the pulse repetition interval.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is seconds. | Range is from the sweep delay (GDRVSWDE) to the sweep time plus the sweep delay. |

GDRVPRI is equivalent to **ENTER PRI** .

Option Required: Option 105. Option 101 is recommended.
Initial Value: 0.
Related Commands: GDRVCLPAR, GDRVST.

## Example

```
OUTPUT 718;"MOV GDRVPRI,1MS;"
```
*Sets the pulse repetition interval to 1 ms.*

## Description

When the pulse repetition interval is entered, the approximate gate trigger position will be indicated on screen by either a "↑" for a positive trigger, or a "↓" for a negative trigger. Unlike **ENTER** PRI , GDRVPRI does not make the marker function active or display the Pulse **Param** softkeys.

Once you enter a value into GDRVPRI, that value is retained until you change it, or execute DISPOSE ALL. Pressing PRESET or turning the spectrum analyzer off does not change the value of GDRVPRI.

You can execute the GDRVPRI command two different ways. You can either execute the GDRVPRI command directly (for example, `"GDRVPRI 1MS ;"`) or use the MOV command to move the value for the time delay into the GDRVPRI command (for example, `"MOV GDRVPRI , 1MS ; "`). If you use the MOV command, no text is displayed in the active function area during command execution.

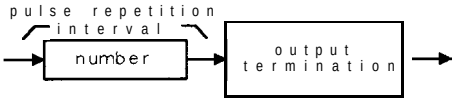
The GDRVPRI command is a gate utility function (see "GDRVUTIL" for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the `COMMAND ERROR:` message and an SRQ 140.



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## Query Response

GDRVPRI returns the current value for the pulse repetition interval.




QGDRVPRI

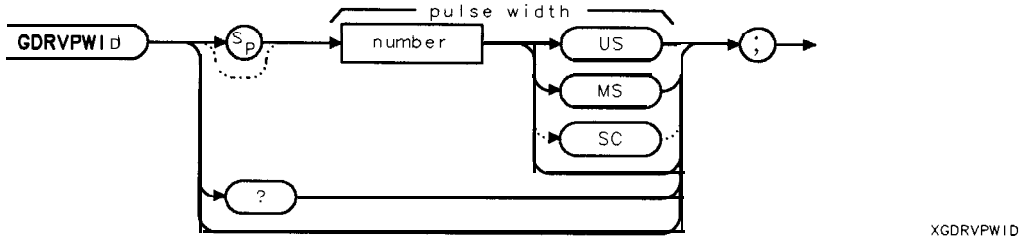


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# GDRVPWID
# Pulse Width

Enters the specified value as the pulse width.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is μs. | Range is from the sweep delay (GDRVSWDE) plus the sweep time to the sweep delay. |

Equivalent Softkey: ENTER WIDTH .
Option Required: Option 105. Option 101 is recommended.
Initial Value: 0.
Related Commands: GDRVCLPAR, GDRVRBW.

## Example

```
OUTPUT 718;"MOV GDRVPWID,1MS;"
```
*Sets the pulse width to 1 ms.*

## Description

Unlike ENTER WIDTH , GDRVPWID does not make the marker function active or display the Pulse Param softkeys.

Once you enter a value into GDRVPWID, that value is retained until you change it, or execute DISPOSE ALL. Pressing PRESET or turning the spectrum analyzer off does not change the value of GDRVPWID.

You can execute the GDRVPWID command two different ways. You can either execute the GDRVPWID command directly (for example, `"GDRVPWID 1MS;"`) or use the MOV command to move the value for the pulse width into the GDRVPWID command (for example, `"MOV GDRVPWID, 1MS; "`). If you use the MOV command, no text is displayed in the active function area during command execution.

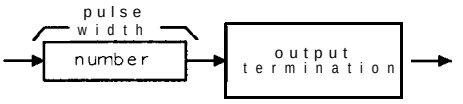
The GDRVPWID command is a gate utility function (see “GDRVUTIL” for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the `COMMAND ERROR:` message and an SRQ 140.



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## Query Response

GDRVPWID returns the current value for the pulse width.




QGDRVPWID

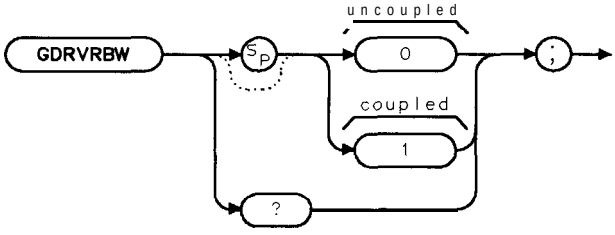


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# GDRVRBW
# Couple Resolution Bandwidth to Pulse Width

Couples or uncouples the resolution bandwidth to the specified pulse width.

## Syntax




Equivalent **Softkey:** CPL **RBW ON** OFF.
Option Required: Option 105. Option 101 is recommended.
Preset Value: Uncoupled.
Related Commands: GDRVPWID, GDRVVBW, GDRVST.

## Example

OUTPUT**718;"MOVGDRVRBW,1;"** *Couples the resolution bandwidth to the pulse width.*

## Description

Before coupling the resolution bandwidth to the pulse width, you should enter the pulse width into GDRVPWID. Coupling the resolution bandwidth to the pulse width updates the trace display in the active window. If the resolution bandwidth and the pulse width are uncoupled, the setting of the resolution bandwidth does not change.

The resolution bandwidth is at least three times $\frac{1}{PulseWidth}$ when coupled. The resolution bandwidth is updated to the coupled value when the window is next active.

You can execute the GDRVRBW command two different ways. You can either execute the GDRVRBW command directly (for example, "GDRVRBW **1;**") or use the MOV command to move the 1 or 0 into the GDRVRBW command (for example, **"MOV** GDRVRBW, 1; **"**). If you use the MOV command, no text is displayed in the active function area during command execution.

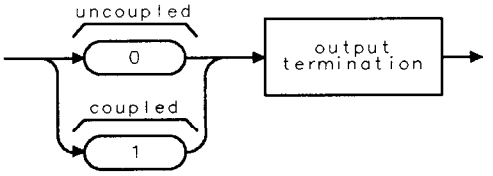
The GDRVRBW command is a gate utility function (see "GDRVUTIL" for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the COMMAND ERROR: message and an SRQ 140.



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## Query Response

GDRVRBW returns a “1” if the resolution bandwidth is coupled to the pulse width, or a “0” if it is not coupled.




QGDRVRBW

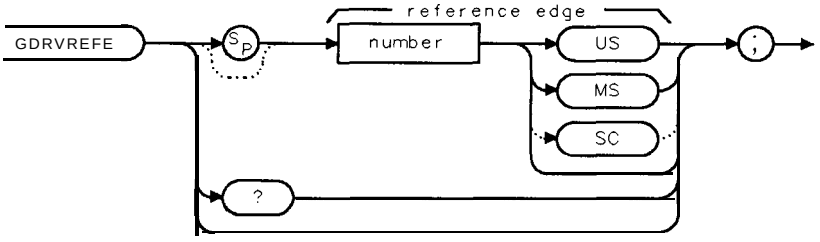


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# GDRVREFE
# Enter Reference Edge

Allows you to enter the position (in time) for a reference edge.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is μs. | Range is from the sweep delay (GDRVSWDE) plus the sweep time to the sweep delay. |

Equivalent Softkey: ENTER REF EDGE .

Option Required: Option 105. Option 101 is recommended.
Initial Value: 0 s.
Related Commands: GDRVUTIL.

## Example

```
OUTPUT 718;"MOV GDRVREFE,1MS;"
```

## Description

Unlike ENTER REF EDGE , GDRVREFE does not make the marker function active or display the ENTER REF EDGE softkeys.

Once you enter a value into GDRVREFE, that value is retained until you change it, or execute DISPOSE ALL. Pressing PRESET or turning the spectrum analyzer off does not change the value of GDRVREFE.

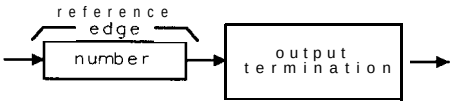
You can execute the GDRVREFE command two different ways. You can either execute the GDRVREFE command directly (for example, "GDRVREFE 1MS ;") or use the MOV command to move the value into the GDRVREFE command (for example, "MOV GDRVREFE, 1MS;"). If you use the MOV command, no text is displayed in the active function area during command execution.

The GDRVREFE command is a gate utility function (see "GDRVUTIL" for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the COMMAND ERROR: message and an SRQ 140.



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## Query Response




QGDRVREFE

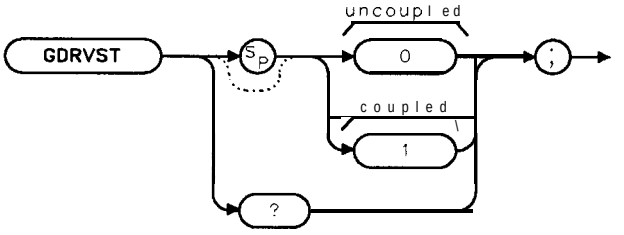


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# GDRVST
# Couple Sweep Time to Pulse Repetition Interval

Couples or uncouples the sweep time to the pulse repetition interval

## Syntax




XGDRVST

Equivalent **Softkey**: CPL SWP ON OFF.
Option Required: Option 105. Option 101 is recommended.
Preset Value: Uncoupled.
Related Commands: GDRVPRI.

## Example

```
OUTPUT 718;"MOV GDRVST,1;"
```

*Couples the sweep time to the pulse repetition interval.*

## Description

Before coupling the sweep time to the pulse repetition interval, you should enter the pulse repetition interval into GDRVPRI. Coupling the sweep time to the pulse repetition interval updates the trace display in the active window. If the sweep time and the pulse repetition interval are uncoupled, the setting of the sweep time does not change.

The sweep time is 401 times the pulse repetition interval when coupled. The sweep time is updated to the coupled value when the window is next active.

You can execute the GDRVST command two different ways. You can either execute the GDRVST command directly (for example, `"GDRVST 1; "`) or use the MOV command to move the 1 or 0 into the GDRVST command (for example, `"MOV GDRVST, 1; "`). If you use the MOV command, no text is displayed in the active function area during command execution.

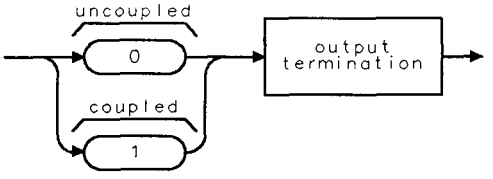
The GDRVST command is a gate utility function (see “GDRVUTIL” for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the `COMMAND ERROR:` message and an SRQ 140.



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## Query Response

GDRVST returns a “1” if the sweep time is coupled to the pulse repetition interval, or a “0” if it is not coupled.




QGDRVST



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# GDRVSWAP
# Update the Time or Frequency Window

Makes the window (either the time or frequency window) that is currently not the active window, the active window.

## Syntax




XGDRVSWAP

Equivalent Softkey: GDRVSWAP is equivalent to UPDATE TIMEFREQ , or pressing NEXT.
Option Required: Option 105. Option 101 is recommended.
Related Commands: GDRVUTIL.

## Example

```
OUTPUT718;"GDRVSWAP;"
```

## Description

Whenever the window is made active, the trace and gate position are updated. GDRVSWAP also couples the resolution bandwidth, video bandwidth, and sweep time to the current pulse width and pulse repetition interval values, if the pulse values have been entered and coupling is active. (See "GDRVRBW," "GDRVVBW," and "GDRVST" for more information about coupling resolution bandwidth, video bandwidth, and sweep time to the current pulse width and pulse repetition interval.)

The GDRVSWAP command is a gate utility function (see "GDRVUTIL" command for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the COMMAND ERROR: message and an SRQ 140.

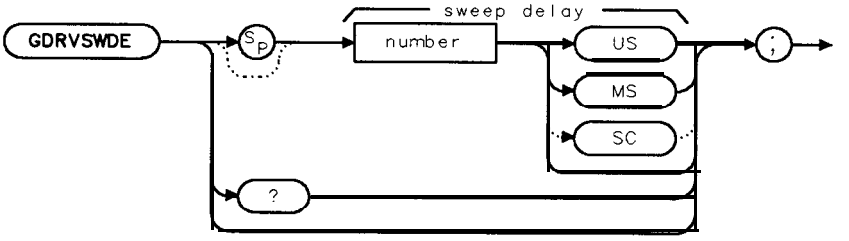


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# GDRVSWDE
# Delay Sweep for Time Window

Allows you to specify the delay from the edge of the gate trigger until the sweep is started in the time window.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is second. | 1 μs to 65 ms. |

Equivalent **Softkey**: SWEEP DELAY .

Option Required: Option 105. Option 101 is recommended.
Initial Value: 1 μs.
Related Commands: GDRVUTIL, GD.

## Example

OUTPUT 718;"MOV GDRVSWDE,1US;" Sets *the time delay to 1 μs.*

## Description

When using GDRVSWDE, the gate zone markers shown in the time window are updated to the value of GDRVSWDE.

Once you enter a value into GDRVSWDE, that value is retained until you change it, or execute DISPOSE ALL. Pressing PRESET or turning the spectrum analyzer off does not change the value of GDRVSWDE.

You can execute the GDRVSWDE command two different ways. You can either execute the GDRVSWDE command directly (for example, "GDRVSWDE 1MS;") or use the MOV command to move the value for the time delay into the GDRVSWDE command (for example, "MOV GDRVSWDE, 1MS;"). If you use the MOV command, no text is displayed in the active function area during command execution.

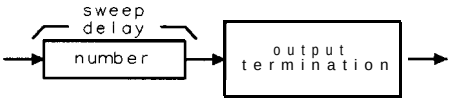
The GDRVSWDE command is a gate utility function (see "GDRVUTIL" for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the COMMAND ERROR: message and an SRQ 140.



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## Query Response

GDRVSWDE? returns the last value entered into GDRVSWDE. To determine the current value of the sweep time delay, query the gate delay (GD) command.




QGDRVSWDE

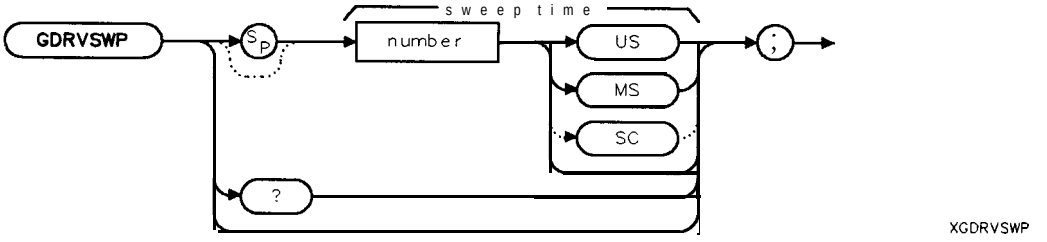


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# GDRVSWP
# Sweep Time for the Time Window

Specifies the sweep time for the time domain window of the gate utility.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is second. | 0 to 65 ms. |

Option Required: Option 105. Option 101 is recommended.
Initial Value: 0.
Related Commands: GDRVUTIL, ST.

## Example

OUTPUT 718;"MOV GDRVSWP,1MS;" *Sets the time delay to 1 ms.*

## Description

The positions of the gate markers and the gate trigger markers are updated to the new value of the sweep time.

Once you enter a value into GDRVSWP, that value is retained until you change it, or execute DISPOSE ALL. Pressing PRESET or turning the spectrum analyzer off does not change the value of GDRVSWP

You can execute the GDRVSWP command two different ways. You can either execute the GDRVSWP command directly (for example, "GDRVSWP 1MS;") or use the MOV command to move the value for the sweep time into the GDRVSWP command (for example, "MOV GDRVSWP , 1MS;"). If you use the MOV command, no text is displayed in the active function area during command execution.

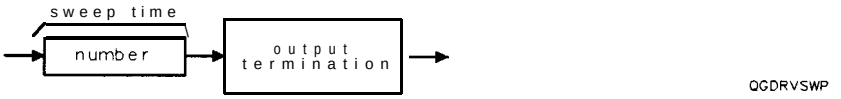
The GDRVSWP command is a gate utility function (see "GDRVUTIL" for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the COMMAND ERROR: message and an SRQ 140.



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## Query Response

GDRVSWP? returns the last value entered into GDRVSWP To determine the current value of the sweep time in the time window, query the sweep time (ST).



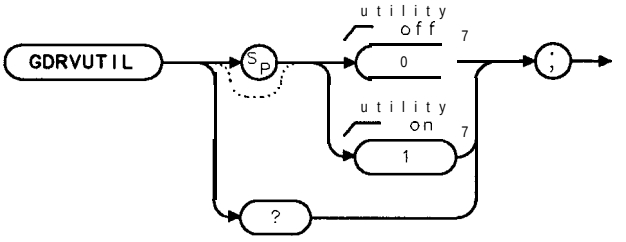



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# GDRVUTIL
# Gate Utility

Turns on or off the gate utility.

## Syntax




Equivalent **Softkey:** *GATE* UTILITY .
Option Required: Option 105. Option 101 is recommended.

## Example

```
OUTPUT 718;"MOV GDRVUTIL,1;"
```
*Turns on the gate utility.*

## Description

When the gate utility is turned on, the spectrum analyzer screen displays two windows. The upper window displays the input signal in the time domain, and the lower window displays the input signal in the frequency domain. If the spectrum analyzer is in zero span when the gate utility is turned on, the frequency span of the lower window will be set to a nonzero frequency span.

Before executing GDRVUTIL, you should do the following:

1. Ensure there is a trigger pulse connected to the GATE TRIGGER INPUT connector on the rear panel of spectrum analyzer. The gate utility functions do not work if there is not a trigger input.
2. Ensure that the GATE OUTPUT connector and the EXT TRIG INPUT connector are connected together.
3. Set the center frequency of the analyzer to the signal's center frequency.
4. Set the reference level of the analyzer so that the signal's peak is within the first graticule.

The spectrum analyzer cannot turn on the gate utility if the spectrum analyzer is not properly triggered. Once the gate utility has been turned on, you can use the commands that begin with "GDRV" to make the time-gate measurement. Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the COMMAND ERROR: message and an SRQ 140.



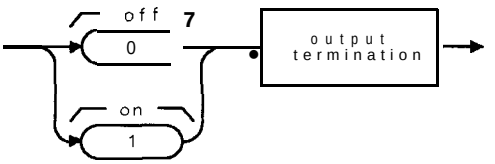
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**Restrictions**

Executing GDRVUTIL exits the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), the FFT menu measurements (FFTAUTO, FFTCONTS, FFISNGLS), TO1 measurement (TOI), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), peak zoom (PKZOOM), or power menu measurements (ACP, ACPE, CHP, and OBW).

You should turn off the gate utility (set GDRVUTIL to 0) when you are done with the gate utilities.

## Query Response




QGDRVUT I L

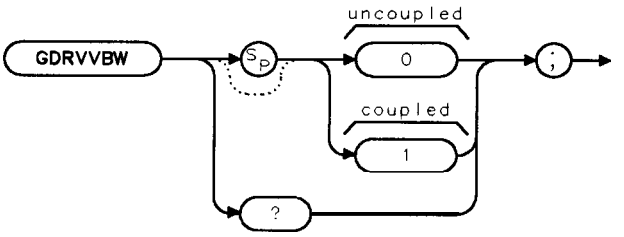


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# GDRVVBW
# Couple Video Bandwidth to Gate Length

Couples or uncouples the video bandwidth to the gate length.

## Syntax




XGDRVVBW

Equivalent Softkey: CPL VBW ON OFF.
Option Required: Option 105. Option 101 is recommended.
Preset Value: Uncoupled.
Related Commands: GDRVGLEN.

## Example

```
OUTPUT 718;"MOV GDRVVBW,1;"
```

*Couples the video bandwidth to the gate length.*

## Description

Before coupling the video bandwidth to the gate length, you should enter the gate length into GDRVGLEN. Coupling the video bandwidth to the gate length updates the trace display in the active window. If the video bandwidth and the gate length is uncoupled, the setting of the video bandwidth does not change.

The video bandwidth is at least equal to the inverse of the gate length when coupled. The video bandwidth is updated to the coupled value when the window is next active.

You can execute the GDRVVBW command two different ways. You can either execute the GDRVVBW command directly (for example, `"GDRVVBW 1; "`) or use the MOV command to move the 1 or 0 into the GDRVVBW command (for example, `"MOV GDRVVBW, 1; "`). If you use the MOV command, no text is displayed in the active function area during command execution.

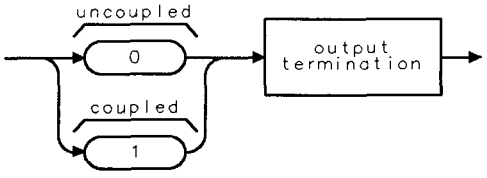
The GDRVVBW command is a gate utility function (see "GDRVUTIL" for more information about the gate utility functions). Executing a gate utility command without Option 105 installed in the spectrum analyzer generates the `COMMAND ERROR:` message and an SRQ 140.



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## Query Response

GDRVVBW returns a “1” if the resolution bandwidth is coupled to the pulse width, or a “0” if it is not coupled.




QGDRVVBW

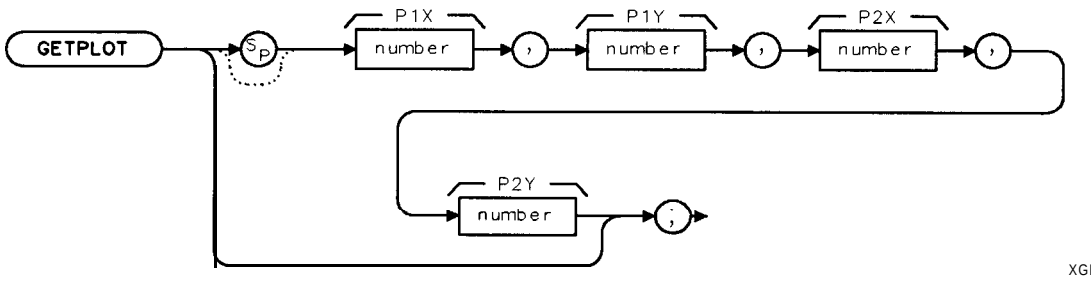


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# GETPLOT
## Get Plot

Initiates output of the spectrum analyzer display to the active plotter port. GETPLOT is meant to be used within a downloadable program.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | Number within the plotter coordinates. |

Related Commands: FUNCDEF, GETPRNT, SNGLS, TS, PLTPRT.
Restrictions: Not available with Analog+ display mode. See "ANLGPLUS" for more information.

### Example for the HP-IB Interface

This example illustrates how you can use a softkey to plot the spectrum analyzer display, and then have the plotter perform a page feed. (Not all plotters support the page feed command, however.) This example assumes that the plotter is at address 5 and the spectrum analyzer is at address 18. (This example is only valid for HP 9000 series 200 and 300 computers.)

```
OUTPUT 718;"FUNCDEF P_LOT,%";
OUTPUT718;"GETPLOT;";
OUTPUT 718;"OUTPUT 5,B,80;";
OUTPUT 718;"OUTPUT 5,B,71;";
OUTPUT 718;"OUTPUT 5,B,59;";
OUTPUT 718;"%;"
OUTPUT 718;"KEYDEF 1,P_LOT,%PLOT PG|FEED  %;"

LOCAL 718
```

*Creates a user-defined function called P-LOT.*
*P_LOT performs the GETPLOT command to plot the spectrum analyzer screen.*
*P-LOT then sends the ASCII code for "P" to the plotter:*
*P-LOT then sends the ASCII code for "G" to the plotter.*
*P-LOT then sends the ASCII code for a semicolon to the plotter:*
*Ends the FUNCDEF declaration.*
*Assigns P-LOT to softkey number 1. Softkey number 1 can be accessed by pressing* (MEAS/USER), **User Menus**.



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## Description

The GETPLOT command transfers the trace data, graticule, and annotation of the spectrum analyzer screen to a plotter via the spectrum analyzer interface (softkey labels excluded). The data is transferred in ASCII, HPGL format.

Before executing the downloadable program that contains GETPLOT, you should do one of the following:

- Disconnect the computer from the spectrum analyzer.

  Or,

- Send the following BASIC commands:

```
ABORT 7
LOCAL 7
```

  ABORT 7 instructs the computer to release control of the HP-IB, and LOCAL 7 allows you to control the spectrum analyzer from the front panel.

When using the PLOT command, the scaling points (Plx, Ply; P2x, P2y) can be specified. These scaling points specify the (x,y) coordinates, which determine the size of the plot. (P1x,P1y) refers to the lower-left plotter coordinates. (P2x,P2y) refers to the upper-right plotter coordinates.

---

**Note** The HP 7470A plotter does not support 2 plots per page. If you use an HP 7470A plotter with an HP 8590 Series spectrum analyzer, you can select one plot per page or four plots per page but not 2 plots per page.

---

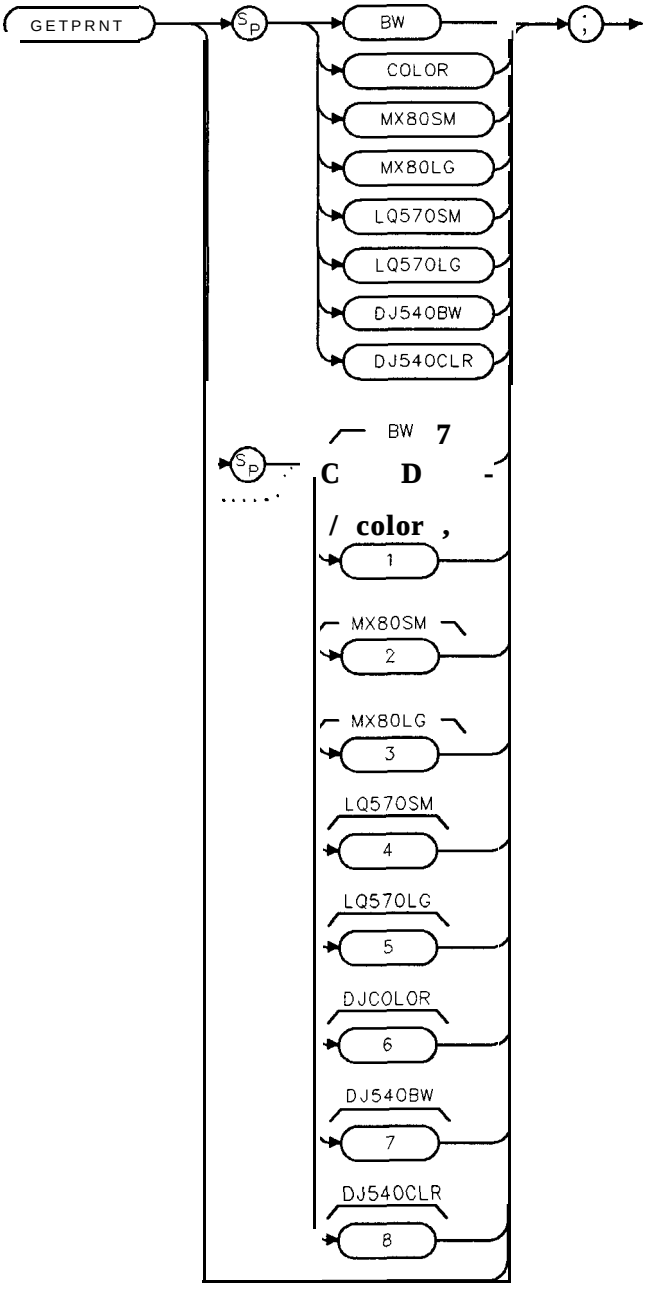


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# GETPRNT
# Get Print

Initiates output of the spectrum analyzer display to a printer. GETPRNT is meant to be used within a downloadable program.

## Syntax




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Related Commands: FUNCDEF, GETPLOT, PRNPRT.

## Example for the HP-IB Interface

This example illustrates how you can use a softkey to print the spectrum analyzer display, and then have the printer perform a page feed. This example assumes that the printer is at address 1 and the spectrum analyzer is at address 18. (This example is only valid for HP 9000 series 200 and 300 computers.)

| | |
|---|---|
| `OUTPUT 718;"FUNCDEF P_RINT,%";` | *Creates a user-defined function called P_RINT.* |
| `OUTPUT718;"GETPRNT;";` | *P_RINT performs the GETPRNT command to print the spectrum analyzer screen.* |
| `OUTPUT 718;"OUTPUT 1,B,10;";` | *P_RINT then sends the ASCII code for a carriage return to the printer* |
| `OUTPUT 718;"OUTPUT 1,B,13;";` | *P_RINT then sends the ASCII code for a line feed to the printer:* |
| `OUTPUT 718;"OUTPUT 1,B,12;";` | *P_RINT then sends the ASCII code for a form feed to the printer:* |
| `OUTPUT 718;"%;"` | *Ends the FUNCDEF declaration.* |
| `OUTPUT 718;"KEYDEF 2,P_RINT,%PRINT\|FRM FEED%;"` | *Assigns P_RINT to softkey number 2. Softkey number 2 can be accessed by pressing* (MEAS/USER), User Menus. |
| `LOCAL 718` | *Allows you to control the spectrum analyzer from the front panel.* |

## Description

The data is output in HP raster graphics format. Executing "GETPRNT;", "GETPRNT O;", or "GETPRNT BW;" produces a monochrome printout. Executing "GETPRNT 1;" and "GETPRNT COLOR;" produces a "color format" output for an HP PaintJet printer. Execute "MENU 0;" before printing to blank the softkeys.

Before executing the downloadable program that contains GETPRNT, you should do one of the following:

- Disconnect the computer from the spectrum analyzer.

  Or,

- Send the following BASIC commands:

```
ABORT7
LOCAL7
```

  ABORT 7 instructs the computer to release control of the HP-IB, and LOCAL 7 allows you to control the spectrum analyzer from the front panel.

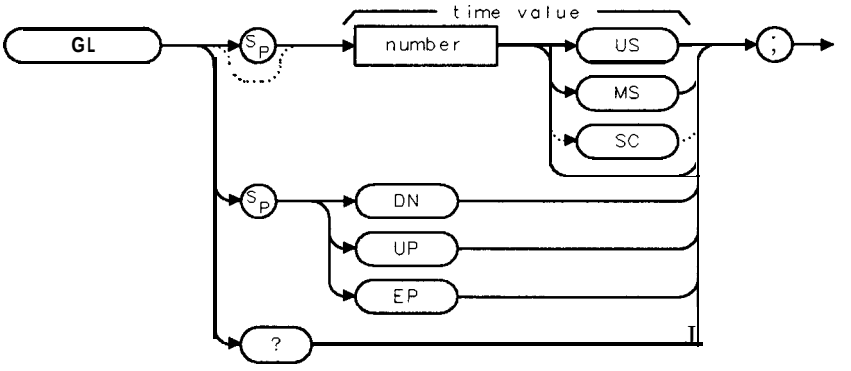


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# GL
# Gate Length

Sets the length of time the gate is open.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is seconds. | 1 μs to 65.5 ms |

Equivalent Softkey: GATE LENGTH .
Option Required: Option 105.
Preset State: 1 ms.
Related Commands: GATE, GATECTL, GC, GD.

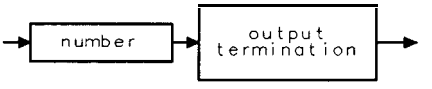
## Example

```
OUTPUT 718;"GL 1US;"
```

## Description

GL applies only if GATECTL is set to EDGE.

## Query Response



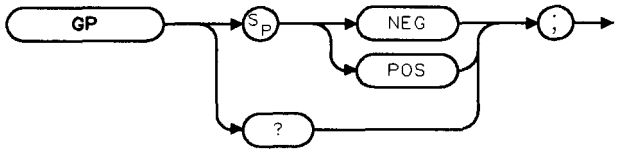



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# GP
# Gate Polarity

Sets the polarity (positive or negative) for the gate trigger.

## Syntax




XGP

Equivalent Softkey: EDGE POL POS NEG.
Option Required: Option 105.
Preset State: GP POS.
Related Commands: GATE, GATECTL, GD, GL.

## Example

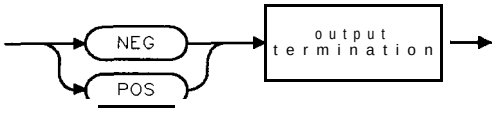
```
OUTPUT 718;"GP POS;"
```

## Description

GP applies only if GATECTL is set to EDGE.

When used as a predefined variable, GP returns a “0” if GP has been set to NEG, a “1” if GP has been set to POS.

## Query Response




QGP

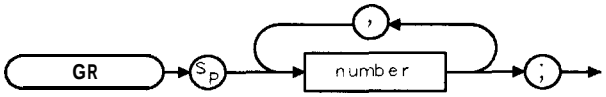


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# GR
# Graph

Graphs the given *y* coordinate while incrementing the x coordinate by 1.

## Syntax




XGR

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | **-22** to 233. |

Related Commands: CLRDSP, DA.

## Example

This example graphs a diagonal line on the spectrum analyzer display.

```
OUTPUT 718;"BLANK TRA;"
OUTPUT 718;"PU;PA 0,0;GR;" Positions the pen.
FOR I = 0 TO 400            I represents the Y value in graticule coordinates.
OUTPUT 718;I DIV 2          Graphs the Y values, incrementing the X value by 1.
NEXT I
```

## Description

The GR command plots a graph at the amplitude point indicated by the next *y* coordinate. The *y* coordinates are specified in display units, with -22 at the bottom of the spectrum analyzer display and 233 at the top of the spectrum analyzer display. See “PA” for more information about display units. The x coordinate is always incremented by 1; it cannot be decremented.

The GR command also places the graph in the display list. See “DA” for more information about the display list.

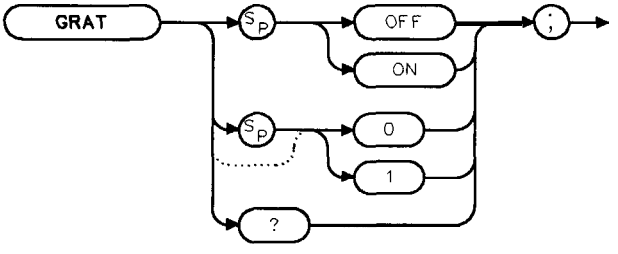


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# GRAT
# Graticule

Turns on or off the graticule.

## Syntax



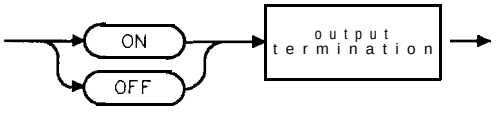

Equivalent **Softkey**: **GRAT ON** OFF.
Preset State: GRAT ON.
Related Commands: **ANNOT**.

## Example

```
OUTPUT 718 ;"GRAT OFF ;"
OUTPUT 718;"GRAT?;"
ENTER 718;Grat$
DISP Grat$
```

*Turns off the graticule.*
*Queries graticule status.*
*Gets response from the spectrum analyze?:*
*Displays OFF on the computer screen.*

## Query Response




QQ2

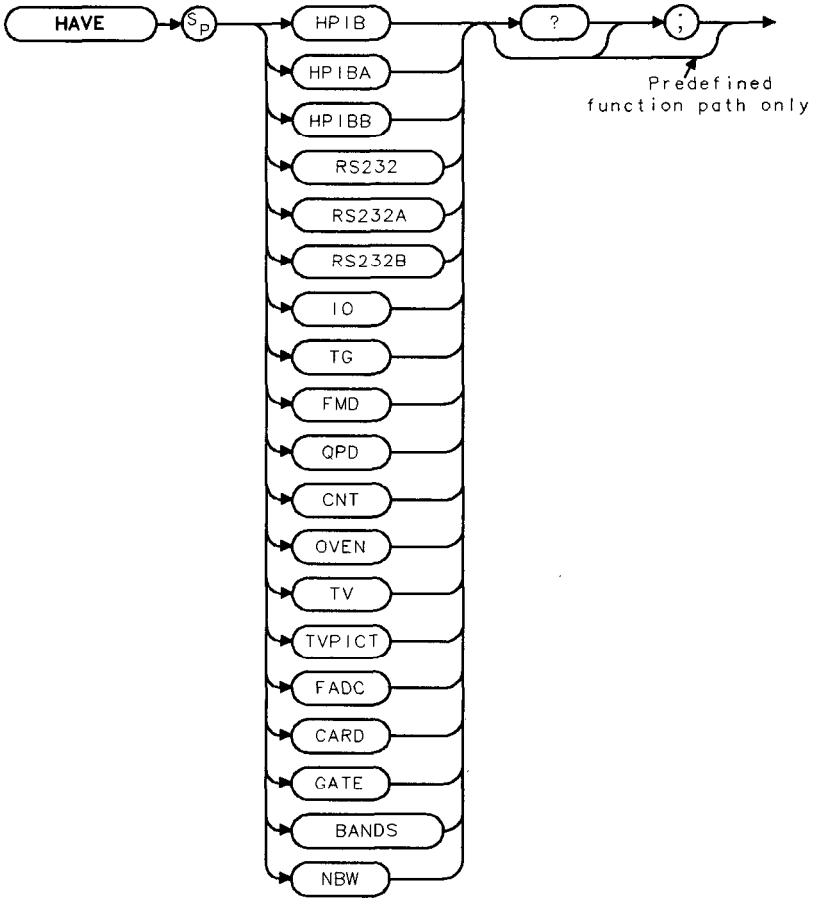


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# HAVE
# Have

Returns a “0” if the specified option or device is *not* installed.

## Syntax




cu 125e

## Example

```
OUTPUT 718; “HAVE HPIB; "   Queries whether Option 041 is installed.
ENTER 718;A                 Receives response from spectrum analyzer.
DISP A                      Displa ys response.
```



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## Description

The parameters are:

| | |
|---|---|
| HPIB | HP-IB interface, Option 021, or HP-IB and parallel interface, Option 041. |
| HPIBA | HP-IB interface, Option 021. |
| HPIBB | HP-IB and parallel interface, Option 041. |
| RS232 | RS-232 interface, Option 023, or RS-232 and parallel interface, Option 043. |
| RS232A | RS-232 interface, Option 023. |
| RS232B | RS-232 and parallel interface, Option 043. |
| IO | Either the HP-IB and parallel interface (Option 041) or RS-232 and parallel interface (Option 043). |
| TG | Tracking generator, Option 010 or 011. |
| FMD | FM demodulator, Option 102, 103, or 301. |
| QPD | Quasi-peak detector, Option 103. |
| CNT | Counter-lock. (The frequency counter is standard for an HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963; it is available as Option 013 for an HP 8590L.) |
| OVEN | Precision frequency reference, Option 004. |
| TV | TV synch trigger, Option 102 or 301. If the TV synch trigger option is installed in the spectrum analyzer and in use, "HAVE TV?; " returns a "2. " |
| TVPICT | TV picture display, Option 180. |
| FADC | Fast ADC, Option 101 or 301. |
| CARD | Memory card reader. (The memory card reader is Option 003 for the HP 8590L or HP 8592L. The memory card reader is standard for the HP 85913, HP 8593E, HP 85943, HP 85953, or HP 85963.) |
| GATE | Time-gated spectrum analyzer capability, Option 105. |
| BANDS | Returns the number of frequency bands that the spectrum analyzer has. See the following description. |
| NBW | Narrow bandwidths, Option 130. |

BANDS returns the number of frequency bands that the spectrum analyzer has, as shown in the following table.

| Model Number | Value HAVE BANDS Returns |
|---|---|
| HP 8590L, HP 85913, or HP 85943 | 1 |
| HP 85953 | 2 |
| HP 8592L or HP 85933 | 5 |
| HP 85963 | 3 |

"HAVE CARD;" returns additional information about the memory card. By checking the bit status of the byte returned from "HAVE CARD;", you can determine the information shown in the following table.



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| Bit Position | Bit Status = 0 | Bit Status = 1 |
|---|---|---|
| 0 | Memory card reader is not installed. | Memory card reader is installed. |
| 1 | Memory card is write protected. | Memory card is not write protected. |
| 2 | Memory card is a random access card (RAM). | Memory card is a read only memory card (ROM). |
| 3 | Memory card not inserted into memory card reader. | Memory card is inserted into memory card reader. |

You can use the BIT or BITF command to determine the status of the bits. For example,

```
OUTPUT 718;"VARDEF R_ESULT,0;"          Stores the bit status in R_ESULT.
OUTPUT 718;"BIT R_ESULT,HAVE CARD,3;"   Checks the status of bit 3.
OUTPUT718;"R_ESULT?;"                   Gets the result.
ENTER 718;A
DISP A                                  Displays the bit status of bit 3.
```

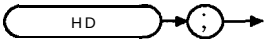


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# HD
# Hold Data Entry

Disables data entry via the spectrum analyzer numeric keypad, knob, or step keys. The active function readout is blanked, and any active function is deactivated.

## Syntax




XHD

Equivalent Key: HOLD (for the HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963) or (HOLD) (for the HP 8590L or HP 8592L).
Related Commands: Any active function. See the description below for a list of the active functions.

## Example

| | |
|---|---|
| `OUTPUT 718;"HD;"` | *Disables the active function and clears the active function block area on the spectrum analyzer screen.* |
| `OUTPUT 718;"CF 600MHZ;HD;700MHZ;"` | *This will leave the center frequency at 600 MHz, because HD deactivates any current function.* |

## Description

The active functions are ACPBW, ACPSP, AT, BAUDRATE, CF, COUPLE, CRTHPOS, CRTVPOS, DA, DL, DOTDENS, FA, FB, FFTSTOP, FMGAIN, FOFFSET, GATECTL, GD, GL, GP, INZ, LG, MKA, MKD, MKFC, MKFCR, MKN, MKPAUSE, MKPX, ML, MODE, NDB, NRL, PREAMPG, RB, RCLS, ROFFSET, RL, RLPOS, SAVES, SAVRCLN, SETDATE, SETTIME, SP, SQLCH, SRCAT, SRCPOFS, SRCPSTP, SRCPSWP, SRCPWR, SRCTK, SS, ST, TH, TIMEDATE, TVLINE, VAVG, VB, VBR, ZMKSPAN, ZMKCNTR and user-defined active function specified by the ACTDEF command.

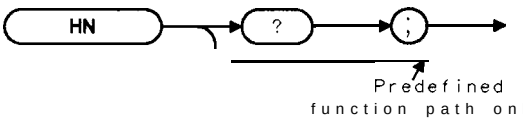


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# HN
# Harmonic Number

Returns the harmonic number of the current harmonic band in which the spectrum analyzer is tuning.

## Syntax




XHN

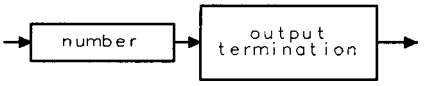
Model Required: HP 8592L, HP 85933, HP 85953, or HP 85963.
Related Commands: FS, HNLOCK, HNUNLK.

## Example

```
OUTPUT 718;"HN?;"   Queries harmonic band of spectrum analyzer.
ENTER 718;Number    Gets response from the spectrum analyzer.
DISP Number         Displays the result on computer screen.
```

## Query Response

The HN command returns the number of the harmonic band, if the spectrum analyzer is sweeping single-band. A “-1” is returned if the spectrum analyzer is sweeping multiband.




QQ1

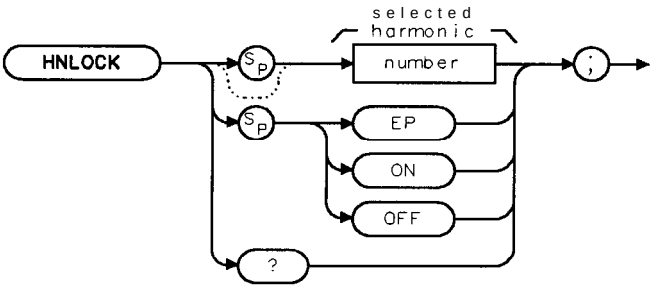


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# HNLOCK
# Harmonic Number Lock

Forces the spectrum analyzer to use only the selected harmonic band.

## Syntax




XHNLOCK

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer number. | 0 to 4 (for HP 8592L, HP 85933, or HP 8596E), 0 to 3 (HP 85963 only), 0 to 1 (for HP 8595E). |

Equivalent Softkey: The HNLOCK command and the softkeys under the Band Luck menu are identical.
Model Required: HP 8592L, HP 85933, HP 85953, or HP 85963.
Preset State: HNLOCK OFF
Related Commands: CF, FA, FB, FOFFSET, HN, HNUNLK, SNGLS, SP.

## Example

```
INPUT "SELECT THE DESIRED FREQUENCY BAND",Harm Gets harmonic band from user.
OUTPUT 718;"HNLOCK";Harm;";"                    Locks harmonic band.
```

## Description

HNLOCK ON locks onto the harmonic band that is appropriate for the current center frequency, lowering the span, if necessary, due to the limits of the harmonic band.

HNLOCK <number>, where <number> is an integer, locks onto harmonic band <number> and automatically selects the settings shown in the following table.

| Remote Commands | Equivalent Softkey | Frequency Settings | |
|---|---|---|---|
| HNLOCK 0 | BAND 0 | Center frequency 1.450 GHz | Span 2.900 GHz |
| HNLOCK 1 | BAND 1 | Center frequency 4.638 GHz | Span 3.600 GHz |
| HNLOCK 2 | BAND 2 | Center frequency 9.400 GHz | Span 6.800 GHz |
| HNLOCK 3 | BAND 3 | Center frequency 15.90 GHz | Span 7.000 GHz |
| HNLOCK 4 | BAND 4 | Center frequency 20.55 GHz | Span 2.900 GHz |



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Once HNLOCK is set, only frequencies and spans that fall within the frequency band of the current harmonic may be entered. The span is reduced automatically to accommodate a center frequency specified near the end of the band range.

---

Note Before changing the frequency range to another harmonic, unlock the band with the harmonic unlock command, "HNLOCK OFF;" or "HNUNLK; ".

---

## BAND LOCK ON (HNLOCK ON)

### Start Frequency

If a start frequency is entered that is outside of the current band boundaries, it will be set to the nearest band edge instead. If a start frequency that is greater than the current stop frequency is entered, the (possibly modified) start frequency is used for both the start and the stop frequency; therefore, the span will be set to zero. If the start and stop frequencies specify too large a span, they will be modified. (Also see "FA.")

### Stop Frequency

If a stop frequency is entered that is outside of the current band boundaries, it will be set to the nearest band edge instead. If a stop frequency that is less than the current start frequency is entered, the (possibly modified) stop frequency will be used for both the start and stop frequency; therefore, the span will be set to zero. (Also see "FB.")

### Center Frequency

The span will be modified if necessary to get the center frequency specified without crossing the band edges. (Also see "CF.")

### Span

The span will be limited as necessary to keep the start and stop frequencies within the band edges without changing the center frequency. The maximum span allowed is 2.943 GHz in band 0, 3.600 GHz in band 1, 6.957 GHz in band 2, and 7 GHz in higher bands. (Also see "SP.")

## BAND LOCK OFF (HNLOCK OFF)

The start and stop frequencies are bounded by the range of the instrument.

The frequency not specified will be bounded by the following scheme:

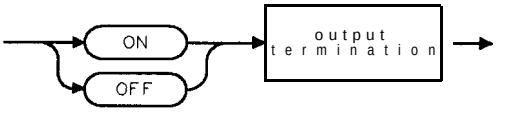
Continuous Sweep Mode: If the specified frequency is in band 0, the values will be contained by the bounds of band 0. If the value is in the harmonic band range, the values will be bounded by the top of the instrument range and the lower end of band 1. (Also see "CONTS.")

Single Sweep Mode: The values are bounded by the instrument range only; therefore, band 0 can be included in a multiband sweep in single mode. (Also see "SNGLS.")



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## Query Response




QQ2



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# HNUNLK
# Unlock Harmonic Number

Unlocks the harmonic band.

## Syntax




XHNUNLK

Equivalent Softkey: HNUNLK is equivalent to HNLOCK OFF and BND LOCK ON OFF (OFF is underlined).
Model Required: HP 8592L, HP 85933, HP 85953, or HP 85963.
Related Commands: CF, FA, FB, FOFFSET, FS, HN, HNLOCK, SP.

## Example

```
OUTPUT 718;"HNUNLK;"
```

## Description

The HNUNLK command allows you to select frequencies and spans outside the range of a single harmonic band.

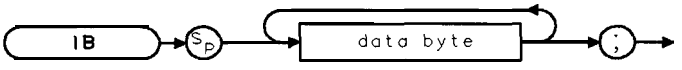


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# IB
# Input B

Provides a method for putting values into trace B. The spectrum analyzer expects 401 two-byte integers. The data values can represent the range of integer numbers.

## Syntax




XIB

| Item | Description/Default | Range |
|---|---|---|
| Data byte | 8-bit byte containing numeric or character data. | |

## Example

```
10 ASSIGN @Sa TO 718;FORMAT ON
20 ASSIGN @Sa_bin TO 718;FORMAT OFF
30 INTEGER Binary(1:401)
40 OUTPUT @Sa;"CF 300MZ;CLRW TRB;BLANK TRA;SP
10MZ;SNGLS;TS;"
50 OUTPUT @Sa;"TDF B;MDS W;TB;"
60 ENTER @Sa_bin;Binary(*)
70 OUTPUT @Sa;"CF 100MZ;RB 30KZ;SP 1MZ;TS;"
80 DISP "PRESS CONTINUE WHEN READY"
90 PAUSE
100 OUTPUT @Sa;"IB";

110 OUTPUT @Sa_bin;Binary(*)
120 OUTPUT 718;"VIEW TRB;"
130 END
```

*Dimensions an array called "'Binary."*
*Takes a measurement sweep.*

*Outputs trace B (in binary) to computer:*
*Stores trace data in array.*
*Changes the spectrum analyzer settings.*

*Prepares spectrum analyzer to receive trace B data stored* in array.
*Sends trace B data to spectrum analyzer.*

## Description

The IB command sends trace B data as binary data only; IB is independent of the measurement data size (MDS) command. The IB command expects 802 data bytes (401 data points, two bytes each).

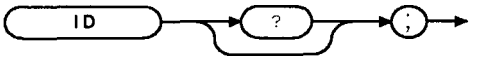


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# ID
# Identify

Returns the spectrum analyzer model number to the controller (for example, "HP8593E").

## Syntax



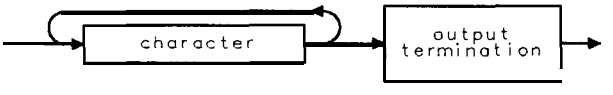

XID

Equivalent **Softkey**: SHOW **OPTIONS** .
Related Commands: REV, SER.

## Example

```
10 ALLOCATE A$[50]     Allocates string to hold model number.
20 OUTPUT 718;"ID;" Gets model number.
30 ENTER 718;A$        Transfers number to computer:
40 DISP A$             Displays model number:
50 END
```

## Query Response




QID

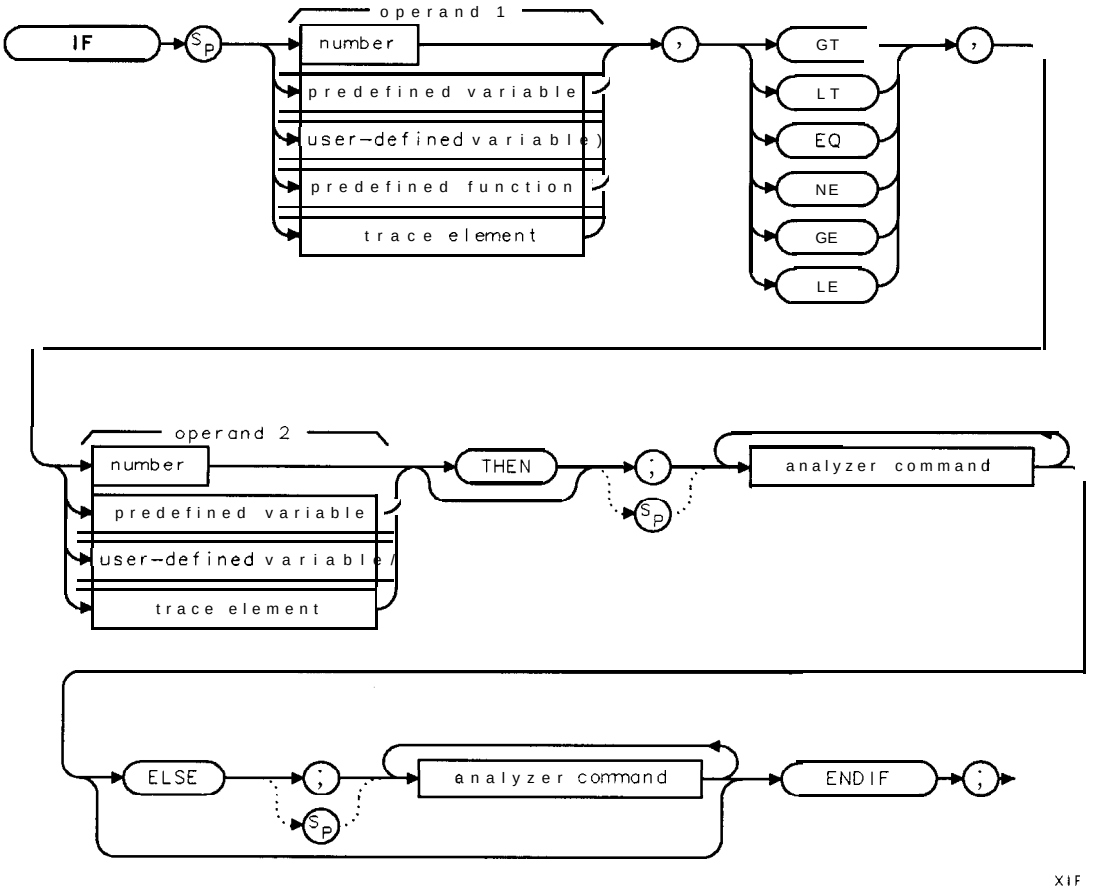


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# IF THEN ELSE ENDIF
# If Then Else Endif

The IF/THEN/ELSE/ENDIF commands form a decision and branching construct.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | Real number range. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| **Predefined** variable | A command that acts as a variable. Refer to Table 5-l. | |
| Predefined function | Function that returns a value. Refer to **Table 5-1**. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Analyzer command | Any spectrum analyzer command. | |

Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: REPEAT/UNTIL.



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## Example

The following example uses the IF/THEN/ELSE/ENDIF command to pick a center frequency.

```
10 OUTPUT 718; "IP;"                          Initializes spectrum analyzer.
20 OUTPUT 718;"TH -35DM;"                     Sets threshold level.
30 OUTPUT 718;"TS;MKPK HI;MA;"                Finds highest peak.
40 OUTPUT 718;"IF MA,GT,TH THEN;"             Compares peak to threshold.
50     OUTPUT 718;"CF 20MHZ;"                 Changes center frequency to 20 MHz if peak
                                              amplitude is greater than the threshold.
60 OUTPUT 718; "ELSE; "                       This line is executed if peak is less than or
70     OUTPUT 718;"CF 100MHZ;TS;MKPK HI;"     equal to the threshold level.
80 OUTPUT 718; "ENDIF;"                       End of IF/THEN/ELSE/ENDIF.
90 END
```

The example below does not include the ELSE portion of the IF/THEN/ELSE/ENDIF command. This example lowers any signal positioned above the spectrum analyzer screen.

```
10 OUTPUT 718; "IP; "                         Initializes spectrum analyzer.
20 OUTPUT 718;"SNGLS;TS ; MKPK HI ; MA;"      Finds peak of trace.
30 OUTPUT 718;"IF MA,GT,RL THEN;"             Compares peak amplitude and reference level.
40     OUTPUT 718;"MKRL;"                     Performs line 40 if the marker amplitude is
                                              greater than the reference level.
50 OUTPUT 718; "ENDIF;"                       Ends IF/THEN/ENDIF structure.
60 END
```

## Description

The IF portion compares operands 1 and 2 with the operators shown in the following table.

| Operator | Description |
|---|---|
| GT | Greater than. |
| LT | Less than. |
| EQ | Equal to. |
| NE | Not equal to. |
| GE | Greater than or equal to. |
| LE | Less than or equal to. |

If the condition is true, the command list following the IF statement is executed and commands between ELSE and ENDIF are skipped. If the condition is false, the commands after the ELSE statement are executed. If there is no ELSE statement, program execution resumes after the ENDIF statement.



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The "equal to" (EQ) operator is not recommended if value 1 or value 2 represents a real number. When checking for equality with real numbers, the difference between the numbers is useful. For example:

```
OUTPUT 718;"SUB T_EST,V_ARA,V_ARB;"   Places the difference of VARA and V_ARB into
                                      T-EST. V_ARA, V_ARB, and T-EST are user-
                                      defined variables.
OUTPUT 718;"ABS T_EST,T_EST;"         Finds the absolute value of T-EST
OUTPUT 718;"IF T_EST,LT,.01 THEN;"    Does a comparison.
OUTPUT 718;"CF UP;"
OUTPUT 718;"ENDIF;"
```

When used within a downloadable program (DLP), the maximum number of IF THEN ELSE ENDIF statements that can be nested is 20.

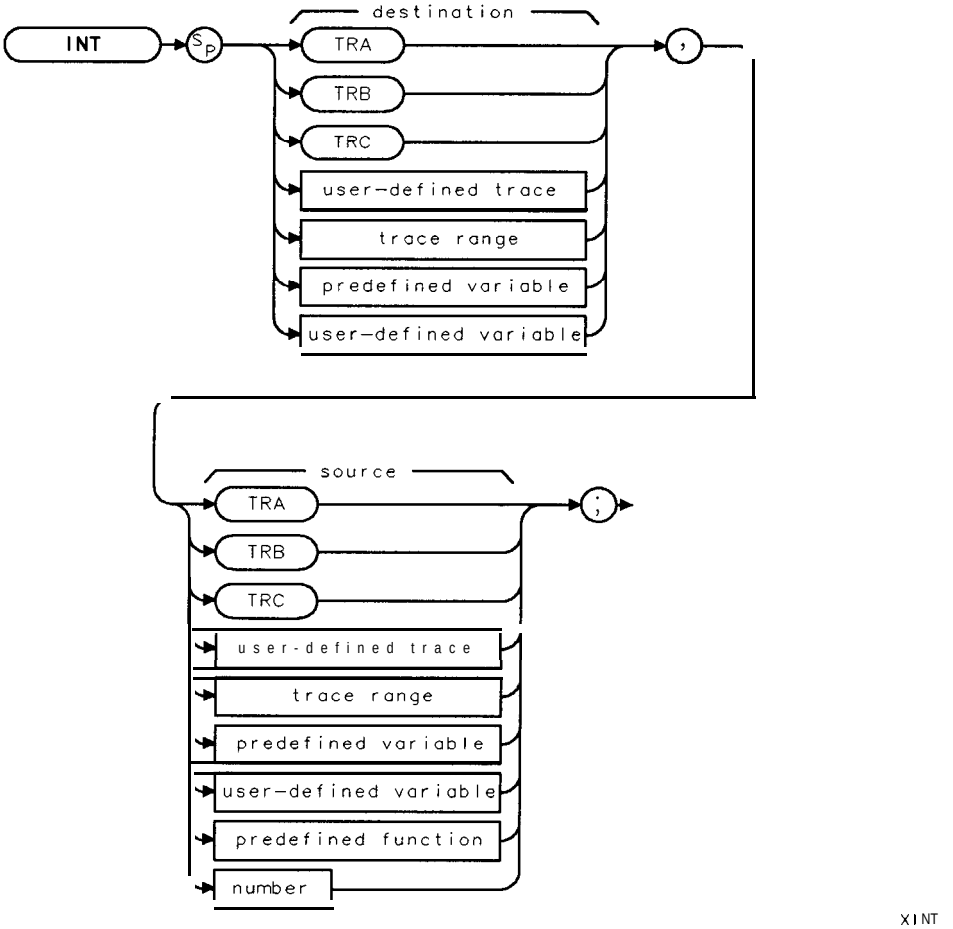


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# INT
# Integer

Places the greatest integer that is less than or equal to the source value into the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| PredeEned variable | A command that acts as a variable. Refer to Table 5-1. | |
| PredeEned function | Function that returns a value. Refer to Table 5-l. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF when using a user-defined variable. TS when using trace data.
Related Commands: REPEAT/UNTIL.



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## Example

```
OUTPUT 718;"INT RL,3.75;"
```
*Resets the reference level using the integer value of 3.*

## Description

When the number of items in the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

When the spectrum analyzer is sweeping across more than one band, taking the integer value of the sweep time (ST) may yield a real number.

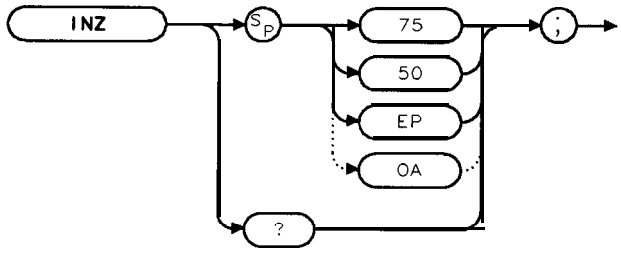


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# INZ
# Input Impedance

Specifies the value of input impedance expected at the active input port.

## Syntax




XINZ

Equivalent Softkey: INPUT Z 50Ω 75Ω .

Preset Value: Returns impedance to the power-on value.

Related Commands: AUNITS.

## Example

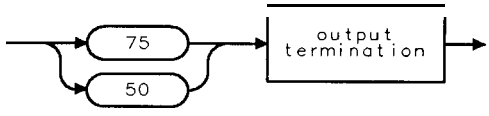
```
OUTPUT 718;"INZ 75;"        Changes input impedance to 75 ohms.
OUTPUT 718;"AUNITS V; "     Changes amplitude units to volts.
```

## Description

The actual impedance can be affected only by internal hardware. With the exception of Option 001 or 011 (HP 859OL or HP 85913 only), the spectrum analyzer hardware supports 50Ω only. The INZ command is used for computation purposes during power or voltage conversions.

The INZ command affects only the amplitude results that are reported in absolute relative power (dBm units or watts). (See "AUNITS.")

## Query Response




QINZ

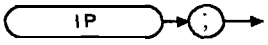


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# IP
# Instrument Preset

Performs an instrument preset.

## Syntax




XIP

Equivalent **Softkey:** (PRESET ) is similar

## Example

```
OUTPUT 718;"IP;"
```

## Description

| | |
|---|---|
| AMB | Turns off A – B mode. |
| AMBPL | Turns off A – B plus display line mode. |
| AMPCOR | Turns off amplitude correction factors. |
| ANLGPLUS | Turns off the Analog+ display mode. |
| **ANNOT** | Turns on annotation. |
| AT | Sets attenuation to 10 dB. |
| **AUNITS** | Loads the amplitude units from a configuration location in spectrum analyzer memory. |
| AUTO | Couples RB, AT, SS, ST, and VB. Turns off display line and threshold. |
| BLANK B, BLANK C | Blanks trace B and trace C. |
| CLRDSP | Erases user graphics. |
| CLRW A | Clears and writes trace A. |
| CONTS | Selects continuous sweep mode. |
| COUPLE | Selects ac coupling. (HP 85943, HP 85953, HP 85963 only.) |
| DA | Sets the display address to zero. |
| DET | Selects positive peak detection. |
| DL | Turns off the display line. |
| **DOTDENS** | Sets the dot density value to 15. |
| FMGAIN | Sets FM gain to 100 kHz. (Option 102 or 103 only.) |
| FOFFSET | Sets the frequency offset to 0 Hz. |
| GATE | Sets the gating to off. (Option 105 only.) |
| GATECTL | Sets the gate control to edge triggering. (Option 105 only.) |



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| | |
|---|---|
| GD | Sets the gate delay to 1 μs. (Option 105 only.) |
| GDRVGDEL | Sets the gate delay to 1 μs. (Option 105 only.) |
| GDRVGLEN | Sets the gate length to 1 μs. (Option 105 only.) |
| GDRVRBW | Uncouples the resolution bandwidth and the pulse width. (Option 105 only.) |
| GDRVST | Uncouples the sweep time and the pulse repetition interval. (Option 105 only.) |
| GDRVVBW | Uncouples the video bandwidth and the gate length. (Option 105 only.) |
| GL | Sets the gate length to 1 ms. (Option 105 only.) |
| GP | Sets the gate trigger polarity to trigger on the positive edge. (Option 105 only.) |
| GRAT | Turns on the graticule. |
| HD | Hold (deactivates active function). |
| HNLOCK OFF | Unlocks harmonic band, allowing multiband sweeping. (HP 8592L, HP 85933, HP 85953, or HP 85963 only.) |
| GRAT | Turns on the graticule. |
| INZ | Loaded from a configurable location in spectrum analyzer memory. |
| LG | Selects 10 dB per division log scale. |
| LIMIDISP | Sets LIMIDISP to AUTO. |
| LIMIHI or LIMILO | Clears any limit-line trace specified by LIMIHI or LIMILO. |
| LIMITEST | Turns off limit-line testing. |
| MDS | 8-bit |
| MEASURE | Sets measurement to signal analysis. |
| MKDLMODE | Displays the marker amplitude values as relative to the reference level. |
| MKFCR | Marker counter resolution is set to AUTO, but a calculated value other than 0 may be returned if the marker counter resolution is queried. ( HP 85913, HP 85933, HP 85943, HP 85953, HP 85963, or Option 013 with HP 8590L only.) |
| MKNOISE | Turns off noise markers. |
| MKOFF | |
| MKPAUSE | Turns off marker pause mode. |
| MKPX | Minimum excursion for peak identification is set to 6 dB. |
| MKREAD | Sets marker readouts to frequency. |
| MKTBL | Turns off the marker table. |
| MKTRACK | Turns off marker tracking. |
| MKTYPE | Sets the marker type as position type. |
| ML | Sets mixer level to -10 dBm. |
| MODE | Sets the operating mode to 0. |



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**IP Instrument Preset**

| | |
|---|---|
| MSI | Selects the spectrum analyzer memory as the mass storage device. |
| NDB | Sets the number of dB for the NDBPNT measurement to -3 dB. |
| PD | Puts pen down at current position. |
| PKDLMODE | Displays all the signal peaks in the peak table. |
| PKSORT | Sorts the signal peaks in the peak table by decreasing amplitude. |
| PKTBL | Turns off the peak table. |
| PKZOOM | Sets the final span for the peak zoom routine to 1 MHz. |
| QPOFFSET | Sets the QPOFFSET to 20. (Option 103 only.) |
| RB | Sets the resolution bandwidth to 3 MHz. |
| RL | Sets reference level to 0 dBm. |
| RLPOS | Sets the reference level position to 8. |
| ROFFSET | Sets reference offset to 0. |
| RQS 40 | Allows SRQ 110, SRQ 140 for illegal commands or broken hardware. |
| SPEAKER | Turns on the speaker. (Option 102, 103, or 301 only.) |
| SQLCH | Sets the squelch level to 0. (Option 102 or 103 only.) |
| SRCALC | Sets the source leveling control to internal. (Option 010 or 011 only.) |
| SRCNORM | Sets the source normalization to off. (Option 010 or 011 only.) |
| SRCPSWP | Sets the source power sweep to off. (Option 010 or 011 only.) |
| SRCPWR | Sets the source power level to -10 dBm. (Option 010 or 011 only.) |
| SS | Sets the center frequency step size to 100 MHz. |
| STATUS BYTE | Clear the status byte. |
| TH | One division above bottom graticule line, threshold line off. |
| TITLE | Clears the title from the spectrum analyzer screen. |
| TM | Selects free run trigger mode. |
| TDF | Selects parameter units output format. |
| TRB | Sets the trace values to 0. |
| TRC | Sets the trace values to 8000. |
| TVLINE | Sets TV line number to 17. (Options 101 and 102, or 301 only.) |
| TVSYNC | Triggers on negative polarity of the video modulation. (Options 101 and 102, or 301 only.) |
| VAVG | Turns off video averaging and sets the video averaging limit to 100. |
| VB | Sets the video bandwidth to 1 MHz. |
| VBR | Sets VBR to 0.300. |



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IP also clears all user graphics, all on-event algorithms, and turns off the windows display mode. (The on-event algorithms are ONCYCLE, ONDELAY, ONEOS, ONMKR, ONSRQ, ONSWP, and ONTIME.)

Instrument preset automatically occurs when you turn on the spectrum analyzer. IP is a good starting point for many measurement processes. When IP is executed remotely, the spectrum analyzer does not necessarily execute a complete sweep, however. You should execute a take sweep (TS) to ensure that the trace data is valid after an IP.

Note that ONPWRUP will be terminated, not erased, by performing one of the following:

- Pressing PRESET on the spectrum analyzer.
- Executing the universal HP-IB command DCL Device Clear.
- Executing the RS-232 command BREAK.

To remove ONPWRUP execute the DISPOSE ONPWRUP command.

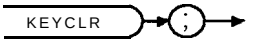


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# KEYCLR
# Key Clear

Clears **softkeys** 1 through 6 of menu 1.

## Syntax




XKEYCLR

Related Commands: DISPOSE, KEYDEF, KEYEXC, KEYLBL, SAVEMENU.

## Example 1

```
OUTPUT 718;"MENU 1;"
OUTPUT718;"KEYCLR;"
```

*Displays menu 1.*
*Erases softkeys 1 through 6 of menu 1.*

## Example 2

```
OUTPUT 718;"MENU 1;"          Displays menu 1.
OUTPUT 718;"SAVEMENU 101;"    Copies the softkey functions from menu 1 into menu 101.
OUTPUT 718;"KEYCLR;"          Erases the softkey functions of menu 1.
PAUSE
OUTPUT 718;"MENU 101;"        Displays menu 101.
```

## Description

The KEYCLR command clears **softkeys** 1 through 6. Use the DISPOSE command to clear a single **softkey**.

**Softkeys** 1 through 6 can be displayed by executing "MENU 1;" or by pressing (MEAS/USER), User Menus .

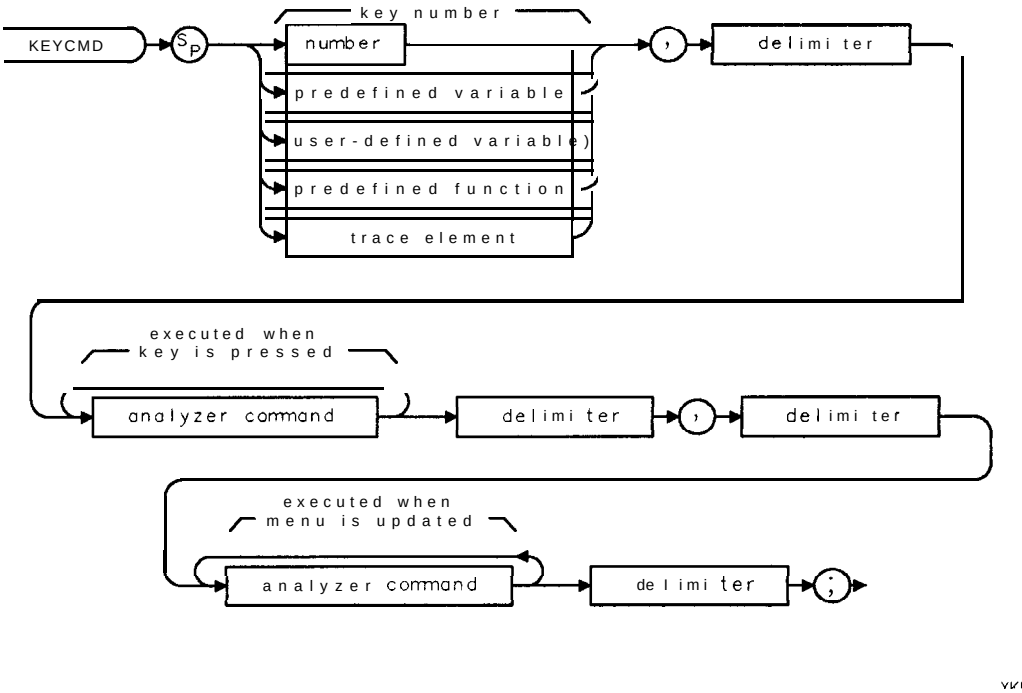


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# KEYCMD
# Key Command

Allows you define the function and label of a softkey. The softkey label is updated whenever a softkey is pressed.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined function | Function that returns a value. Refer to Table 5-l. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any valid integer. | 1 to 6, 601 to 1200 |
| Predefined variable | A command that act as a variable. Refer to Table 5-l. | |
| Analyzer command | Any valid spectrum analyzer command. | |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |

Related Commands: DISPOSE, ERASE, FUNCDEF, KEYENH, KEYEXC, KEYLBL.



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## Example 1

This example defines softkey 1. Softkey 1 has the label "QSAD" until it is pressed. When softkey 1 is pressed, the following changes occur: center frequency changes to 105.3 MHz, span changes to 300 kHz, and the label for softkey 1 changes from "QSAD" to "KSAD." If softkey 1 is pressed again, the center frequency changes to 100.1 MHz and the label changes back to "QSAD."

```
10 OUTPUT 718;"IP;"                          Initializes spectrum analyzer.
20 !
30 OUTPUT 718;"VARDEF C_OUNTRY,1;"           Defines variable called C_OUNTRY.
40 !
50 OUTPUT 718;"KEYCMD 1,";                   Defines softkey 1.
60 OUTPUT 718;"%";
70 OUTPUT 718;"IF C,OUNTRY,EQ,
   1;THEN;";
80   OUTPUT 718;"CF 105.3MHZ;SP 300KHZ;";
90   OUTPUT 718;"MOV C_OUNTRY,0;";
100 OUTPUT 718;"ELSE;";
110   OUTPUT 718;"CF 100.1MHZ;SP 300KHZ;";
120   OUTPUT 718;"MOV C_OUNTRY,1;";
130 OUTPUT 718;"ENDIF;";
140 OUTPUT 718;"%,";
150 OUTPUT 718;"@";
160 OUTPUT 718;"IF C_OUNTRY,EQ,0 THEN;";
170   OUTPUT 718;"KEYLBL 1,%KSAD%;";
180 OUTPUT 718;"ELSE;";
190   OUTPUT 718;"KEYLBL 1,%QSAD%;";
200 OUTPUT 718;"ENDIF;";
210 OUTPUT 718;"@;";
220 END
```

## Example 2

Softkey 2 has a softkey label, "COUNTRY YES NO." If the value of the variable COUNTRY is 1, then YES is underlined and label of softkey 1 is "QSAD." Pressing softkey 2 moves the underline to NO and changes the label of softkey 1 to "KSAD."

```
10    OUTPUT 718;"IP;"
20
30    Ul$=CHR$(16)
40    Off$=CHR$(15)
50
60    OUTPUT 718;"VARDEF C_OUNTRY,1;"
70    !
80    OUTPUT 718;"KEYCMD 1,";
90    OUTPUT 718;"%";
100   OUTPUT 718;"IF C_OUNTRY,EQ,Q THEN;";
110     OUTPUT 718;"MOV CF 105.3MHZ;MOV SP,300KHZ;";
120     OUTPUT 718;"MOV C_OUNTRY,0;";
130   OUTPUT 718;"ELSE;";
140     OUTPUT 718;"MOV CF 100.1MHA;MOV SP,300KHZ;";
150     OUTPUT 718;"MOV C_OUNTRY,1;";
160   OUTPUT718;"ENDIF;";
```



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```
170   OUTPUT 718;"%,";
180   OUTPUT 718;"@";
190   OUTPUT 718;"IF C_OUNTRY,EQ,0 THEN;";
200     OUTPUT 718;"KEYLBL 1,%KSAD%;";
210   OUTPUT 718;"ELSE;";
220     OUTPUT 718;"KEYLBL 1,%QSAD%;";
230   OUTPUT 718;"ENDIF;";
240   OUTPUT 718;"@;";
250   !
260   OUTPUT 718;"KEYCMD 2,";
270   OUTPUT 718;"%";
280   OUTPUT 718;"IF C_OUNTRY,EQ,1 THEN;";
290     OUTPUT 718;"MOVCF,105.3MHZ;MOV SP,300KHZ;";
300     OUTPUT 718;"MOV C_OUNTRY,0;";
310   OUTPUT 718;"ELSE;";
320     OUTPUT 718;"MOV CF,100.1MHZ;MOV SP,300KHZ;";
330     OUTPUT 718;"MOV C_OUNTRY,1;";
340   OUTPUT 718;"ENDIF;";
350   OUTPUT 718;"%,";
360   OUTPUT 718;"@";
370   OUTPUT 718;"KEYENH 2,";
380   OUTPUT 718;"/";
390   OUTPUT 718;"COUNTRY|";U1$;"YES";Off$;"NO";
400   OUTPUT 718;"/";
410   OUTPUT 718;",0,";
420   OUTPUT 718;"!";
430   OUTPUT 718;"IF C_OUNTRY,EQ,0";
440   OUTPUT 718;"!;";
450   OUTPUT 718;"@;";
460   !
470   END
```

## Description

The KEYCMD command updates the **softkey** label whenever the **softkey** is pressed (as shown in example 2).

The functions of KEYCMD and KEYDEF are similar. The advantage of KEYCMD is that the label of the **softkey** can change dependent on a conditional statement without the **softkey** itself being pressed. KEYCMD is useful for indicating the state of a function in the spectrum analyzer by changing the appearance of the **softkey**.



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**Softkey numbers:** When specifying the softkey number, you should only use a number from 1 through 6, or 601 through 1200. Using other than the recommended softkey numbers can cause undesirable results.

The softkey number corresponds to the menu number as follows:

softkey number = (menu number – 1) x 6 + softkey position
(The softkey position range is 1 through 6.)

For example:

Menu 1 contains softkey numbers 1 through 6
Menu 101 contains softkey numbers 601 to 606
Menu 200 contains softkey numbers 1195 to 1200

Menu 1 can be accessed by pressing (MEAS/USER), User Menus . Menus 101 through 200, as well as menu 1, can be accessed using the MENU command. See "MENU" for more information on accessing softkeys and menus.

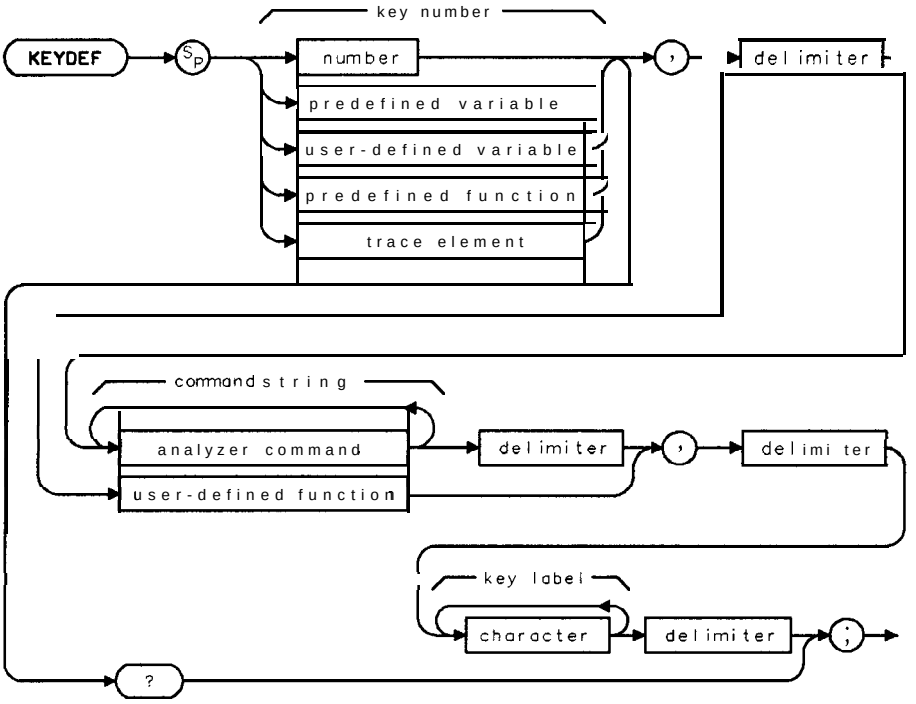


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# KEYDEF
# User-Defined Key Definition

Assigns a label and user-defined function to a softkey.

## Syntax




xkeydef



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**KEYDEF User-Defined Key Definition**

| Item | Description/Default | Range |
|---|---|---|
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined function | Function that returns a value. Refer to Table 5-l. | Any valid predefined function that returns a value within the softkey number range. |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any valid integer. | 1 to 6, 601 to 1200. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-l. | Any valid predeflned variable that returns a value within softkey number range. |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Analyzer command | Any valid spectrum analyzer command. | |
| User-defined function | A subroutine defined by the FUNCDEF command. | Any valid function name. |
| Character | Any valid character. Bee "LB" for additional characters and label functions. | 1 to 8 characters per label line, use the (\|) symbol or blank spaces to separate softkey label lines. |

Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: DISPOSE, ERASE, FUNCDEF, KEYEXC, KEYLBL.

## Example 1

Connect CAL OUT to the spectrum analyzer input.

```
OUTPUT 718;"IP;"                          Initializes spectrum analyzer.
OUTPUT 718;"FUNCDEF D_LP,@";              Defines a function called D-L?
OUTPUT 718;"CF 300MHZ;";                  Changes center frequency to measure the
                                          calibration signal.
OUTPUT 718;"SP 1MHZ;";                    Measures the calibration signal in narrow
                                          span.
OUTPUT 718;"@;"                           The "@" signifies the end of the function
                                          declaration.
OUTPUT 718;"KEYDEF 1,D_LP,%SHOW|CAL%;"    Softkey 1 will now have the "'SHOW CAL"
                                          label and perform the function D-LI?
OUTPUT 718;"KEYEXC 1;"                    Executes softkey 1.
```



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## Example 2

To redefine the command string without changing the label, enter a single blank space for the command string parameter. If you want to delete the command string and the **softkey** label, enter two or more blank spaces for the **softkey** label parameter.

| | |
|---|---|
| OUTPUT 718;"KEYDEF 2,%IP;CF 300MHZ;%,%MY KEY\|LABEL%;" | *Defines softkey 2.* |
| OUTPUT 718;"KEYDEF 2, ,%MY KEY\|LABEL%;" | *Removes the command string functions, but the softkey label remains on screen.* |
| OUTPUT 718;"KEYDEF 2, , ;" | *Removes the command string functions and the softkey label.* |

## Description

Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.



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**Softkey numbers:** When specifying the softkey number, you should only use a number from 1 through 6, or 601 through 1200. Using other than the recommended softkey numbers can cause undesirable results.

The softkey number corresponds to the menu number as follows:

softkey number = (menu number – 1) x 6 + softkey position
(The softkey position range is 1 through 6.)

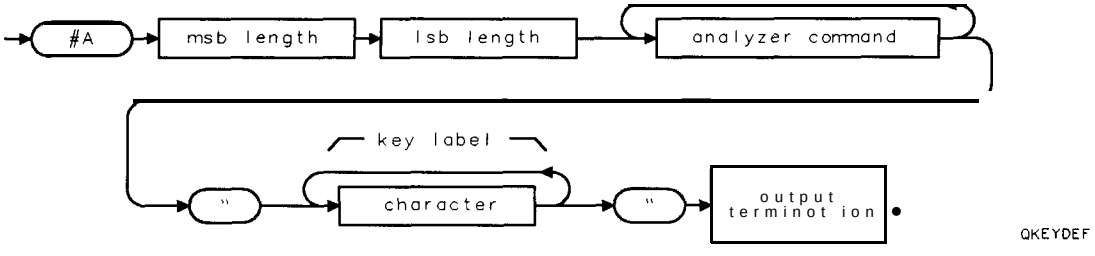
For example:

Menu 1 contains softkey numbers 1 through 6
Menu 101 contains softkey numbers 601 to 606
Menu 200 contains softkey numbers 1195 to 1200

Menu 1 can be accessed by pressing (MEAS/USER), User Menus . Menus 101 through 200, as well as menu 1, can be accessed using the MENU command. See "MENU" for more information on accessing softkeys and menus.

The softkey label and the command string can be deleted by entering blank spaces in the softkey label or command string. See example 2.

## Query Response



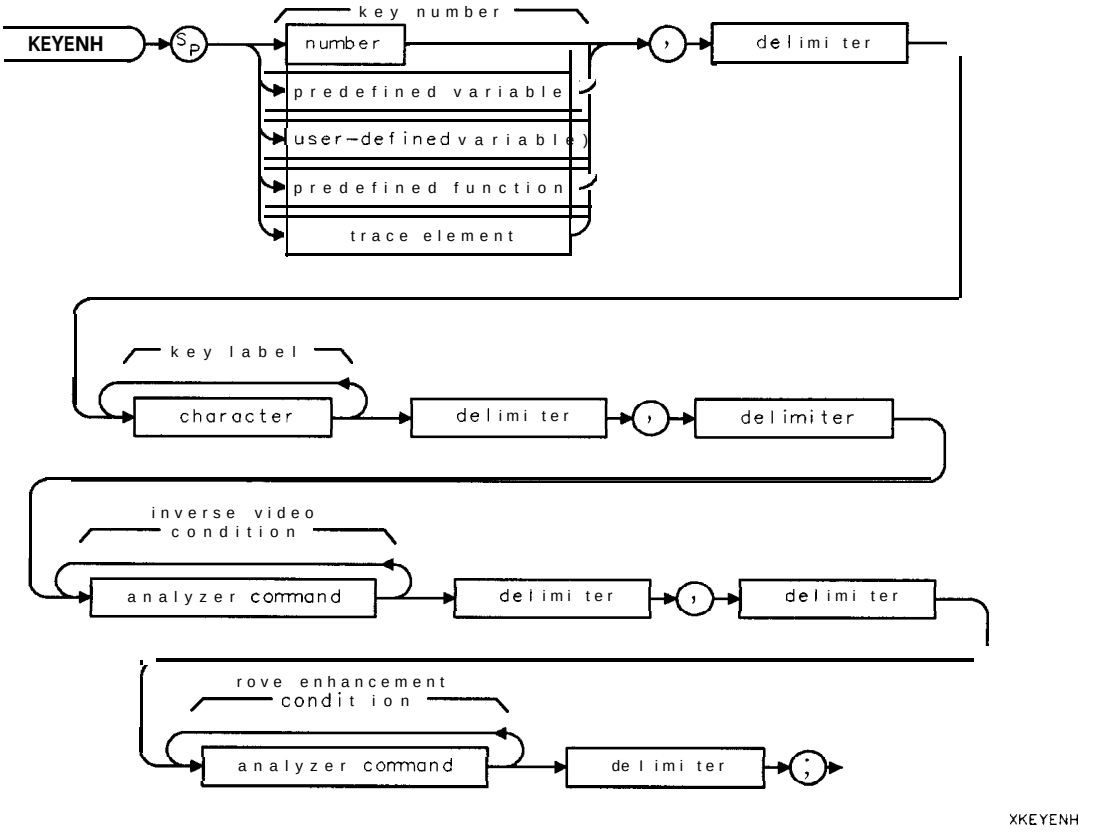



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# KEYENH
# Key Enhance

Allows you to activate inverse video mode or underline part or all of the softkey label.

## Syntax






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**KEYENH Key Enhance**

| Item | Description/Default | Range |
|---|---|---|
| User-defined variable | **A** variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined function | Function that returns a value. Refer to Table 5-1. | Any valid **predefined** function that returns a value within the **softkey** number range |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any valid integer. | 1 to 6, 601 to 1200. |
| **Predefined** variable | A command that act as a variable. Refer to Table 5-l. | Any valid predefined variable that returns **ε** value within **softkey** number range. |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ **\|** \ **@** = / ^ **$** % ; ! ' : **"** **&** |
| Character | Any valid character. gee "LB" for additional characters and label functions. | 1 to 8 characters per line, use the **(\|)** symbol or blank spaces to separate **softkey** label lines. |
| Analyzer command | Any valid spectrum analyzer command. | |

Related Commands: DISPOSE, ERASE, FUNCDEF, KEYCMD, KEYEXC, KEYLBL.

## Example 1

The following program lines show two different ways of using KEYENH to underline "OFF" in the **softkey** label.

```
OUTPUT 718;"KEYENH 2,@ON ";CHR$(16);"OFF";
CHR$(15);"@,0,0;"
```

*Underlines the "OFF" section of the label. Notice that the **move** enhancement condition is **false**, and **CHR$(16)** and **CHR$(15)** control the "OFF" section of the **softkey** label.*

```
OUTPUT 718;"KEYENH 2,@";CHR$(16);"ON";
CHR$(15);" OFF@,0,1;"
```

*Underlines the "OFF" section of the **label**. Notice that the **move** enhancement condition is **true**, and **CHR$(16)** and **CHR$(15)** control the "ON" section of the **softkey** label.*

The following program lines show two different ways of using KEYENH to underline "ON" in the **softkey** label.

```
OUTPUT 718;"KEYENH 2,@";CHR$(16);"ON";CHR$(15);
" OFF@,0,0;"
```

*Underlines the "ON" section of the **label**.*

```
OUTPUT 718;"KEYENH 2,@ON";CHR$(16);"OFF";
CHR$(15);"@,0,1;"
```

*Underlines the "ON"* section of *the* label.



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## Example 2

Use the KEYENH command to turn on inverse video for the upper label line of softkey number 1.

```
Ul$=CHR$(16)
```
*Defines UL$ as the character to turn the underline on.*

```
Off$=CHR$(15)
```
*Defines OFF$ as the character to turn off inverse video and underlining.*

```
OUTPUT 718;"VARDEF I_NV,0;"
```
*The value of I-NV acts as a inverse video condition.*

```
OUTPUT 718;"VARDEF M_OVENH,0;"
```
*The value of M_OVENH acts as the move enhancement condition.*

```
OUTPUT 718;"KEYENH 1,%MY KEY|";Ul$;"ON";Off$;" OFF%,@IF 0,
EQ,I_NV@,@IF 0,EQ,M_OVENH@;"
```
*The MY KEY label line changes to inverse video, and OFF (in the lower label line) is underlined.*

## Example 3

Changing the condition of the inverse video mode to false turns off the inverse video.

```
Ul$=CHR$(16)
```
*Defines UL$ as the character to turn the underline on.*

```
Off$=CHR$(15)
```
*Defines OFF$ as the character to turn off inverse video and underlining.*

```
OUTPUT 718;"MOV I_NV,0;"
OUTPUT 718;"MOV M_OVENH,1;"
```
*Changes the conditional value of M_OVENH.*

```
OUTPUT 718;"KEYENH 1,%MY KEY|";Ul$;"ON";Off$;" OFF%,@IF 0,
EQ,I_NV@,@IF 0,EQ,M_OVENH@;"
```
*The ON portion of the lower label is underlined, the MY KEY portion of the label is still in inverse video.*



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## Example 4

Omitting **Ul$** and **Off$** turns on inverse video for the upper and lower **softkey** label lines.

```
Ul$=CHR$ (16)                                    Defines UL$ as the character to turn the underline
                                                 on.
Off$=CHR$(15)                                    Defines OFF$ as the character to turn off inverse
                                                 video and underlining.
OUTPUT 718;"MOVI_NV,0;"
OUTPUT 718;"MOVM_OVENH,1;"
OUTPUT 718;"KEYENH 1,%MY KEY|ON OFF%,@IF 0, EQ,I_NV@,@IF MY KEY and ON OFF are
0,EQ,M_OVENH@;"                                  displayed in inverse video.
```

## Description

The KEYENH command has two parameters (inverse video condition and move enhancement condition). Setting these parameters to true or false controls how the **softkey** label is displayed. The **softkey** label can be displayed with sections of the label in inverse video or underlined.

If the inverse video condition for the **softkey** label is true, the following occurs:

- The top line of the **softkey** label is displayed in inverse video (see example 2).
- If there are no enhancements embedded in the **softkey** label for the second line of the **softkey** label, the second line of the **softkey** label is displayed in inverse video. (See example 4). (See the following section, "Using Enhancements," for more information about enhancements.)

If the inverse video condition for the **softkey** label is false, the inverse video is not used and the **softkey** label appears as specified by the move enhancement condition.

If the move enhancement condition is true, the following occurs:

- If no enhancements are used in the **softkey** label, the last line of the **softkey** label is underlined.
- If enhancements are used in the **softkey** label, the enhancement (inverse video or underlining) is moved to the other side of the **softkey** label.

If the move enhancement condition for the **softkey** label is false, the **softkey** label appears as specified by the inverse enhancement condition.

## Using Enhancements

An alternate way to control underlining and inverse video is to use "codes" to separate sections of a **softkey** label.

- If you want to underline different sections of the **softkey** label, use code **CHR$(16)** (turns on underlining) and **CHR$(15)** (turns off the enhancements).
- If you want to use inverse video on different sections of the **softkey** label, use code **CHR$(14)** (turns on inverse video) and **CHR$(15)** (turns off enhancements).

Example 1 demonstrates that there are two ways to underline the "OFF" section of **softkey** label using enhancements.

The recommended convention for using inverse video and underlining is to use inverse video to indicate an active function and underlined labels to show a choice.



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**Softkey numbers:** When specifying the softkey number, you should only use a number from 1 through 6, or 601 through 1200. Using other than the recommended softkey numbers can cause undesirable results. The softkey number corresponds to the menu number as follows:

softkey number = (menu number – 1) x 6 + softkey position
(The softkey position range is 1 through 6.)

For example:

Menu 1 contains softkey numbers 1 through 6
Menu 101 contains softkey numbers 601 to 606
Menu 200 contains softkey numbers 1195 to 1200

Menu 1 can be accessed by pressing (MEAS/USER), User Menus . Menus 101 through 200, as well as menu 1, can **be** accessed using the MENU command. See "MENU" for more information on accessing softkeys and menus.

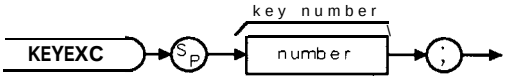


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# KEYEXC
## Key Execute

Executes the specified, previously defined softkey.

### Syntax




XKEYEXC

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer | 1 to 6, 601 to 1200. |

Related Commands: DISPOSE, ERASE, FUNCDEF, KEYDEF, KEYLBL.

### Example

```
OUTPUT 718;"FUNCDEF D_LP,@";
OUTPUT 718;"CF 300MHZ;";
OUTPUT 718;"SP 1MHZ;";
OUTPUT 718;"@;"
OUTPUT 718;"KEYDEF 1,D_LP,%SHOW CAL%;"
OUTPUT 718;"KEYEXC 1;"
```

*Defines a function called D_LP.*
*Changes center frequency to measure the calibration signal.*
*Measures the calibration signal in narrow span.*
*The "@" signifies the end of the function declaration.*
*Softkey 1 will now have the "SHOW CAL." label and perform the function D_LP.*
*Executes softkey 1.*

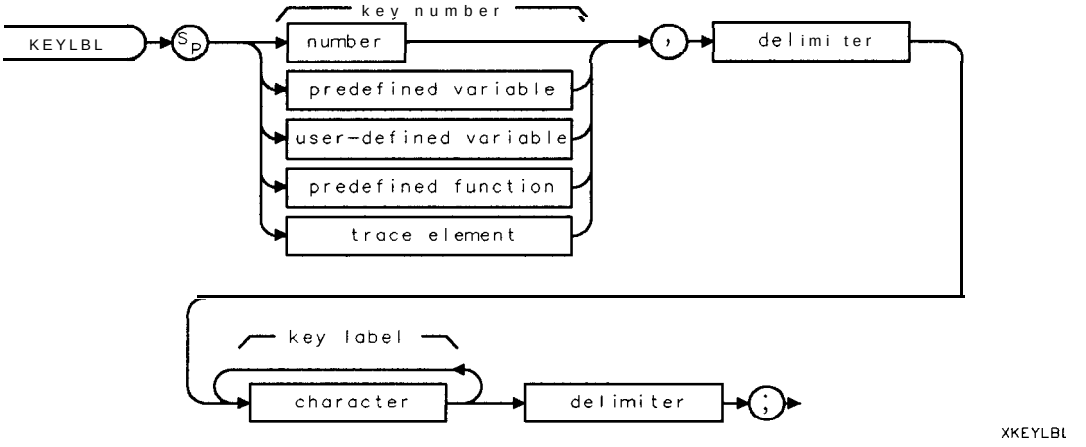


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# KEYLBL
# Key Label

Relabels a **softkey** without changing its function.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| **Predefined** function | Function that returns a value. Refer to **Table** 5-l. | |
| **Trace** element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| **Number** | Any valid integer. | 1 to 6, 601 to 1200. |
| **Predefined** variable | A command that acts as a variable. Refer to Table 5-1. | |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' " & |
| **Character** | Any valid character. See "LB" for additional characters and label functions. | 1 to 8 characters per label line, use the (\|) symbol or blank spaces to separate **softkey** label lines. |

Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: DISPOSE, ERASE, FUNCDEF, KEYDEF, KEYEXC, KEYLBL.

## Example

Connect CAL OUT to the spectrum analyzer input.

```
10 OUTPUT 718;"FUNCDEF D_LP,@";
```
*&fines a function called D_LP. The "@" symbol indicates the beginning of the function.*

```
20 OUTPUT 718;"CF 300MHZ;";
```
*Changes center frequency to measure the calibration signal.*

```
30 OUTPUT 718;"SP 1MHZ;";
```
*Measures the calibration signal in narrow span.*



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```
40 OUTPUT 718;"@;"                          The "@" signifies the end of the function
                                            declaration.
50 OUTPUT 718;"KEYDEF 1,D_LP,%SHOW CAL%;"   Softkey 1 is now called "'SHOW CAL" and
                                            performs the function D_LP.
60 OUTPUT 718;"KEYEXC 1;"                   Executes softkey 1.
70 OUTPUT 718;"KEYLBL 1,%NEW NAME%;"        Softkey 1 is now labeled "NEW NAME",
                                            but performs the same function.
80 END
```

## Description

When specifying the **softkey** number, you should only use a number from 1 through 6, or 601 through 1200. Using other than the recommended **softkey** numbers can cause undesirable results.

The **softkey** number corresponds to the menu number as follows:

**softkey** number = (menu number – 1) x 6 + **softkey** position
(The **softkey** position range is 1 through 6.)

For example:

Menu 1 contains **softkey** numbers 1 through 6
Menu 101 contains **softkey** numbers 601 to 606
Menu 200 contains **softkey** numbers 1195 to 1200

Menu 1 can be accessed by pressing (MEAS/USER), User **Menus** . Menus 101 through 200, as well as menu 1, can be accessed using the MENU command. See "MENU" for more information on accessing **softkeys** and menus.

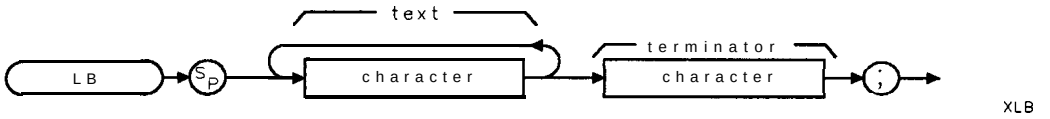


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# LB
# Label

Writes text (label) at the current pen position. The text consists of alphanumeric characters specified in the character field.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Character (text) | Any valid character. See "LB" for additional characters available. | |
| Character (delimiter) | Any valid character declared as a delimiter by the DT command. | |

Prerequisite Command: DT.
Related Commands: TEXT, TITLE.

## Example

```
10 OUTPUT 718;"IP;"                          Initializes spectrum analyzer.
20 OUTPUT 718;"BLANK TRA;ANNOT OFF;"         Clears trace and annotation from the
                                             spectrum analyzer screen.
30 OUTPUT 718;"DT@;"                         Establishes @ as the termination of the
                                             label text.
40 OUTPUT 718;"PU;PA 75,175;LB LABEL@;"      Displays "'LABEL" on the spectrum an-
                                             alyzer screen.
50 OUTPUT 718;"PU;PA 75,150;LB";             Displays the dollar sign "$" on the
   CHR$(36);"@;"                             spectrum analyzer screen. The semi-
                                             colons before and after CHR$(36) pre-
                                             vent the computer from performing a
                                             line feed.
60 OUTPUT 718;"PU;PA 75,125;LB";CHR$(16);    Underlines the text.
   "AN UNDERLINED LABEL";CHR$(15);"@;"
70 OUTPUT 718;"PU;PA 75,100;LB";CHR$(14);    Displays the text in inverse video.
   "A LABEL IN INVERSE VIDEO";CHR$(15);"@;"
80 END
```



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## Description

Each text character is specified by 8 bits in an 8 bit data byte, which immediately follows the LB command. Additional characters can be displayed using CHR$(code) where code represents the ASCII code. (See line 50 of the example.) Refer to the following tables for additional characters and label functions available.

LB displays the text at the current pen position. When using LB, the end of the text characters must be terminated. If the text is not terminated, instructions and other text following the actual label's statement are displayed on the spectrum analyzer screen. The label mode can always be terminated with an ASCII end-of-text code (decimal code 3), or with a character specified previously by the DT command. The terminator character itself must immediately follow the label.

To remove the text written by the LB command, write spaces over the text or use the CLRDSP command.

The LB command also enters the text into the display list. See "DA" for more information about the display list.



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**Table 5-6. Character Set**

| Code | Char | Code | Char | Code | Char | Code | Char | Code | Char |
|---|---|---|---|---|---|---|---|---|---|
| 32 | space | 73 | I | 114 | r | 190 | ≥ | 237 | μ |
| 33 | ! | 74 | J | 115 | s | 191 | | 238 | ν |
| 34 | " | 75 | K | 116 | t | 192 | ∠ | 239 | 0 |
| 35 | # | 76 | L | 117 | u | 193 | A | 240 | π |
| 36 | $ | 77 | M | 118 | v | 194 | ∫ | 241 | e |
| 37 | % | 78 | N | 119 | w | 195 | ¢ | 242 | ϱ |
| 38 | & | 79 | O | 120 | x | 196 | V | 243 | σ |
| 39 | ' | 80 | P | 121 | Y | 199 | g | 244 | τ |
| 40 | ( | 81 | Q | 122 | z | 200 | h | 245 | υ |
| 41 | ) | 82 | R | 123 | { | 201 | ↑ | 246 | |
| 42 | * | 83 | S | 125 | } | 204 | L | 247 | w |
| 43 | + | 84 | T | 126 | | 205 | n | 248 | Γ |
| 44 | , | 85 | U | 160 | A | 206 | n | 249 | 6 |
| 45 | – | 86 | V | 162 | ¨ | 207 | o | 250 | Ω |
| 46 | | 87 | W | 163 | ≠ | 208 | p | 251 | σ |
| 47 | / | 88 | X | 164 | £ | 209 | ∞ | 252 | A |
| 48 | 0 | 89 | Y | 165 | ∝ | 210 | r | 253 | Υ |
| 49 | 1 | 90 | Z | 166 | ⊕ | 211 | S | 254 | Ξ |
| 50 | 2 | 91 | [ | 167 | | 212 | T | | |
| 51 | 3 | 92 | \ | 168 | ← | 213 | A | | |
| 52 | 4 | 93 | ] | 169 | → | 214 | V | | |
| 53 | 5 | 94 | | 170 | § | 216 | ⊦ + = + + | | |
| 54 | 6 | 95 | | 171 | ± | 217 | " | | |
| 55 | 7 | 96 | ` | 172 | ↓ | 218 | | | |
| 56 | 8 | 97 | a | 173 | | 219 | π | | |
| 57 | 9 | 98 | b | 174 | X | 220 | θ | | |
| 58 | | 99 | c | 175 | ÷ | 221 | ψ | | |
| 59 | , | 100 | d | 176 | 0 | 222 | ϕ | | |
| 60 | < | 101 | e | 177 | 1 | 224 | φ | | |
| 61 | = | 102 | f | 178 | 2 | 225 | α | | |
| 62 | > | 103 | g | 179 | 3 | 226 | β | | |
| 63 | ? | 104 | h | 180 | -1 | 227 | χ | | |
| 64 | @ | 105 | i | 181 | 2 | 228 | Δ | | |
| 65 | A | 106 | j | 182 | 3 | 229 | ϵ | | |
| 66 | B | 107 | k | 183 | √ | 230 | ϕ | | |
| 67 | C | 108 | l | 184 | | 231 | γ | | |
| 68 | D | 109 | m | 185 | ≃ | 232 | η | | |
| 69 | E | 110 | n | 186 | // | 233 | L | | |
| 70 | F | 111 | o | 187 | ∴ | 234 | ζ | | |
| 71 | G | 112 | p | 188 | ≤ | 235 | κ | | |
| 72 | H | 113 | q | 189 | ≡ | 236 | λ | | |



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**Table 5-7. Label Functions**

| Code | Function | Description |
|---|---|---|
| 8 | back space | Positions the pen back one character width. |
| 10 | line feed | Positions the pen position down one character height. |
| 11 | vertical tab | Positions the pen up one character height. |
| 12 | form feed | Position the pen to the upper-left comer of the display. |
| 13 | carriage return | Positions the pen at the far left side of the display. |
| 14 | inverse video on | Turns on inverse video. |
| 15 | enhancements off | Turns off underlining or inverse video. |
| 16 | underlining on | Turns on underlining. |



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# LF
# Base Band Instrument Preset

Performs an instrument preset into base band (band 0).

## Syntax




XLF

Model Required: HP 8592L, HP 85933, HP 85953, HP 85963.
Related Commands: IP.

## Example

```
OUTPUT 718;"LF;"
```

## Description

Use LF instead of instrument preset (IP) if harmonic band 0 is desired. Using LF instead of IP reduces the wear on an internal spectrum analyzer switch (the RF switch).

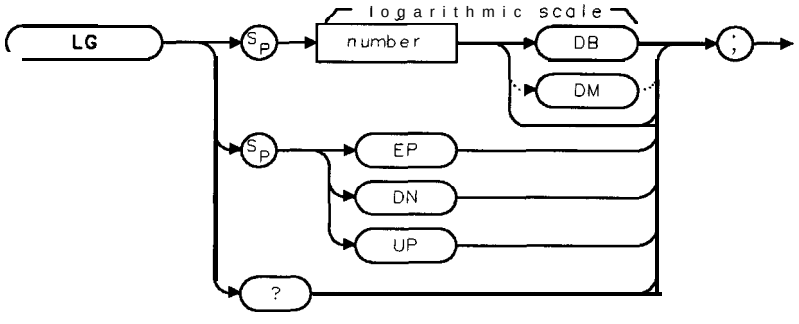


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# LG
# Logarithmic Scale

Specifies the vertical graticule divisions as logarithmic units, without changing the reference level.

## Syntax




XLG

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default units are dB. | 0.1 to 20 dB. |

Equivalent Softkey: SCALE LOG LIN (when LOG is underlined).
Preset State: 10 dB.
Related Commands: LN.

## Example

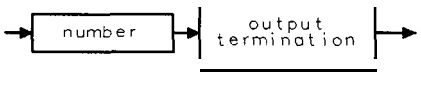
```
OUTPUT 718;"LG 1DB;"
```

## Description

The vertical scale can be specified (in tenths) from 0.1 to 0.9 dB, or in integers from 1 to 20 dB per graticule division.

If LG is used as the destination in a MOV command, it changes the log scale, but does not change the scale from linear to logarithmic.

## Query Response




QQ1



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# LIMIDEL
# Delete Limit-Line Table

Deletes all upper and lower segments in the current limit-line table.

## Syntax




XLIMIDEL

Equivalent **Softkey:** PURGE LIMITS .

Related Commands: LIMIFT, LIMIHI, LIMILO, LIMIREL, LIMISEG, LIMISEGT, SEGDEL, SENTER, SENTERT.

## Example

```
OUTPUT 718;"LIMIDEL;"
```

## Description

Use LIMIDEL before entering a new limit line.

**Note** Use STOR, SAVET, or SAVRCLW if you want to save the current limit-line table. LIMIDEL does not affect stored limit-line data.

LIMIDEL sets LIMIREL OFF (specifies that the limit line is fixed) and LIMIFT FREQ (specifies that the limit line is based on frequency). See “LIMILINE” for more information about limit line construction.

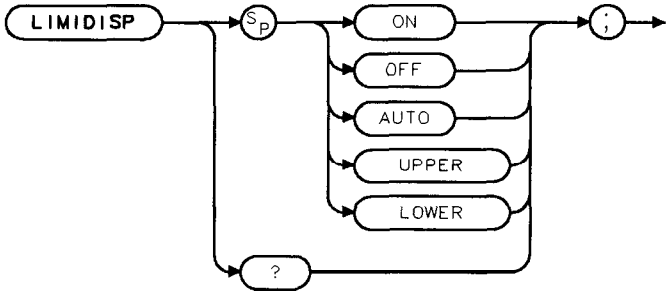


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# LIMIDISP
## Limit Line Display

Controls when the limit line (or limit lines) are displayed.

### Syntax




Equivalent Softkey: LMT DISP Y N AUTO .
Preset Value: AUTO.
Related Commands: ANLGPLUS, LIMILINE, LIMITEST.

### Example

OUTPUT 718; "LIMIDISP ON;" *Displays any portion of the limit lines that are currently within the spectrum analyzer screen boundaries.*

### Description

If a limit line is currently in spectrum analyzer memory, you can use LIMIDISP to control the display of the limit lines. The parameters of LIMIDISP do the following:

| | |
|---|---|
| ON | Turns on the limit line display. |
| OFF | Turns off the limit line display. |
| AUTO | Allows LIMITEST to control the display of the limit lines. If LIMITEST is on, the limit lines will be displayed. If LIMITEST is off, the limit lines will not be displayed. |
| UPPER | Displays the upper limit line only. |
| LOWER | Displays the lower limit line only. |

**Note** Turning on Analog+ display mode changes the way that LIMIDISP functions as follows:

- LIMIDISP ON, LIMIDISP LOWER, and LIMIDISP UPPER do not work when the Analog+ display mode is turned on.
- LIMIDISP AUTO will still perform the limit line test if LIMITEST is on, but the limit lines will not be displayed.

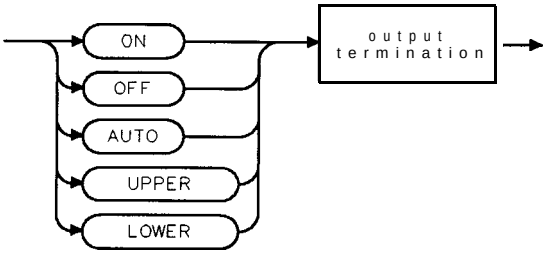


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When used as a predefined variable, LIMIDISP returns a number from 0 to four, depending on the setting of the LIMIDISP parameter. The number corresponds to the LIMIDISP parameter as shown in the following table.

| LIMIDISP Parameter | Value Returned |
|---|---|
| OFF | 0 |
| UPPER | 1 |
| LOWER | 2 |
| ON | 3 |
| AUTO | 4 |

## Query Response




QLIMIDISP

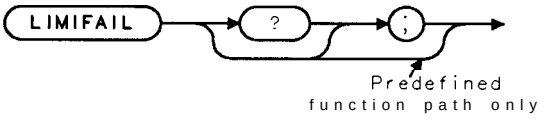


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# LIMIFAIL
## Limits Failed

Returns a "0" ifthelastmeasurementsweep of trace A is equal to or within the limit-line bounds.

### Syntax




XLIMIFAIL

Related Commands: LIMIHI, LIMILINE, LIMILO, LIMISEG, LIMISEGT, LIMITEST, SENTER, SENTERT.

### Example

```
10   OUTPUT718;"IP;SNGLS;CF300MHZ;SP100MHZ;"
20   OUTPUT718;"LIMIDEL;"
30   OUTPUT718;"LIMIMODE UPPER;"
40   OUTPUT718;"LIMISEG250MHZ,-60DB,FLAT;"
50   OUTPUT 718;"LIMISEG 290MHZ,-60DB,SLOPE;"
60   OUTPUT718;"LIMISEG 295MHZ,-15DB,FLAT;"
70   OUTPUT 718;"LIMISEG 305MHZ,-15DB,SLOPE;"
80   OUTPUT 718;"LIMISEG 310MHZ,-60DB,FLAT;"
90   OUTPUT 718;"LIMISEG 910MHZ,-60DB,FLAT;"
100  OUTPUT 718;"LIMITEST ON;TS;"
110  OUTPUT718;"LIMIFAIL?;"
120  ENTER 718;A
130  DISP A
140  END
```

*Initializes spectrum analyzer and changes the frequency and span settings.*

*Deletes any limit-line tables, sets the table type to fixed.*

*Specifies the upper limit-line table.*

*Creates an entry for the upper limit-line table. Because the LIMISEG command is used, the limit-line will be boxed on the frequency.*

*Turns on limit-line testing.*

*Returns the status of the limit-line testing.*

*Displays the result.*



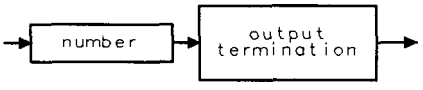
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## Description

LIMIFAIL returns one of the following values:

0 indicates that the measurement sweep was within the limit-line bounds.
**1** indicates that the measurement sweep failed the lower limit.
2 indicates that the measurement sweep failed the upper limit.
3 indicates that the measurement sweep failed both the lower and upper limits.
4 indicates that no test was performed. A “4” is returned if LIMITEST is set to OFF.

## Query Response




QQ1

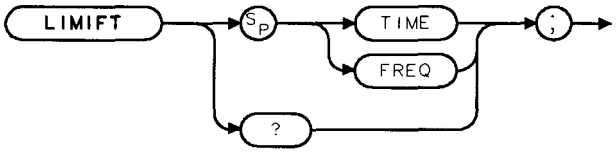


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# LIMIFT
## Select Frequency or Time Limit Line

Selects how the limit-line segments are defined: according to frequency, or according to the sweep time setting of the spectrum analyzer.

### Syntax




XLIMIFT

Equivalent **Softkey**: LIMIFT is equivalent to LIMITS **FRQ** TIME.

Related Commands: LIMIDEL, LIMILINE, LIMIMODE, LIMIREL, LIMISEG, LIMISEGT, SEGDEL, SENTER, SENTERT.

### Example

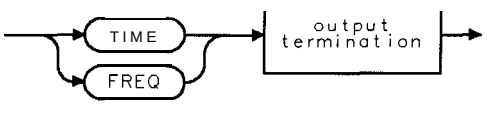
```
OUTPUT 718;"LIMIFT TIME;"
```

*If the current* limit-line *table is a frequency* limit-line *table, it is purged. LIMIFT TIME places the limit-line segments on the spectrum analyzer display with respect to the sweep time of the spectrum analyzer:*

### Description

If you execute "LIMIFT TIME;", LIMISEGT, or SENTERT, the limit-line segments are placed on the spectrum analyzer display with respect to the sweep time setting of the spectrum analyzer. If you execute "LIMIFT FREQ;", LIMISEG, or SENTER, the limit-line segments are placed according to the frequency that is specified for each segment. If a limit line has already been defined, changing the **LIMIFT** setting clears the existing limit line.

### Query Response




QLIMIFT

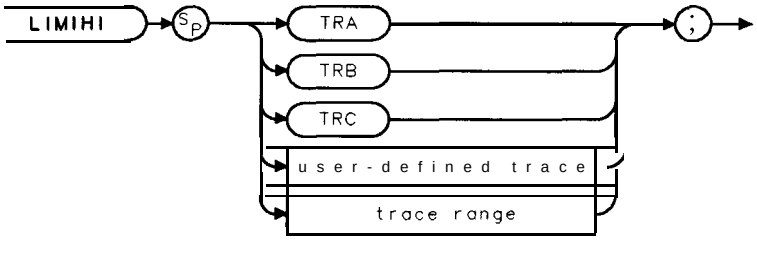


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# LIMIHI
# Upper Limit

Allows you to specify a fixed trace as the upper limit line.

## Syntax




Related Commands: IP, LIMIDEL, LIMIFAIL, LIMILO, LIMISEG, LIMITEST, SENTER.

## Example

```
10    OUTPUT 718;"TRDEF M_ASK,401;"          Defines a trace called "M-ASK."
20    OUTPUT 718;"MOV M_ASK[1,100],1000;"    Moves values into sections of the M-ASK
                                             trace.
30    OUTPUT 718;"MOV M_ASK[101,200],2000;"
40    OUTPUT 718;"MOV M_ASK[201,300],3000;"
50    OUTPUT 718;"MOV M_ASK[301,401],4000;"
60    OUTPUT 718;"LIMIHI M-ASK;"             Specifies M-ASK as the upper limit
                                             line.
70    OUTPUT 718;"LIMITEST ON;"              Turns on limit-line testing.
80    OUTPUT718;"LIMIFAIL?;"                 Tests if trace A fails limit-line testing.
90    ENTER 718;A
100   DISP A                                 Displays result of limit-line testing.
110   END
```

## Description

Unlike specifying a limit line with LIMISEG, LIMISEGT, SENTER, or SENTERT, the limit line specified with LIMIHI is *not* updated if the center frequency, frequency span, sweep time, or reference level are changed.

**Note** Executing IP, LIMIDEL, LIMISEG, LIMISEGT, SENTER, or SENTERT will delete the limit line specified with LIMILO or LIMIHI. Executing LIMILO or LIMIHI will delete the limit line specified with LIMISEG, LIMISEGT, SENTER, or SENTERT.

Use LIMITEST ON to display the limit line trace specified by LIMIHI. Use LIMITEST OFF to blank the limit line trace specified by LIMIHI.

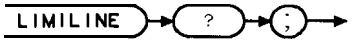


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# LIMILINE
## Limit Lines

Outputs the current limit-line table definitions.

### Syntax




XLIMILINE

Related Commands: LIMIFI', LIMIREL, LIMIMODE, LIMIREL, LIMISEG, LIMISEGT, LIMITEST, SAVRCLW, SENTER, SENTERT.

### Example

```
10    DIM States$[2000]                          Dimensions an array to store the
                                                 limit-line information.
20    OUTPUT718;"IP;CF300MHZ;SP100MHZ;"          Initializes spectrum analyzer.
30    OUTPUT718;"LIMIDEL;"                       Deletes any limit-line tables, sets
                                                 the table type to fixed.
40    OUTPUT 718;"LIMIMODE UPPER;"               Specifies the upper limit-line table.
45    OUTPUT 718;"LIMIFT FREQ;"                  Selects a limit line based on frequency.
50    OUTPUT 718;"LIMISEG 250MHZ,-60DB,FLAT;"    Enters a value for the upper limit-
                                                 line table. Because the LIMISEG
                                                 command is used, the limit-line
                                                 segment is for a limit-line based
                                                 on frequency.
60    OUTPUT 718;"LIMISEG 290MHZ,-60DB,SLOPE;"
70    OUTPUT 718;"LIMISEG 295MHZ,-15DB,FLAT;"
80    OUTPUT 718;"LIMISEG 305MHZ,-15DB,SLOPE;"
90    OUTPUT 718;"LIMISEG 310MHZ,-60DB,FLAT;"
100   OUTPUT 718;"LIMISEG 910MHZ,-60DB,FLAT;"
110   OUTPUT718;"LIMILINE?;"                     Gets the current limit-line table
                                                 definitions.
120   ENTER 718 USING "#,-K";States$             Enters information into array.
130   PRINT States$                              Prints the current limit-line table
                                                 definitions.
140   END
```



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## Description

LIMILINE is used to query the current limit line. Executing LIMILINE returns an ASCII string containing the commands needed to create the limit line.

Use these commands (in the order given) to build a limit line:

1. Use LIMIDEL to clear the limit-line table.
2. Use LIMIFT to select a limit line that is either based on frequency or sweep time.
3. Use LIMIREL to determine whether the values of the limit line are absolute values or positioned relative to the reference-level and center-frequency settings.
4. Use LIMIMODE, LIMISEG, LIMISEGT, SENTER, SENTERT to enter the limit-line segments. (Use LIMISEG or SENTER for a limit-line based on frequency; use LIMISEGT or SENTERT for a limit-line based on sweep time.)
5. Use the LIMIDISP command to select if the limit line is displayed or not.
6. Use the LIMITEST command to turn on limit-line testing.
7. Use the LIMIFAIL command to determine if the measurement sweep passed or failed the limit line boundaries.

**Enabling limit-line testing:** When limit testing is enabled, the segments in the current table are interpolated into the limit-line traces according to the current span and center frequency or sweep time of the spectrum analyzer. After the sweep, each value in trace A is compared to its corresponding value in the limit-line traces. If the current limit-line table is empty (for instance after using the command LIMIDEL) and limit testing is enabled, then the limit-line traces are blanked and set to out-of-range values. By using the SUB, MKPK HI, and MKF? commands, you can read the point of greatest difference between the trace and limit line. See “LIMITEST” for more information about limit-line testing.

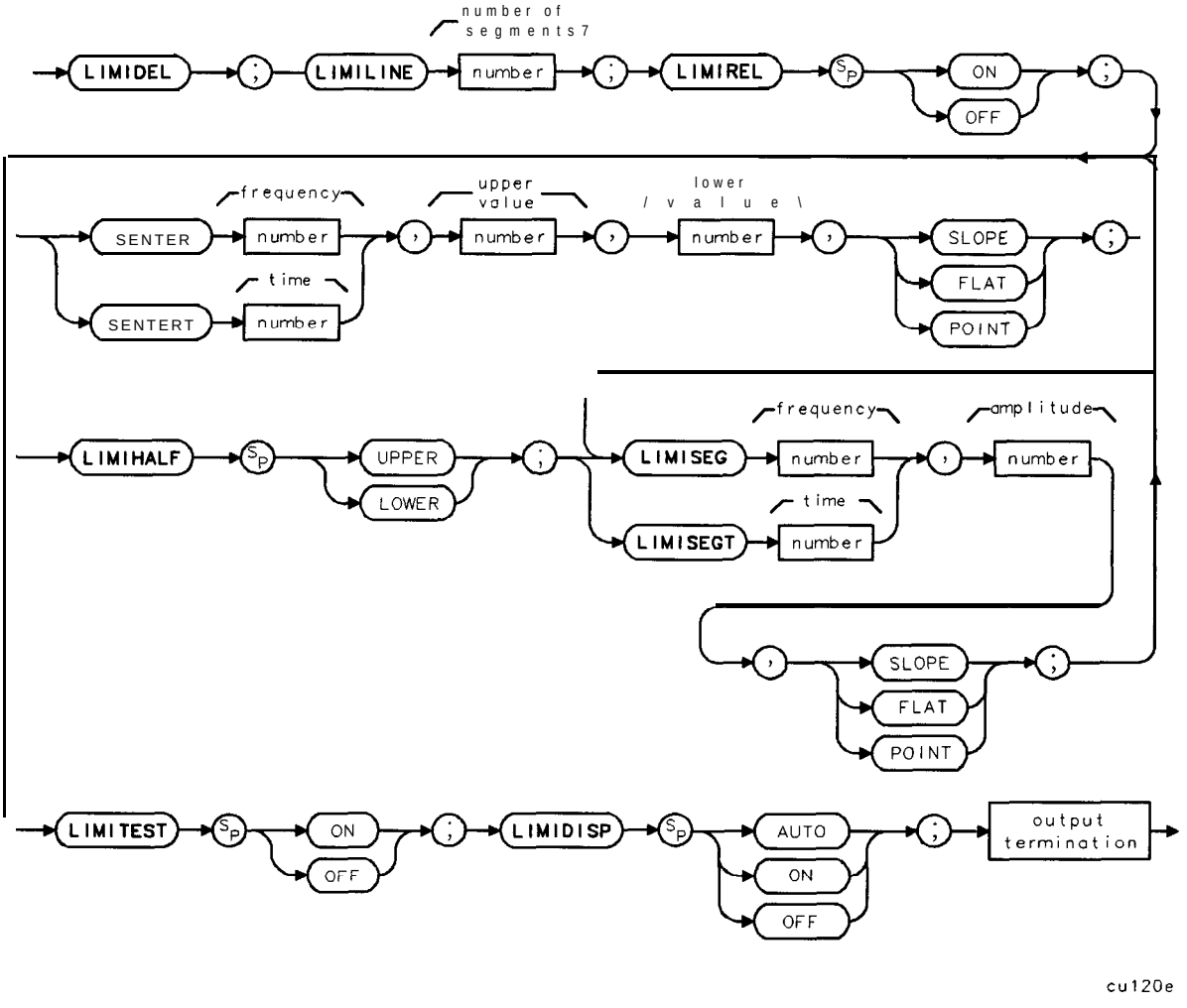
**Saving the limit line table:** Once you have built the limit line, you can save the limit-line table on a memory card or in spectrum analyzer memory. Use the STOR or SAVRCLW commands to store the current limit-line table on the memory card. Use SAVET or SAVRCLW to store the limit-line table in spectrum analyzer memory.

## Query Response

The query response is a character string consisting of LIMILINE, LIMIREL, LIMIMODE, LIMIHALF, LIMISEG, LIMISEGT, SENTER, or SENTERT commands. LIMIMODE returns the number of for the current limit-line table. (The LIMIHALF command is for backward compatibility; it is not used as an HP 8590 Series spectrum analyzer programming command.)



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cu120e

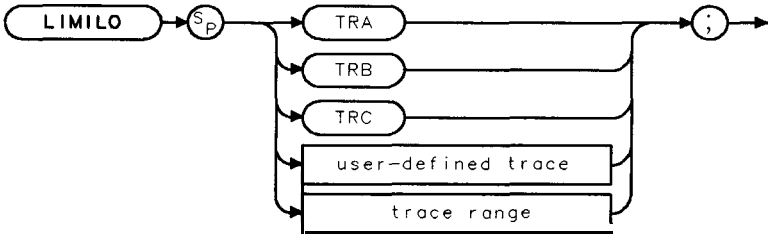


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# LIMILO
# Lower Limit

Allows you to specify a fixed trace as the lower limit line.

## Syntax




Related Commands: **IP**, LIMIDEL, LIMIFAIL, LIMISEG, LIMITEST, SENTER.

## Example

```
10    OUTPUT 718;"TRDEF M_ASK,401;"          Defines a trace called "M_ASK."
20    OUTPUT 718;"MOV M_ASK[1,100],1000;"    Moves values into sections of the M-ASK
                                             trace.
30    OUTPUT 718;"MOV M_ASK[101,200],2000;"
40    OUTPUT 718;"MOV M_ASK[201,300],3000;"
50    OUTPUT 718;"MOV M_ASK[301,401],4000;"
60    OUTPUT 718;"LIMILO M-ASK;"             Specifies M-ASK as the lower limit
                                             line.
70    OUTPUT 718;"LIMITEST ON;"              Turns on limit-line testing.
80    OUTPUT 718;"LIMIFAIL?;"                Tests if trace A fails limit-line testing.
90    ENTER 718;A
100   DISP A                                 Displays result of limit-line testing.
110   END
```

## Description

Unlike specifying a limit line with LIMISEG, LIMISEGT, SENTERT, or SENTER, the limit line specified with LIMILO is ***not*** updated if the center frequency, frequency span, sweep time, or reference level is changed.

**Note** Executing **IP**, LIMIDEL, LIMISEG, LIMISEGT, SENTERT, or SENTER will delete the limit line specified with LIMILO or LIMIHI. Executing LIMILO or LIMIHI will delete the limit line specified with LIMISEG or SENTER.

Use LIMITEST ON to display the limit line trace specified by LIMILO. Use LIMITEST OFF to blank the limit line trace specified by LIMILO.



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# LIMIMIRROR
## Mirror Limit Line

Reflects the current definition about the amplitude axis at the largest frequency (for a limit line based on frequency) or the largest sweep time (for a limit line based on the sweep time) in the definition.

### Syntax




XLIMIMIRROR

Related Commands: LIMILINE, LIMISEG, LIMISEGT, SENTER, SENTERT.

### Example

```
10    OUTPUT 718,"IP;CF300MHZ;SP100MHZ;"
20    OUTPUT 718;"LIMIDEL;"
30    OUTPUT 718;"LIMIMODE UPPER;"
35    OUTPUT 718;"LIMIFT FREQ;"
40    OUTPUT 718;"LIMISEG 250MHZ,-60DB,FLAT;"
50    OUTPUT 718;"LIMISEG 290MHZ,-50DB,SLOPE;"
60    OUTPUT 718;"LIMISEG 295MHZ,-15DB,SLOPE;"
70    OUTPUT 718;"LIMISEG 300MHZ,-10DB,SLOPE;"
80    OUTPUT 718;"LIMIMIRROR;"
90    OUTPUT 718;"LIMITEST ON;"
100   END
```

*Initializes spectrum analyzer, changes the frequency and span.*

*Deletes any limit-line tables, sets the table type to fixed.*

*Specifies the upper limit-line table*

*Selects a limit line based on frequency.*

*Enters a value into the upper limit-line table.*

*Mirrors the upper limit-line entries.*

*Turns on the limit-line testing and displays the limit lines.*

The example results in the limit-line table shown in the following table.

| SEG | WART-FREQ! | UPPER_AMP | TYPE |
|---|---|---|---|
| 1 | 250.0 MHz | −60.0 dBm | FLAT |
| 2 | 290.0 MHz | −60.0 dBm | SLOPE |
| 3 | 295.0 MHz | −15.0 dBm | SLOPE |
| 4 | 300.0 MHz | −10.0 dBm | SLOPE |
| 5 | 305.0 MHz | −15.0 dBm | SLOPE |
| 6 | 310.0 MHz | −50.0 dBm | POINT |
| 7 | 310.0 MHz | −60.0 dBm | FLAT |
| 8 | 350.0 MHz | −60.0 dBm | SLOPE |

You may notice that the LIMIMIRROR command may create more than one table entry for a frequency (for example, see segment 6 in the above table). The LIMIMIRROR command creates an extra segment so that the previous segment is explicitly ended at the correct amplitude.

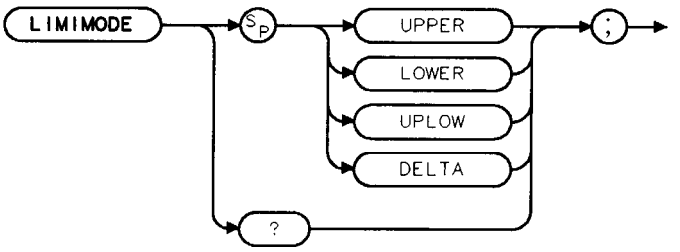


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# LIMIMODE
# Limit-Line Entry Mode

Determines whether the limit-line entries are treated as upper amplitude values, lower amplitude values, upper and lower amplitude values, or mid-amplitude and delta values.

## Syntax




Related Commands: LIMILINE, LIMISEG, LIMISEGT, SEGDEL, SENTER, SENTERT.

## Example

This example uses LIMIMODE to enter segments into the upper limit-line table, and then to enter a segment into the lower limit-line table (upper and lower limit lines are treated as separate tables). Line 60 demonstrates entering a segment into a combined upper and lower limit-line table.

```
10 OUTPUT 718;"LIMIDEL;"
20 OUTPUT 718;"LIMIMODE UPPER;"
30 OUTPUT 718;"LIMIFT FREQ;"
40 OUTPUT 718;"LIMISEG 300MHZ,-30DB,SLOPE;"
50 OUTPUT 718;"LIMIMODE LOWER;"
60 OUTPUT 718;"LIMISEG 300MHZ,-70DB,SLOPE;"
70 OUTPUT 718;"LIMIMODE UPLOW;"
80 OUTPUT 718;"SENTER 350MHZ,-30DB,-80DB,FLAT;"
90 OUTPUT 718;"LIMIDISP ON;"
100 END
```

*Deletes the **current** limit-line table, sets the table type to **fixed**.*

*Specifies the upper limit-line table.*

*Selects a limit line based on frequency.*

*Enters a segment into the upper limit-line table. **Because** the **LIMISEG** command is used, the limit-line table will be based on **frequency**.*

***Specifies** the lower limit-line table.*

*Enters a segment into the lower limit-line table.*

***Specifies** the upper and lower **limit**-line tables.*

*Enters a segment into the upper and **lower** limit-line tables.*

***Displays** the limit lines.*



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**LIMIMODE Limit-Line Entry Mode**

## Description

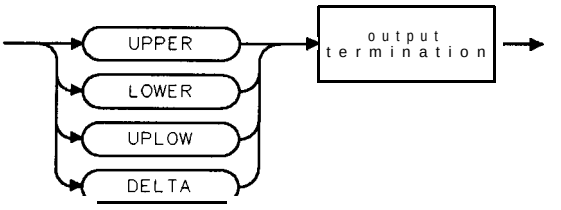
Use LIMIMODE in conjunction with LIMISEG, LIMISEGT, SENTER, or SENTERT. Specify LIMIMODE UPPER or LIMIMODE LOWER before using LIMISEG or LIMISEGT. Specify LIMIMODE UPLOW or LIMIMODE DELTA before using SENTER or SENTERT.

The LIMIMODE command determines whether the limit-line table entries are to be treated separately (upper or lower) or together (upper and lower) when deleting a segment with SEGDEL (see "SEGDEL"). If limit-line table entries are entered with LIMISEG or LIMISEGT, they are treated as entries to separate tables even if LIMIMODE UPLOW or LIMIMODE DELTA had been previously specified.

When used as a predefined variable, LIMIMODE returns a number from 0 to three, depending on the setting of the LIMIMODE parameter. The number corresponds to the LIMIMODE parameter as shown in the following table.

| LIMIMODE Parameter | Value Returned |
|---|---|
| UPLOW | 0 |
| DELTA | 1 |
| UPPER | 2 |
| LOWER | 3 |

## Query Response




QLIMIMODE

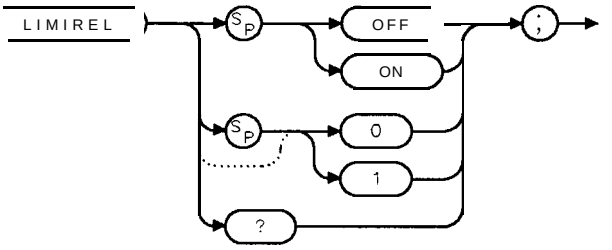


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# LIMIREL
# Relative Limit Lines

Specifies whether the current limit lines are fixed or relative.

## Syntax




XLIMIREL

Related Commands: LIMIDEL, LIMIFT, LIMILINE.

## Example

```
OUTPUT 718;"LIMIFT FREQ;"
OUTPUT 718;"LIMIREL ON;"
```

*Selects a limit line based on frequency.*
*Specifies that the limit line will be relative to the reference-level and center-frequency settings.*

## Description

You should use LIMIFT to select whether the limit lines are based on frequency or sweep time before using LIMIREL, because changing between a frequency or sweep time limit line purges the current limit line table and sets LIMIREL to OFF.

**LIMIREL and the reference level:** Regardless of whether the limit line is based on frequency or sweep time, LIMIREL determines if the amplitude parameter in a limit line table represents absolute values or relative values. If LIMIREL is set to OFF, the limit lines amplitude values are specified in absolute amplitude and do not depend on the reference level (RL) setting. If LIMIREL is set to ON, the limit line amplitude values are relative to the current reference level (RL) setting.

**For limit lines that are based on frequency:** The LIMIREL command determines whether the frequency parameter in a limit-line table represent absolute or relative values that are referenced to the center-frequency settings.

- Executing "LIMIREL OFF;" specifies that the frequency values in a limit-line table are fixed values, and the limit line is positioned accordingly. Fixed limit lines are specified in absolute frequency and do not depend upon the center frequency value.
- Executing "LIMIREL ON;" specifies that the frequency values in a limit-line table are relative values and positions the limit line relative to the center-frequency settings. Relative limit lines are specified in relative frequency and are positioned with respect to the current center frequency. When the current center frequency value is changed, the segment frequencies are converted according to the current center frequency value.

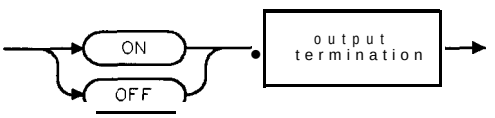


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**LIMIREL Relative Limit Lines**

**For limit lines that are based on the sweep time:** Limit lines that are based on sweep time are always relative to the start time, and the horizontal position of the limit line is not affected by the setting of LIMIREL.

## Query Response




QQ2

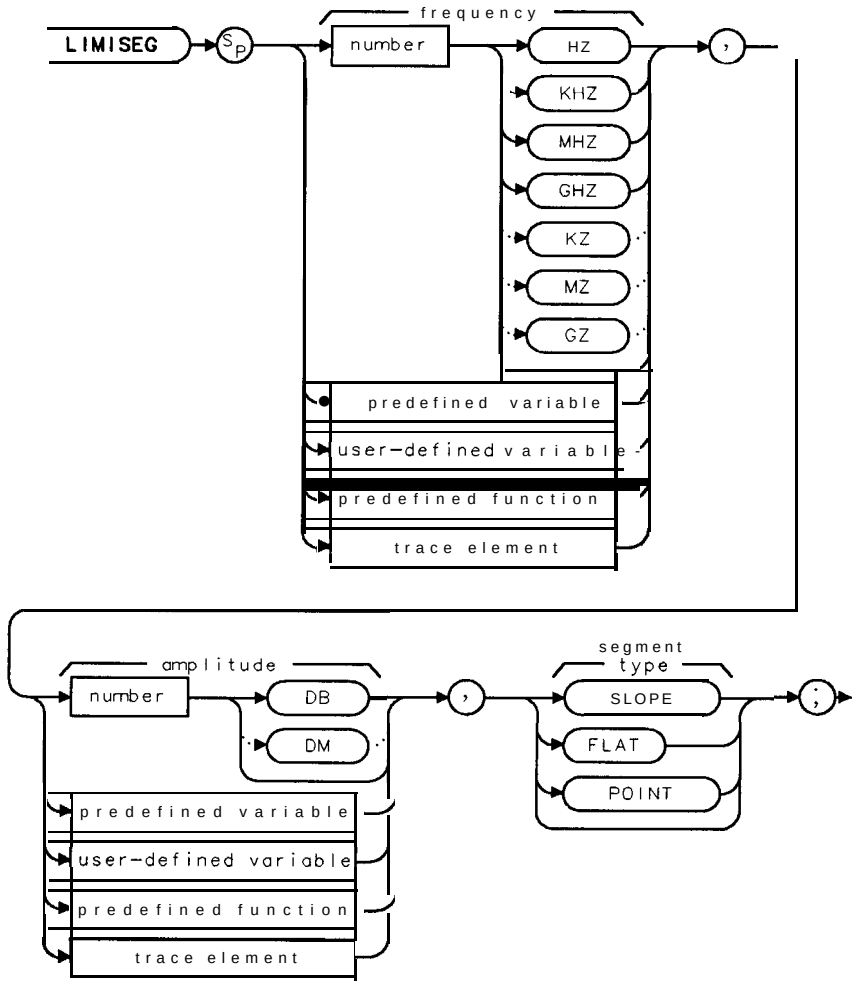


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# LIMISEG
# Enter Limit-Line Segment for Frequency

Adds new segments to the current frequency limit line in either the upper limit line or the lower limit line.

## Syntax




XLIMISEG

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is dBm. | Varies with FOFFSET and ROFFSET. |

Related Commands: LIMIDEL, LIMILINE, LIMIMODE, LIMIREL, SEGDEL, SENTER.



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## Example

```
10    OUTPUT 718;"IP;SNGLS;CF300MHZ;SP100MHZ;RB 3MHZ;"
20    OUTPUT718;"LIMIDEL;"
30    OUTPUT 718;"LIMIMODE UPPER;"
35    OUTPUT 718;"LIMIFT FRED;"
40    OUTPUT 718;"LIMISEG 250MHZ,-60DB,FLAT;"
50    OUTPUT 718;"LIMISEG 290MHZ,-60DB,SLOPE;"
60    OUTPUT 718;"LIMISEG 295MHZ,-15DB,FLAT;"
70    OUTPUT 718;"LIMISEG 305MHZ,-15DB,SLOPE;"
80    OUTPUT 718;"LIMISEG 310MHZ,-60DB,FLAT;"
90    OUTPUT 718;"LIMISEG 910MHZ,-60DB,FLAT;"
100   OUTPUT 718;"LIMIMODE LOWER;"
110   OUTPUT718;"LIMISEG250MHZ,-75DB,FLAT;"
120   OUTPUT 718;"LIMISEG 910MHZ,-75DB,FLAT;"
130   OUTPUT 718;"LIMITEST ON;TS;"
140   OUTPUT718;"LIMIFAIL?;"
150   ENTER 718;A
160   DISP A
170   END
```

*Initializes spectrum analyzer, changes the frequency, span, and bandwidth.*

*Deletes the current limit-line table, sets the table type to fixed.*

*Specifies the upper limit-line table.*

*Selects a limit line based on frequency.*

*Adds segment to the upper limit-line table*

*Specifies the lower limit-line table.*

*Adds segment to the lower limit-line table.*

*Enables limit-line testing.*

*Returns the result of limit-line testing.*

*Displays the result.*

## Description

If the current limit line table contains lines based on sweep time (as opposed to a limit line based on the frequency), executing LIMISEG will clear the current sweep time limit line table, and set LIMIREL to OFF.

Each limit-line segment is specified with a starting frequency, an amplitude, and a segment type. The segment type defines how the line segment is to extend from its starting point to the next segment. The segment types are FLAT, SLOPE, and POINT.

- FLAT draws a zero-slope line between the coordinate point of the current segment and the coordinate point of the next segment, producing limit-line values equal in amplitude for all frequencies between the two points. If the amplitude values of the two segments differ, the limit line will "step" to the value of the second segment.
- SLOPE draws a straight line between the coordinate point of the current **segment** and the coordinate point of the next segment, producing limit-line values for all frequencies between the two points.



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- POINT specifies a limit value for the coordinate point, and no other frequency points, so that a POINT segment specifies a limit value for a single frequency. For an upper limit line, a POINT segment is indicated by a line drawn from the coordinate point, to a point that is vertically off the top of screen. For a lower limit line, a POINT segment is indicated by a line drawn from the coordinate point, to a point that is vertically off the bottom of screen. The POINT segment type should be used as the last segment in the limit-line table. However, if the last segment in the table is not specified as the POINT segment type, an implicit point is used automatically. If a visible POINT segment at the right edge of the display is not desired, add an explicit last point segment (higher in frequency than the stop frequency) to the limit-line table.

Segments are sorted according to starting frequency. A maximum of 20 segments can be defined in each of the upper and lower halves of a limit line. When the segment type is omitted, the last type given (or SLOPE if no previous type has been given) is used.

Use LIMISEG if you want to enter amplitude data in the upper or lower limit lines. If you want to enter amplitude data as upper and lower amplitude pairs or as mid and delta pairs, use the SENTER command instead of LIMISEG. Use LIMIMODE to specify entry into the upper limit-line table or the lower limit-line table. (See line 30 of example.)

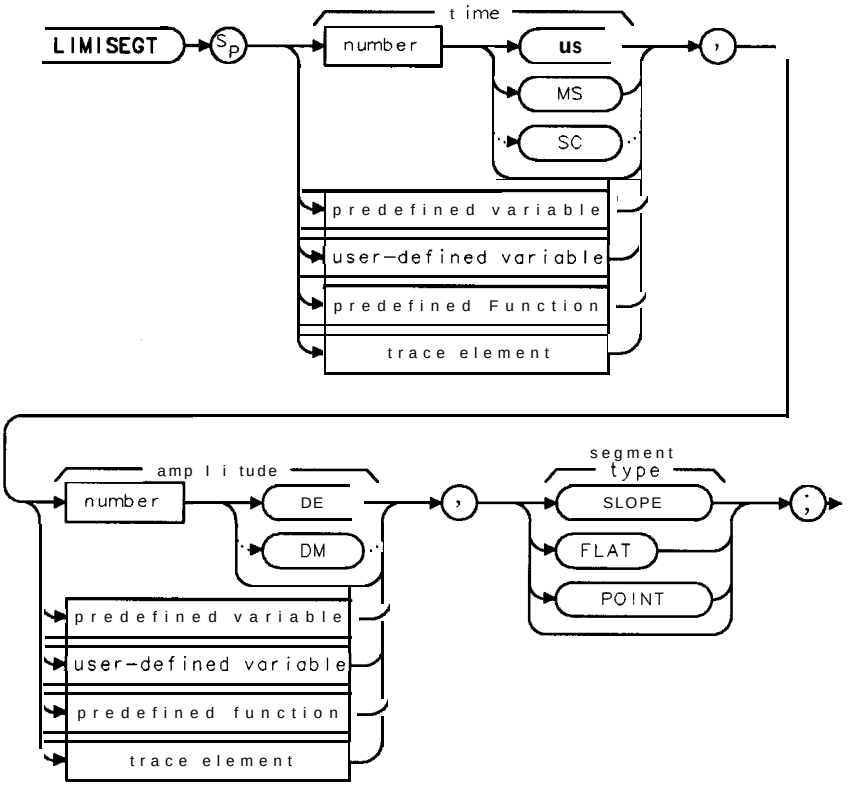


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# LIMISEGT
## Enter Limit-Line Segment for Sweep Time

Adds new segments to the current sweep time limit line in either the upper limit line or the lower limit line.

### Syntax




XLIMISEGT

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. For the sweep time, the default unit is seconds. For the amplitude value, the default unit is **dBm.** | The range of the sweep time is 0 to 100 **s.** The range of the amplitude varies with ROFFSET. |

Related Commands: LIMIDEL, LIMIFT, LIMILINE, LIMIMODE, LIMIREL, SEGDEL, SENTERT.



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## Example

```
OUTPUT 718;"LIMIDEL;"                          Deletes the current limit-line table, sets the
                                               table type to fixed.
OUTPUT 718;"LIMIMODE UPPER;"                   Specifies the upper limit-line table.
OUTPUT 718;"LIMIFT TIME;"                      Selects a limit line based on the sweep time.
OUTPUT 718;"LIMISEGT 0MS,-60DB,FLAT;"          Adds segment to the upper limit-line table.
OUTPUT 718;"LIMISEGT 6MS,-60DB,SLOPE;"
OUTPUT 718;"LIMISEGT 8MS,-15DB,FLAT;"
OUTPUT 718;"LIMISEGT 11MS,-20DB,SLOPE;"
OUTPUT 718;"LIMISEGT 14MS,-60DB,FLAT;"
OUTPUT 718;"LIMISEGT 20MS,-60DB,POINT;"
OUTPUT 718;"LIMIMODE LOWER;"                   Specifies the lower limit-line table
OUTPUT 718;"LIMISEGT 0MS,-75DB,FLAT;"          Adds segment to the lower limit-line table.
OUTPUT 718;"LIMISEGT 20MS,-75DB,POINT;"
OUTPUT 718;"LIMITEST ON;TS;"                   Enables limit-line testing.
OUTPUT 718;"LIMIFAIL?;"                        Returns the result of limit-line testing.
ENTER 718;A
DISP A                                         Displays the result.
```

## Description

Each limit-line segment is specified with a starting sweep time, an amplitude, and a segment type.

---

Note — If the current limit line table contains limit lines based on frequency (as opposed to a limit line based on the sweep time), executing LIMISEGT will clear the current frequency limit line table, and set LIMIREL to OFF

---

**Starting sweep time:** When you specify the starting sweep time, you are specifying the starting sweep time with respect to the sweep time of the spectrum analyzer. For example, if you specify a starting sweep time of 0, the limit-line segment will start at the left side of the spectrum analyzer display.

**Segment type:** The segment type defines how the line segment is to extend from its starting point to the next segment. The segment types are FLAT, SLOPE, and POINT.

- FLAT draws a zero-slope line between the coordinate point of the current segment and the coordinate point of the next segment, producing limit-line values equal in amplitude for all sweep times between the two points. If the amplitude values of the two segments differ, the limit line will “step” to the value of the second segment.
- SLOPE draws a straight line between the coordinate point of the current segment and the coordinate point of the next segment, interpolating amplitude values for all sweep times between the two points.



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- POINT specifies a limit value for the coordinate point, and no other sweep time points, so that a POINT segment specifies an amplitude value for a single sweep time. For an upper limit line, a POINT segment is indicated by a line drawn from the coordinate point, to a point that is vertically off the top of the graticule area. For a lower limit line, a POINT segment is indicated by a line drawn from the coordinate point, to a point that is vertically off the

  the limit-line table. However, if the last segment in the table is not specified as the POINT

  edge of the display is not desired, add an explicit last point segment to (higher in sweep time

Segments are sorted according to starting sweep time. A maximum of 20 segments can be

Use LIMISEGT if you want to enter amplitude data in the upper or lower limit lines. Use LIMIMODE to specify entry into the upper limit-line table or the lower limit-line table (see line 30 of example). If you want to enter amplitude data as upper and lower amplitude pairs or as mid and delta pairs, use the SENTERT command instead of LIMISEGT.

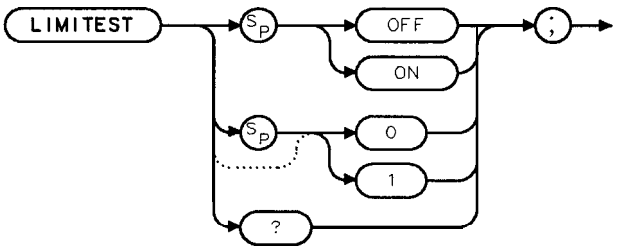


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# LIMITEST
# Enable Limit Line Testing

Compares trace A with the current limit-line data.

## Syntax




XLIMITEST

Preset State: LIMITEST OFF.
Related Commands: LIMIFAIL, LIMIHI, LIMILO, LIMISEG, LIMISEGT, SENTER, SENTERT.
Restrictions: Not available with Analog+ display mode. See "ANLGPLUS" for more information.

## Example

```
10   OUTPUT718;"IP;SNGLS;CF300MHZ;SP100MHZ;"
20   OUTPUT718;"LIMIDEL;"
30   OUTPUT718;"LIMIMODE UPPER;"
35   OUTPUT 718;"LIMIFT FREQ;"
40   OUTPUT 718;"LIMISEG 250MHZ,-60DB,FLAT;"
50   OUTPUT 718;"LIMISEG 290MHZ,-60DB,SLOPE;"
60   OUTPUT 718;"LIMISEG 295MHZ,-15DB,FLAT;"
70   OUTPUT 718;"LIMISEG 305MHZ,-15DB,SLOPE;"
80   OUTPUT 718;"LIMISEG 310MHZ,-60DB,FLAT;"
90   OUTPUT 718;"LIMISEG 910MHZ,-60DB,FLAT;"
100  OUTPUT 718;"LIMITEST ON;TS;"
110  OUTPUT718;"LIMIFAIL?;"
120  ENTER 718;A
130  DISP A
140  END
```

*Initializes spectrum analyzer and changes the frequency and span settings.*

*Deletes any limit-line tables, sets the table type to fixed.*

*Specifies the upper limit-line table.*

*Selects a limit* line *based on frequency.*

*Creates an entry to the upper limit-line table.*

*Turns on limit-line testing.*

*Returns the status of the limit-line testing.*

*Displays the result.*

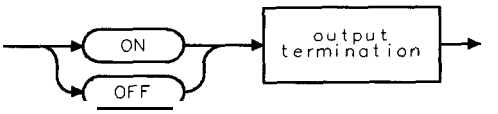


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## LIMITEST Enable Limit Line Testing

### Description

A test is made of the data in TRA (trace A), and the result can be read, using LIMIFAIL, after each sweep.




QQ2

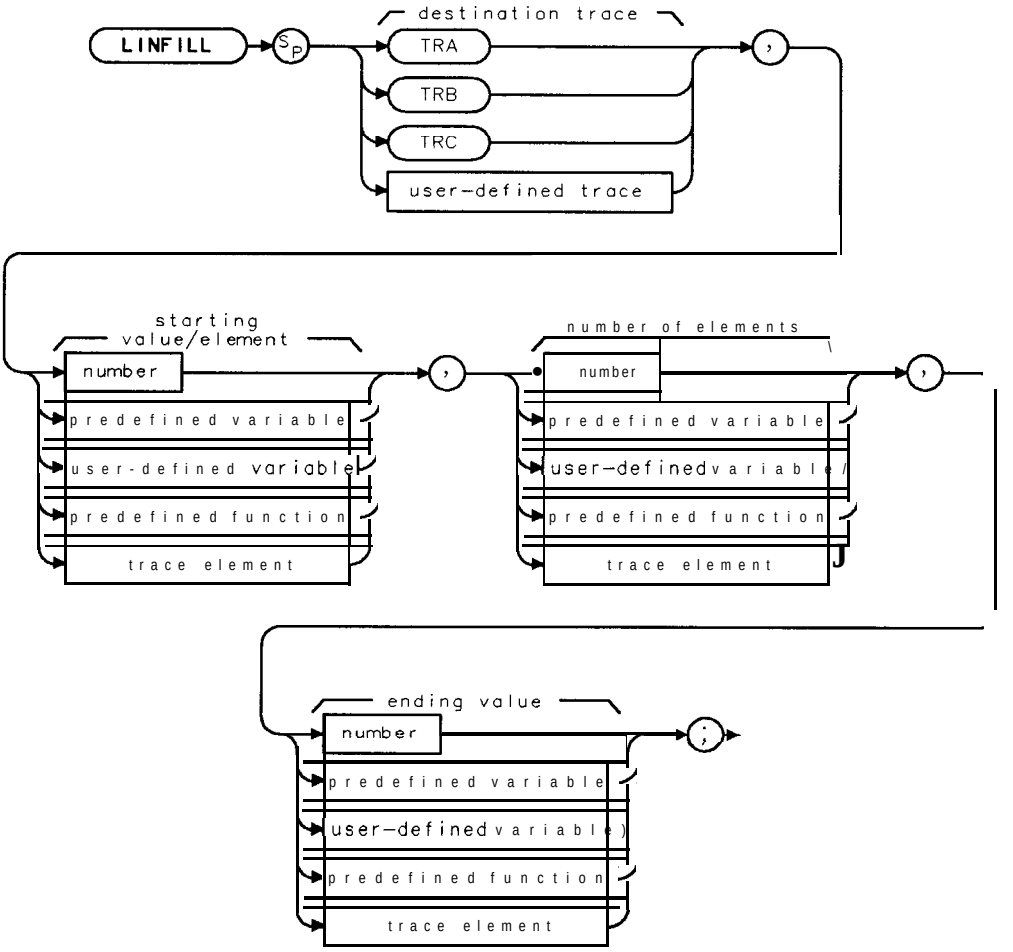


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# LINFILL
# Line Fill

Fills linear interpolated data into the specified trace data points of a destination trace.

## Syntax






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| Item | Description/Default | Range |
|---|---|---|
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to 'lhble 5-1. | |
| Predefined function | Function that returns a value. Refer to Table 5-l. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any valid integer number. | For the starting value or number of elements, the range of the number is 0 to the length of the trace minus 1. For the ending value, the range is -32,763 to + 32,767. |

## Example

```
OUTPUT 718;"LINFILL TRC,0,0,0;"
OUTPUT 718;"MOV TRC[1,10],TRA[1,10];"

OUTPUT 718;"LINFILL TRC,10,40,8000;"
```

*Initializes trace C.*

*Moves the jirst 10 elements of trace A into trace C.*

*Uses the 10th element of trace C as the starting value, fills trace C elements 11 through 50 with the interpolated data, and places ending value (8000) into the 50th element of trace C.*

## Description

LINFILL uses the value of the starting value and the ending value to calculate the linear interpolation data (the values for ending value should be in measurement units). The “number of elements” field allows you to specify the number trace data points that are “filled in” with linear interpolation data. The number of elements field includes the starting element, so if the starting value is 10 and the number of elements is 40, the ending element will be 50.

The data will not be interpolated if the starting value is 0. If the starting value is 0, the ending value is copied into the first element of the destination trace. You may want to set the starting value to 0 to initialize a trace before using LINFILL to fill the trace with interpolated data. If the starting value and the number of elements exceed the length of the destination trace, the interpolation ends at the end of the trace array; the ending value is never reached.



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# LN
# Linear Scale

Specifies the vertical graticule divisions as linear units, without changing the reference level.

## Syntax




XLN

Equivalent **Softkey**: SCALE LOG LIN (when LIN is underlined).
Related Commands: LG, RL.

## Example

```
OUTPUT 718;"LN;"                    Selects linear mode.
OUTPUT 718;"LN;RL 30MV;"
```

## Description

The LN command scales the amplitude (vertical graticule divisions) proportionally to the input voltage, without changing the reference level. The bottom graticule line represents a signal level of zero volts.

Voltage entries are rounded to the nearest 0.1 dB. Thus, 30.16 mV becomes – 17.4 dBm for a 50Ω spectrum analyzer system.

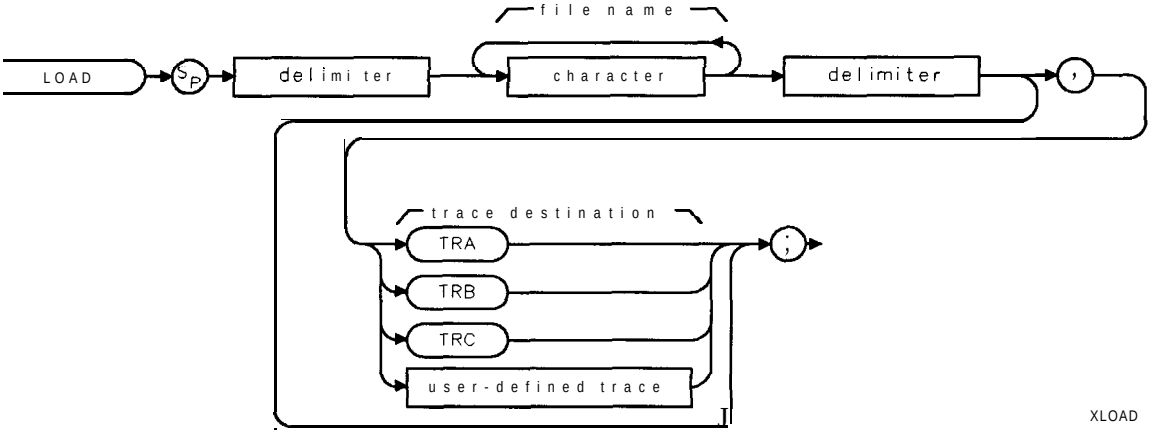


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# LOAD
## Load

Loads a file from the memory card.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| Character | Any valid character. | Any valid file name. |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |

Equivalent Softkey: LOAD FILE.

Option Required: An HP 8590L or HP 8592L needs to have Option 003 installed in the spectrum analyzer to use the LOAD command to load a file from the memory card.

Related Commands: CAT, STOR.

### Example

OUTPUT 7 18; "LOAD %tMYTRA%,TRA;" *Loads MYTRA from the memory card into trace A.*

OUTPUT 718; "LOAD %dM_YPROG%;" *Loads a program from the memory card into spectrum analyzer memory.*

### Description

Be sure to insert the memory card into the spectrum analyzer's memory card reader before using the LOAD command.

lb use the LOAD command, you must specify the file name of the file to be loaded from the memory card into spectrum analyzer memory, and, if you are loading trace data, you must also specify the trace destination.



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**File name:** You must supply the file name of the file to be loaded. When specifying the file name, be sure to include the lowercase letter that indicates the data type, because the result of the LOAD operation is dependent on the data type. (For example, the "d" in "dM_YPROG" indicates the file type is for a downloadable program.) The lowercase letters correspond to the data type as shown in the following table.

| Lowercase Letter | File Description | Result |
|---|---|---|
| a | Amplitude correction factors | Loads the amplitude correction factors. |
| i | Display image file | Loads and displays the display image file. |
| d | Downloadable program | Loads the contents of the file that was stored with STOR. Because STOR stores a copy of user-memory in the file, more than one item may be retrieved when executing the LOAD command. |
| l | Limit lines | Loads the limit-line values into the current limit-line table. |
| s | Analyzer State | Loads the spectrum analyzer state, and changes the current spectrum analyzer state to the state that was loaded. |
| t | Trace | Loads the trace and state. The current spectrum analyzer trace and state is changed to the trace and state that was loaded. |

**Destination:** When recalling trace data, you need to specify either TRA, TRB, TRC, or a user-defined trace as the destination. Omit the destination parameter when recalling downloadable programs, states, limit-line tables, display image files, or amplitude correction factors.

Note — The LOAD command recalls data from the memory card. See "SAVRCLN," "RCLT," or "RCLS" to recall data from spectrum analyzer memory.

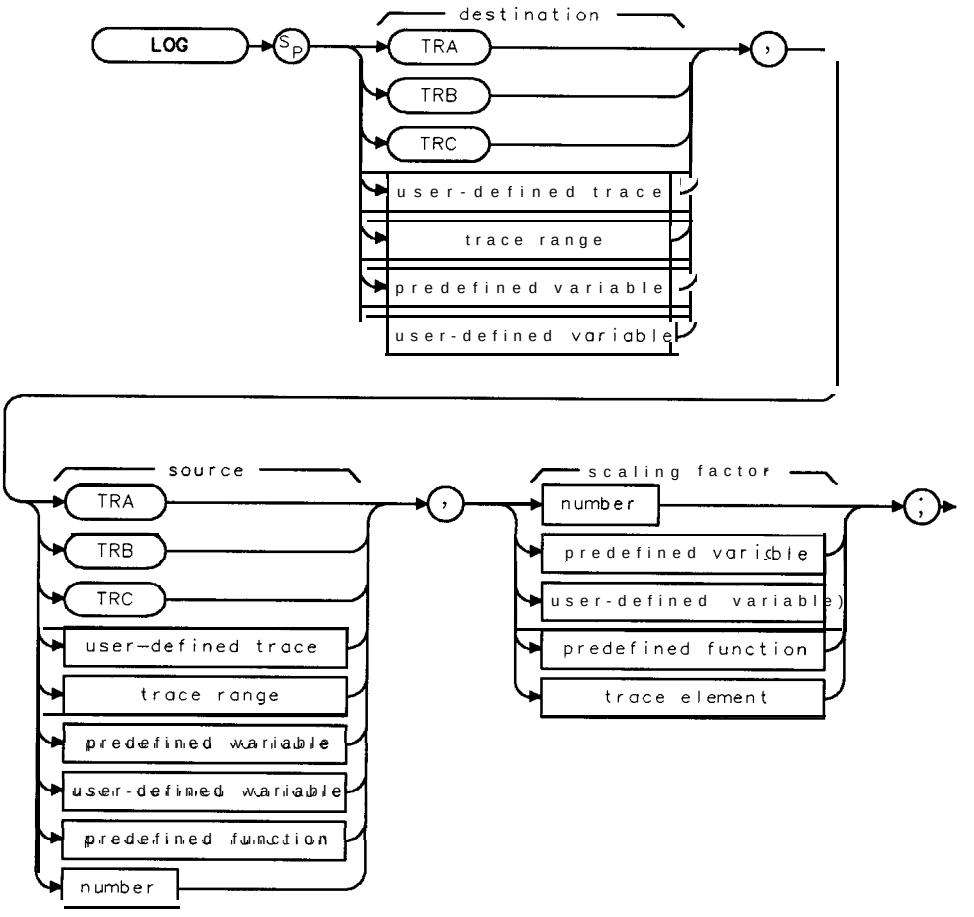


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# LOG
# Logarithm

Takes the logarithm (base 10) of the source, multiplies the result by the scaling factor, then stores it in the destination.

## Syntax




XLOG

| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-1. | |
| Predefined function | Function that returns a value. Refer to Table 5-1. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |



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Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF when using a user-defined variable. TS when using trace data.
Related Commands: **EXP**.

## Example 1

```
OUTPUT 718;"IP;"                    Initializes spectrum analyzer
OUTPUT 718;"VARDEF P_OWER,0;"       Defines a user-defined variable, called P_OWER, and sets
                                    it equal to 0.
OUTPUT 718;"LOG P_OWER,5,10;"       P-OWER = 10x LOG(5).
OUTPUT 718;"P_OWER?;"               Returns value to computer:
ENTER 718;N                         Assigns value to computer variable.
DISP USING "D.DD,K";N;" dB"         Displays value on the computer screen.
```

## Example 2

This example finds the natural exponential of a number and uses the LOG function to return the original source value of the **EXP** function.

```
10 OUTPUT 718;"VARDEF E_XP,0;"                  Defines a variable called E_XP.
20 OUTPUT 718;"EXP E_XP,2,2.30259;"             Finds the natural exponential of 2.
30 OUTPUT 718;"E_XP?;"                          Returns the natural exponential of 2.
40 ENTER 718;Value
50 PRINT Value                                  Prints the value of the exponential.
60 OUTPUT 718;"LOG E_XP,E_XP,2.30259;"          Uses the log function on the exponential
                                                value.
70 OUTPUT 718;"E_XP?;"                          The log of the exponential value is ap-
                                                proximately 2.
80 ENTER 718;Logvalue
90 PRINT Logvalue
100 OUTPUT 718;"VARDEF E_XPY,0;"                Declares a variable called E_XPY.
110 OUTPUT 718;"EXP E_XPY,-5,2.30259;"          Finds the natural exponential of -5.
120 OUTPUT 718;"E_XPY?;"                        Returns the value of the natural exponen-
                                                tial of -5.
130 ENTER 718;Value2
140 PRINT Value2                                Prints the value of the exponential.
150 OUTPUT 718;"LOG E_XPY,E_XPY,2.30259;"       Uses the log function on the exponential
                                                value.
160 OUTPUT 718;"E_XPY?;"                        The log of the exponential value is ap-
                                                proximately -5.
170 ENTER 718;Logval
180 PRINT Logval
190 END
```



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## Description

The scaling factor may be used to improve numerical computations when calculating logarithms of integer trace data. For example, the log of a trace value of 8000 is 3.9, which would be stored as the value 4 in a trace.

The log of trace value of 1 is 0, so the log of a trace containing values from 1 to 8000 would be compressed to values 0, 1, 2, 3, 4. Computational accuracy can be improved by using the scaling factor to scale up the log values before they are stored. In this case, because 3.903 is the log of 8000 and the largest positive trace value is 32,767, a scaling factor of 32,767 divided by 3.903 or 8,395 may be applied to the data. Because EXP and LOG are inverse functions, the EXP command has a scaling factor that may be used to "undo" the scaling factor of the LOG command.

The LOG command can be used to calculate the natural logarithm by using 2.30259 as the scaling factor.

The LOG function returns an invalid result if the source is zero or a negative number.

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.



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# LSPAN
# Last Span

Changes the spectrum analyzer's span to the previous span setting.

## Syntax




XLSPAN

Equivalent **Softkey**: LAST SPAN .
Related Commands: **SP**.

## Example

```
OUTPUT 718;"LSPAN;"
```

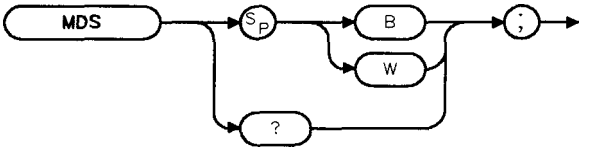


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# MDS
# Measurement Data Size

Specifies measurement data size as byte or word.

## Syntax




Related Commands: MKA, TDF, TRA.
Preset State: W.

## Example

These commands transfer trace A in binary, 2 bytes per word.

```
INTEGER TRACE-A(1:401)          Declares variable, Trace-A.
OUTPUT718;"SNGLS;TS;"           Activates single-sweep, updates trace A.
OUTPUT 718;"TDF B;MDS W;TRA?;"  Reads trace A in "word" format.
ENTER 7 18 USING "#,401(W)";TRACE-A(*)
                                Formats trace A output using data size of one
                                word.
PRINT TRACE-A(*)                Prints trace A.
```

## Description

The MDS command formats binary data in one of the following formats:

**B** selects a data size of one 8-bit byte. When transferring trace data, MDS B transfers trace data the faster than MDS W because only 401 bytes are transferred. Because MDS B combines two bytes into one byte, some resolution is lost.

**W** selects a data size of one word, which is two 8-bit bytes. When transferring trace data, MDS W transfers 802 bytes of trace data with no loss of resolution.

**How data is represented with MDS W:** When data is sent with MDS W, the trace data is converted into two bytes as follows:

1. The trace element's amplitude (in measurement units) is divided by 256. The binary representation of the result is placed in the most significant byte (MSB).

2. The binary representation of the remainder is placed in the least significant byte (LSB).

For example, a trace element that is at the reference level has the value of 8000 (in measurement units). The result of 8000 divided by 256 is 30, with a remainder of 120. For this data, the contents of the MSB would contain the binary representation for 30.

**Contents of the MSB**

| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |
|---|---|---|---|---|---|---|---|



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For this data, the contents of the LSB would contain the binary representation for 120.

**Contents of the LSB**

| 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
|---|---|---|---|---|---|---|---|

**How data is represented with MDS B:** When data is sent with MDS B, the trace data is converted into one byte as follows:

- The trace element's amplitude (in measurement units) is divided by 32. The binary representation of the result is placed into one byte.

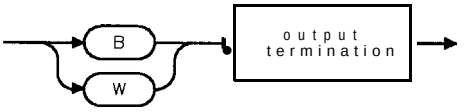
For example, a trace element that is at the reference level has the value of 8000 (in measurement units). The result of 8000 divided by 32 is 250. For this data, the contents of the byte would contain the binary representation for 250.

**Contents of Byte**

| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
|---|---|---|---|---|---|---|---|

See "TDF" for information about using MDS for trace data transfers.

## Query Response:




QMDS

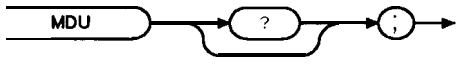


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# MDU
# Measurement Data Units

Returns values for the spectrum analyzer baseline and reference level.

## Syntax




XMDU

Related Commands: TDF.

## Example

```
10 OUTPUT 718;"IP;TDF M;"
20 OUTPUT 718;"RL -10DM;"
30 OUTPUT 718;"MDU?;".
40 ENTER 718;A,B,C,D,A$
50 PRINT A,B,C,D,A$
60 END
```

*Initializes the spectrum analyzer and formats the trace data in measurement units.*

*Changes the reference level to -10 dBm.*

*Queries the position of the spectrum analyzer baseline and reference level.*

*Moves the spectrum analyzer response to the computer.*

*Displays the results on the computer screen.*

The example returns the following to the controller: 0, 200, -90, -10 dBm. The first two numbers received indicate that the vertical scale spans from 0 to 200 plotter units. The third and fourth number received indicate that the baseline is at -90 dBm, and the reference level is at -10 dBm. So, the baseline value of -90 dBm is equal to 0 plotter units. The reference level of -10 dBm is equal to 200 plotter units.

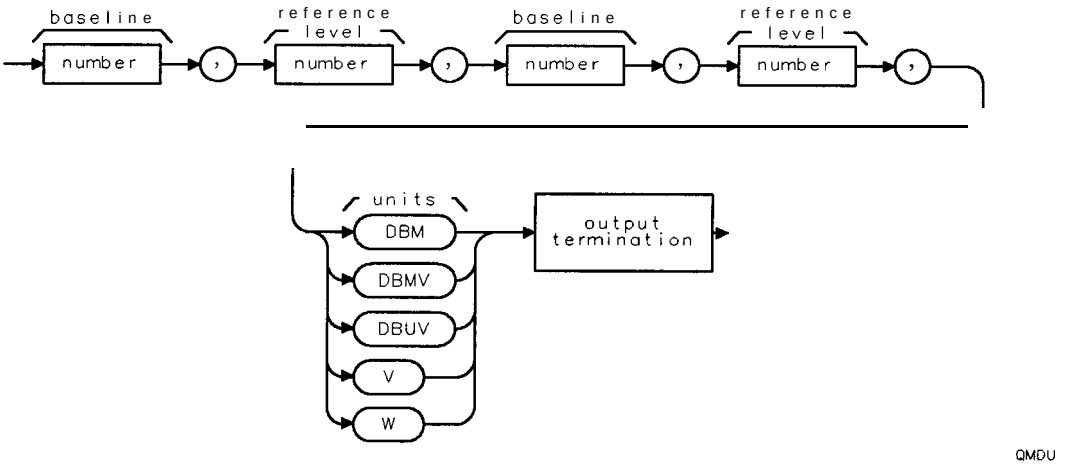
## Description

The MDU command returns values for the spectrum analyzer baseline and reference level, in plotter units and measurement units.



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## Query Response




QMDU

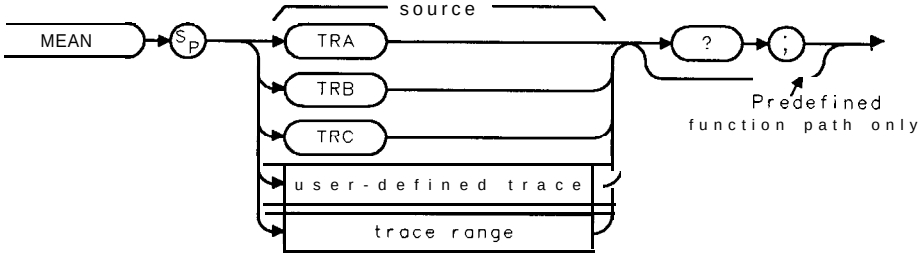


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# MEAN
## Trace Mean

Returns the mean value of the given trace in measurement units.

### Syntax




XMEAN

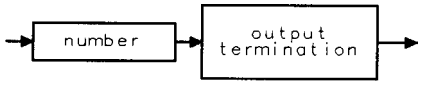
| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | **A** trace **defined** by the TRDEF command | Any valid trace name. |
| Trace Range | A segment of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.
Related Commands: MEANTH, RMS, STDEV, VARIANCE.

### Example

```
10 OUTPUT 718;"IP;"                    Initializes spectrum analyzer
20 OUTPUT 718;"SNGLS;"                 Activates the single-sweep mode.
30 OUTPUT 718;"CF 300MHZ;SP 1MHZ;"     Sets measurement range.
40 OUTPUT 718;"TS;"                    Sweeps trace A.
50 OUTPUT 718;"MEAN TRA?;"             Returns the mean value of trace A to the computer:
60 ENTER 718;Number                    Assigns value to computer variable, Number
70 DISP "MEAN OF TRACE A IS ";Number   Displays result on the computer screen.
80 END
```

### Query Response




QQ1

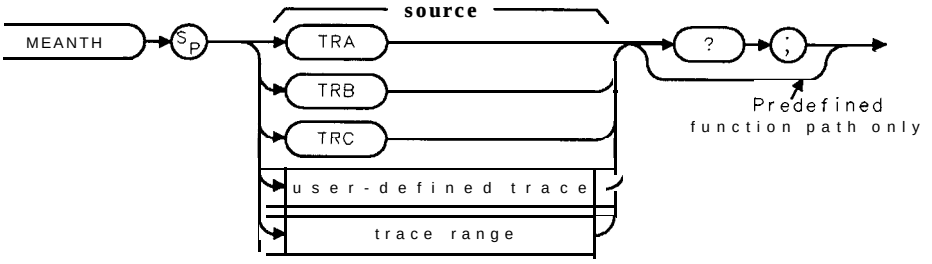


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# MEANTH
# Trace Mean Above Threshold

Returns the mean value of the given trace above the threshold, in measurement units.

## Syntax




XMEANTH

| Item | Description/Default | Range |
|---|---|---|
| **User-defined** trace | **A** trace defined by the TRDEF command | Any valid trace name. |
| Trace Range | A segment of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.
Related Commands: MEAN, RMS, STDEV, TH, VARIANCE.
Restrictions: Not available with Analog+ display mode. See “ANLGPLUS” for more information.

## Example

```
10 OUTPUT 718;"IP;"
20 OUTPUT 718;"SNGLS;"

30 OUTPUT 718;"CF 300MHZ;SP1GHZ;"
40 OUTPUT 718;"TH -40;"

50 OUTPUT 718;"TS;"
60 OUTPUT 718;"MEANTH TRA?;"


70 ENTER 718;Number

80 DISP "MEAN OF TRACE A ABOVE THE THRESHOLD IS ";Number

90 END
```

*Initializes spectrum analyzer:*
*Activates the single-sweep mode.*
*Sets measurement range.*
*Sets threshold level to -40 dB.*
*Sweeps trace A.*
*Returns the mean value of trace A above the threshold to the computer:*
*Assigns value to computer variable, Number:*
*Displays result on the computer screen.*



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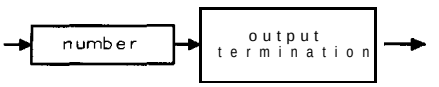
**MEANTH Trace Mean Above Threshold**

## Description

MEANTH returns the mean value of the trace above the threshold; MEAN returns the mean value of the trace, regardless of the threshold level. MEANTH returns a “0” if there is not a signal above the threshold.

Use TH (threshold) to set the threshold level.

## Query Response




QQ1



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# MEASOFF
# Measurement Off

Turns off the current measurement, erases the display, and then displays the MEAS/USER menu.

## Syntax




XMEASOFF

Equivalent Softkey: MEAS OFF .
Related Commands: ACP, ACPE, ACPGRAPH, CHP, OBW.

## Example

```
OUTPUT 718;"MEASOFF;"
```

*Turns off the current measurement.*

## Description

If ACPPAR is set to automatic, executing MEASOFF returns the following spectrum analyzer settings back to their premeasurement settings:

- Frequency span, resolution bandwidth, video bandwidth, center frequency step size, and sweep time.
- Detector mode.
- Amplitude scale.

MEASOFF does *not* do any of the following:

- Change the values of the channel spacing (ACPSP) or the channel bandwidth (ACPBW).
- Restore the trace contents, trigger mode, amplitude units, and any trace math functions (see Table 5-4 for a list of the trace math functions) to their premeasurement state.

You should execute MEASOFF when you no longer want to use any of the power menu functions. (The power menu functions are ACP, ACPE, ACPGRAPH, CHP, and OBW).

MEASOFF may also turn off some other spectrum analyzer measurements. For example, MEASOFF also turns off FFTCONTS, FFTAUTO, FFTSNGLS, NDBPNT, PCTAM, GDRVUTIL, and TOI.

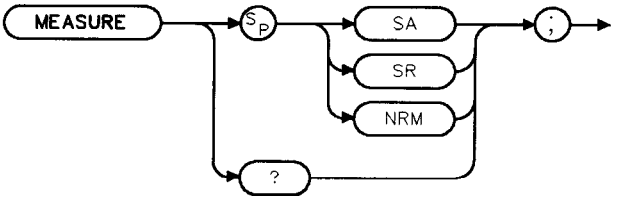


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# MEASURE
## Measure Mode

Determines what kind of measurements the spectrum analyzer makes: signal analysis, stimulus response, or signal normalization.

### Syntax




XMEASURE

Option Required: Option 010 or 011.
Related Commands: Commands affecting amplitude, such as **AUNITS**, DL, INZ, LN, MKA, MKREAD, MKRL, RL, RLPOS, ROFFSET, TH.
Preset State: MEASURE SA.

### Example

Activate the tracking-generator source output.

```
OUTPUT 718;"MEASURE SR;"          Sets spectrum analyzer to stimulus-response mode.
OUTPUT 718;"SRCPWR -10DM;"        Makes the tracking generator source power the active function.
```

### Description

"MEASURE SA;" activates spectrum analysis and auto couples the spectrum analyzer functions. If AMB ON or AMBPL ON and RLPOS have been executed prior to MEASURE SA, MEASURE SA turns off the reference level position. When normalization is off, all amplitude units are specified in absolute values determined by:

- Amplitude units (AUNITS).
- Reference level (RL).
- Reference-level offset (ROFFSET).
- Input impedance (INZ).
- Logarithm scale (LG).
- Linear scale (LN).
- Amplitude Correction (AMPCOR).

"MEASURE SR;" activates stimulus-response measurements and uncouples the sweep time for faster sweep times. If AMB ON or AMBPL ON and RLPOS are executed, MEASURE SR activates the reference level position. When normalization is used, amplitude units are specified relative to the display level.



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During this relative-amplitude mode, the following parameters are in dB:

- Trace data (TRA, TRB, TRC).
- Display line (DL).
- Threshold (TH).
- Marker amplitude (MKA).

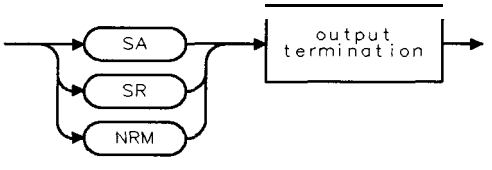
"MEASURE NRM;" recouples the sweep time for accurate signal analysis measurements. If AMB ON or AMBPL ON and RLPOS are executed, MEASURE NRM activates the reference level position.

See "RLPOS" for more information about changing the reference level position.

When used as a predefined variable, MEASURE returns a value depending on the setting of the MEASURE parameter.

| LIMIMODE Parameter | Value Returned |
|---|---|
| SA | 0 |
| SR | 1 |
| NRM | 2 |

## Query Response




QMEASURE

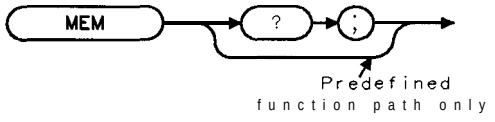


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# MEM
# Memory Available

Returns the amount of spectrum analyzer memory available.

## Syntax




XMEM

Related Commands: ACTDEF, DISPOSE, ERASE, FUNCDEF, LOAD, **ONDELAY,** ONEOS, **ONTIME,** ONSRQ, **ONSWP,** TRCMEM, TRDEF, TRMATH, VARDEF.

## Example

```
10 OUTPUT 718;"MEM?;"
20 ENTER 718;How_much_memory
30  DISP  How-much-memory
40 END
```

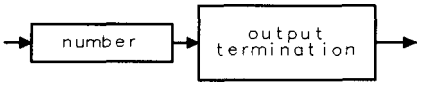
*Queries the amount of user-allotted memory available.*
*Sends response from spectrum analyzer to the computer.*
*Displays the amount of available memory.*

## Description

Functions that affect the amount of user-allotted memory include: ACTDEF, FUNCDEF, **ONDELAY,** ONEOS, ONSRQ, ONSWP, **ONTIME,** TRDEF, TRMATH, VARDEF.

The MEM command returns the number of bytes of user-allotted spectrum analyzer memory to the controller.

## Query Response




QQ1

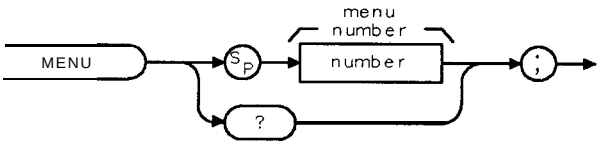


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# MENU
# Menu

Selects and displays the **softkey** menus on the spectrum analyzer screen.

## Syntax




YMENU

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer number. | 1, 101 to 200. |

Related Commands: DISPOSE, ERASE, KEYDEF, KEYLBL, SAVEMENU.

## Example 1

```
OUTPUT 718;"MENU 1;"
```
*Displays menu 1 on the spectrum analyzer screen.*

## Example 2

```
10 OUTPUT 718;"KEYDEF 1,!IP;CF 300MHZ;SP 100MHZ;
MKPK HI;!,@SETUP|#1@;"
```
*Defines softkey 1.*

```
20 OUTPUT 718;"KEYDEF 2,!IP;CF 600MHZ;SP 100MHZ;
MKPK HI;!@SETUP|#2@;"
```
*Defines softkey 2.*

```
30 OUTPUT 718;"KEYDEF 3,!IP;CF 900MHZ;SP 100MHZ;
MKPK HI;!,@SETUP|#3@;"
```
*Defines softkey 3.*

```
40 OUTPUT 718;"KEYDEF 4,!SNGLS;TS;MKPK
HI;MKD;MKMIN;!,@FIND|DELTA@;"
```
*Defines softkey 4.*

```
50 OUTPUT 718;"KEYDEF 5,!MKOFF ALL;
CONTS;!,@RESUME|SWEEP@;"
```
*Defines softkey 5.*

```
60 OUTPUT 718;"KEYDEF 6,!MENU 102! ,@MORE|SETUPS@;"
```
*Defines softkey 6.*

```
70 OUTPUT 718;"KEYDEF 607,!FA 88MHZ;FB 108MHZ;
MKPK HI;DEMOD ON;DEMOD FM;MENU 1;!,@FM |DEMOD@;"
```
*Defines softkey 607. Softkey 607 is accessed by executing MENU 102 (see programming line 60).*

```
80 OUTPUT 718;"KEYDEF 608,!FA 10KHZ;FB 88MHZ;
MKPK HI;DEMOD ON;DEMOD AM;MENU 1; !,@AM |DEMOD@;"
```
*Defines softkey 608. Softkey 608 is accessed by executing MENU 102 (see programming* line 60).



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## Description

When using the KEYDEF, KEYENH, or KEYCMD commands, you need to specify the **softkey** number. The **softkey** number corresponds to the menu number as follows:

**softkey** number = (menu number – 1) x 6 + **softkey** position
(The **softkey** position range is 1 through 6.)

For example:

Menu 1 contains **softkey** numbers 1 through 6
Menu 101 contains **softkey** numbers 601 to 606
Menu 200 contains **softkey** numbers 1195 to 1200

Menu 1 can be accessed by pressing (MEAS/USER), User **Menus** . Menus 101 through 200, as well as menu 1, can be accessed using the MENU command. The MENU command is a useful way to "link" **softkey** menus together. For example, example 2 shows how menu 1 (with **softkeys** 1 through 6) can be used to access menu 102 (with **softkeys** 607 and 608). Menu 1 can be accessed by pressing (MEAS/USER), User **Menus** .

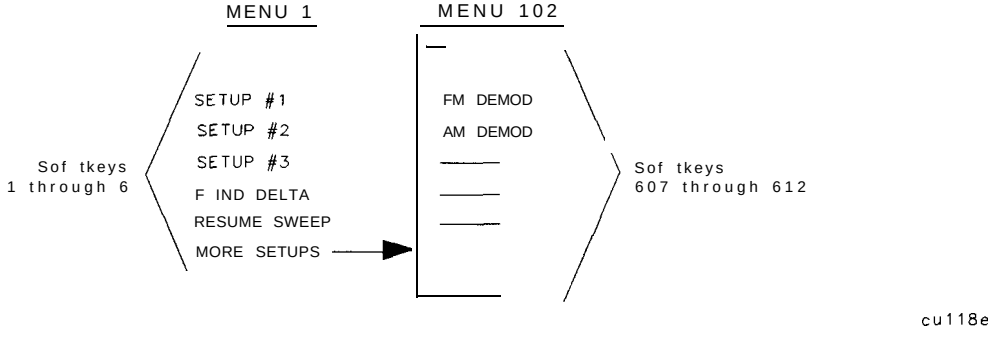
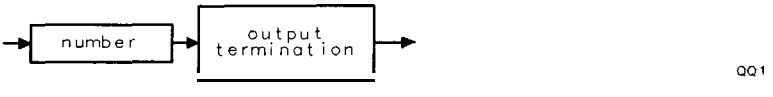



**Figure 5-7. Using the MENU Command**

The menu numbers 1 and 101 through 200 are the recommended menus available for the user to use.

Executing "MENU 0;" clears the **softkey** menu from the spectrum analyzer screen.

## Query Response



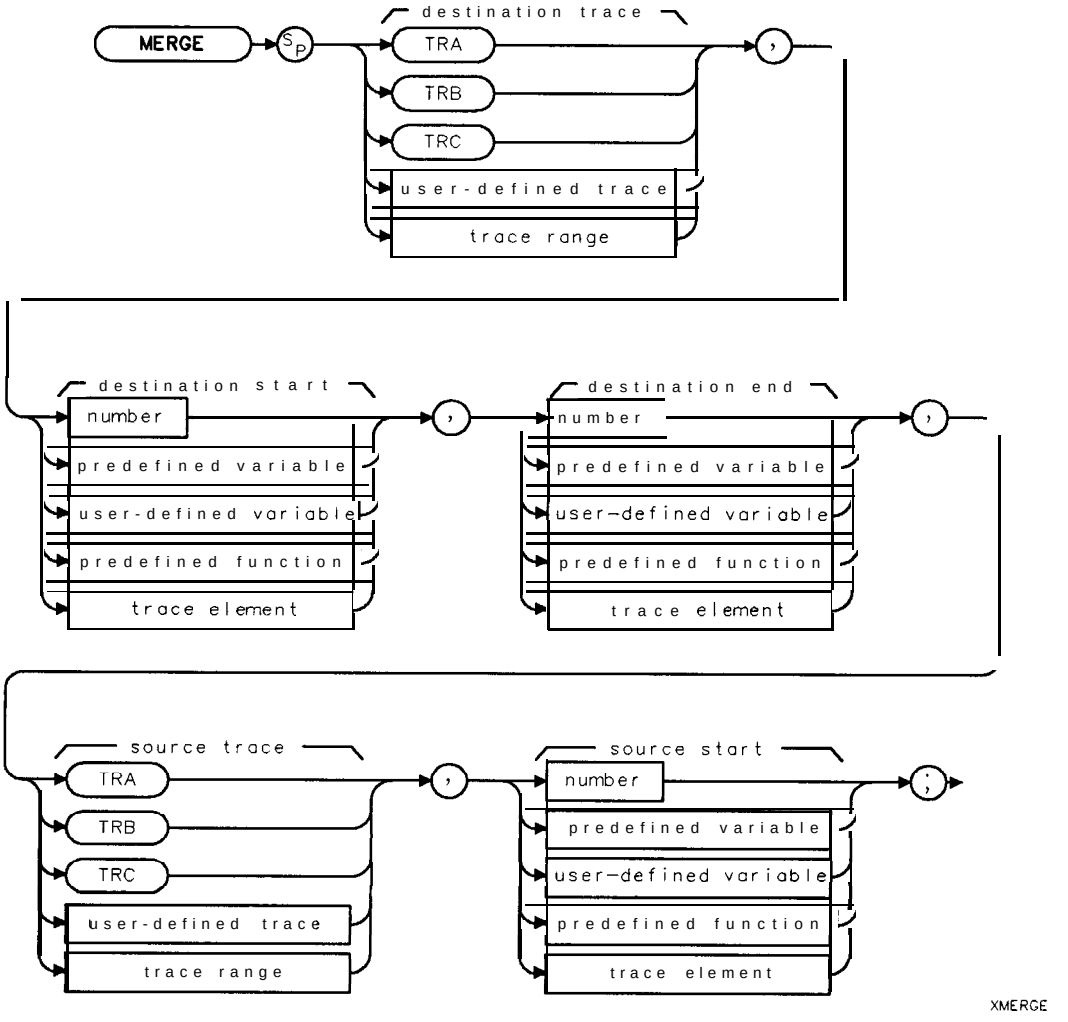



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# MERGE
# Merge Two Traces

Merges the source trace into the specified area of the destination trace.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| **Predefined** variable | A command that acts as a variable. Refer to **Table** 5-1. | |
| **Predefined** function | Function that returns a value. Refer to Table 5-1. | |
| Trace element | An element of trace A, trace B, trace C, or a **user-defined** trace. | |
| Number | Any valid integer number. | **-32,768** to + 32,767. |

Related Commands: All other trace math commands. See **Table** 5-4 for a list of trace math commands.



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## Example

```
OUTPUT 718;"MERGE TRC,1,200,TRA,200;"
```

*Merges trace A into trace C. The trace A elements 200 through 399 are merged into trace C elements 1 through 200.*

## Description

MERGE copies the trace data from the source trace, starting at the specified trace element, into the specified trace elements of the destination trace. MERGE differs from CONCAT because MERGE does not need the trace range of the source to be specified. If the source is not a trace, its value is copied to the destination trace. If the destination segment is longer than the specified source segment, the last element of the source trace is repeated to fill the destination.



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# MF
# Marker Frequency Output

Returns the frequency (or time) of the on-screen active marker.

## Syntax




XMF

Related Commands: MA, MKA, MKCF, MKD, MKF, MKN, MKPK, MKREAD.

## Example

Connect CAL OUT to the spectrum analyzer input.

```
OUTPUT 718;"IP;SNGLS;"          Initializes the spectrum analyzer, activates single-
                                sweep mode.
OUTPUT 718;"FA 280MHZ;FB 320MHZ;TS;"   Sets up the measurement range.
OUTPUT 718;"MKN;MKPK HI;"       Places marker on peak of calibrator signal.
OUTPUT 718;"MF;"                Takes frequency of marker:
ENTER 718;A                     Returns frequency to the computer:
PRINT A                         Prints the frequency on the computer screen.
```

## Description

The MF command returns the frequency of the active marker to the controller if the marker is on screen. In delta marker mode, nonzero span, "MF;" returns the frequency difference between the two markers. In zero span, "MF;" returns the marker time, or the delta marker time.

The data that is returned by "MF;" depends on many command conditions including TDF, MKREAD, and MDS.

If the trace data format P is used with MF, the result is one real value in time units or frequency units, depending on the marker readout format. (See "MKREAD.")

## Example 1

```
OUTPUT 718;"TDF P;MKREAD FRQ;MF;"   This returns a frequency value (in Hz) if not in
                                    zero-span.
OUTPUT 718;"TDF P;MKREAD FRQ;MF;"   This returns a time value (in seconds) if in zero-
                                    span.
OUTPUT 718;"TDF P;MKREAD PER;MF;"   This returns the time value (in seconds) of 1/(marker
                                    frequency).
OUTPUT 718;"TDF P;MKREAD SWT;MF;"   This returns the marker time value (in seconds).
OUTPUT 718;"TDF P;MKREAD IST;MF;"   This returns thefrequency value (in Hz) for 1/(marker
                                    time).
OUTPUT 718;"TDF P;MKREAD FFT;MF;"   This returns the frequency value (in Hz).
```

If the trace data format is used with trace data format A, the result depends on the setting of the MDS command.



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## Example 2

`OUTPUT 718;"TDF A;MDS B;MF;"` *Returns one byte representing the marker position. The byte can assume values 1 to 101.*

`OUTPUT 718;"TDF A;MDS W;MF;"` *Returns two bytes in a binary word format that has a value from 1 to 401.*

If the trace data format is used with trace data format M, the result is the marker horizontal position value, from 1 to 401, in ASCII.

## Example 3

`OUTPUT 7 18 ;"TDF M ;MF ;"` *Returns marker horizontal position value in ASCII.*

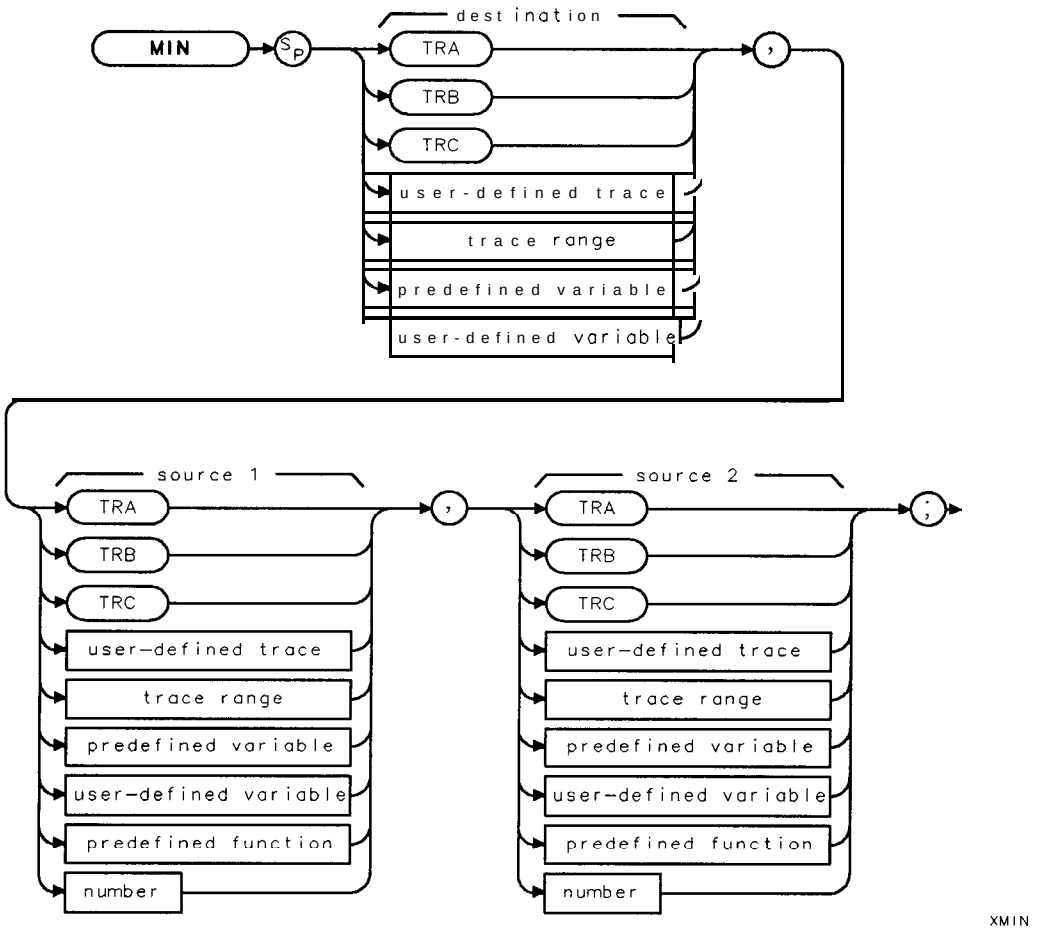


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# MIN
# Minimum

Compares source 1 and 2, point by point, and stores the lesser of the two in the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to **Table** 5-l. | |
| **Predefined** function | Function that returns a value. Refer to Table 5-l. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF when using a user-defined variable. TS when using trace data.
Related Commands: MINPOS, MXM, TS.



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## Example

```
10 OUTPUT 718;"IP;"                          Initializes spectrum analyzer.
20 OUTPUT 718;"SNGLS;"                       Activates the single-sweep mode.
30 OUTPUT 718;"VARDEF M_INIMUM,0;"           Defines variable with an initial value of 0.
40 OUTPUT 718;"TS;MKPK HI;";                 Sweeps trace A and places the marker at the
                                             highest peak.
50 OUTPUT 718;"MIN M_INIMUM,MKA,-20;";       Compares the marker amplitude to -20 dBm.
                                             Stores the lesser of the two in MINIMUM.
60 OUTPUT718;"M_INIMUM?;"                    Returns the result to the computer:
70 ENTER 718;Number                          Puts the result in the computer variable,
                                             Number.
80 DISP  Number                              Displays the result.
90 END
```

## Description

If one of the sources is a single value, it acts as a threshold, and all values equal to or less than the threshold pass to the destination. The values larger than the threshold are replaced by the threshold value in the destination.

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

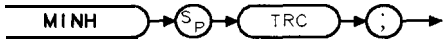


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# MINH
# Minimum Hold

Updates trace C with the minimum level detected.

## Syntax




XMINH

Equivalent **Softkey: MIN** HOLD **C** .
Related Commands: BLANK, CLRW, MXMH, VAVG, VIEW.
Restrictions: Not available with Analog+ display mode. See “ANLGPLUS” for more information.

## Example

```
OUTPUT 718;"CLRW TRC;CONTS;"
OUTPUT 718;"MINH TRC;"
```

*Clears trace C and begin taking data.*
*Updates* **trace** C with *the* minimum ***level*** *detected.*

## Description

MINH updates trace C with a new value from a detector only if the new value is smaller than the previous trace data value.

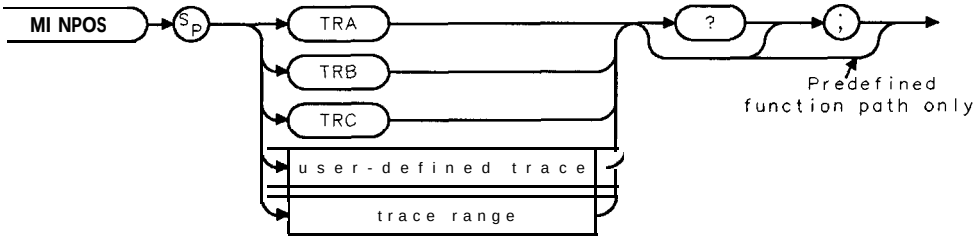


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# MINPOS
## Minimum Position

Returns a value, which is the x-axis position (in display units) of the minimum amplitude value in trace A, trace B, trace C, or user-defined trace.

### Syntax




XMINPOS

| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace ACTDEF. TS when using trace data.
Related Commands: MIN, MKMIN, PKPOS.

### Example

```
10 OUTPUT 718;"IP;"          Initializes spectrum analyzer.
20 OUTPUT 718;"MINPOS TRA;"  Finds the minimum value of trace A.
30 ENTER 718;Number          Returns value to the computer:
40 DISP Number               Displays result.
50 END
```

### Description

If a trace range is used with MINPOS, MINPOS returns a value relative to the first element of the trace range. For example, if a trace has a range of 150 to 300 elements, and the minimum value is element 200, MINPOS will return the value of 51.

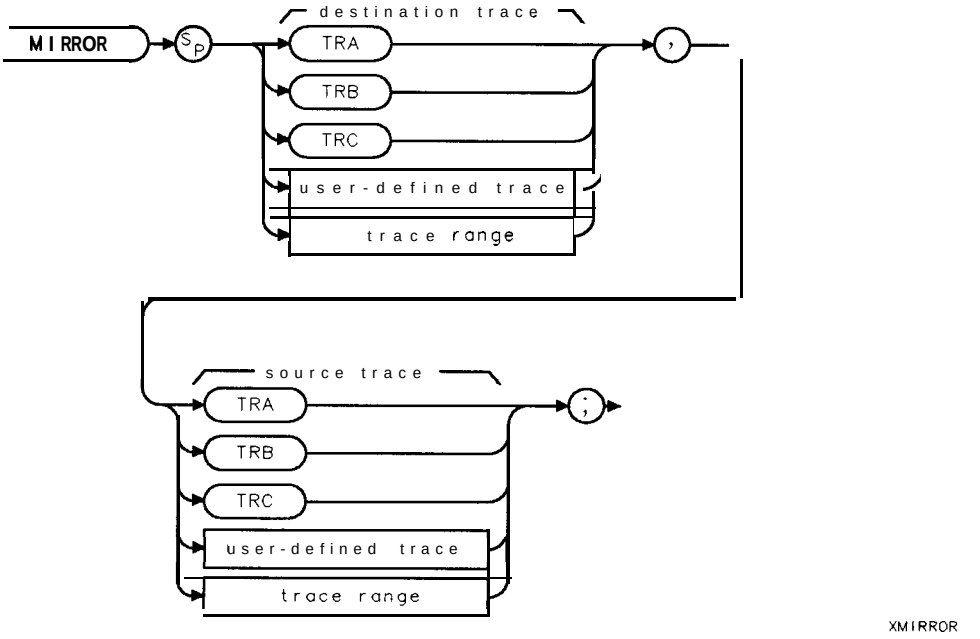


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# MIRROR
# Mirror Image

Displays the mirror image of the trace.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.

## Example

```
10 OUTPUT 718;"IP;"                    Initializes spectrum analyzer
20 OUTPUT 718;"SNGLS;"                 Activates the single-sweep mode.
30 OUTPUT 718;"TS;"                    Takes sweep.
40 OUTPUT 718;"BLANK TRA;"             Blanks trace A from spectrum analyzer screen.
50 OUTPUT 718;"MIRROR TRB,TRA;"        Moves the mirror image of trace A into trace B.
60 OUTPUT 718;"VIEW TRB;"              Displays the result.
70 END
```



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## Description

The MIRROR command stores the mirror image (with respect to the frequency axis) of a source trace in a destination trace.

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

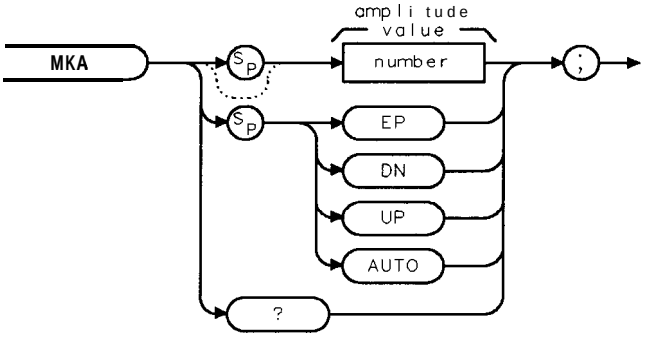


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# MKA
# Marker Amplitude

Specifies the amplitude of the active marker in the current amplitude units when marker type is of fixed or amplitude type. When queried, MKA returns the marker amplitude independent of marker type.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Unit is current amplitude type. | Amplitude range of spectrum analyzer. |

Step Increment: by 1 dB.
Related Commands: AUNITS, AUTO, MA, MKD, MKN, MKTYPE, TDF.

## Example

```
OUTPUT 718;"IP;"          Initializes the spectrum analyzer.
OUTPUT 718;"MKTYPE AMP;"  Changes the marker type to amplitude.
OUTPUT 718;"MKA -50;"     Places the marker at -50 dBm.
```

## Description

The MKA command specifies the amplitude of the active marker in current units when the marker is the fixed or amplitude type (see "MKTYPE"). If both the delta marker and active marker are on the screen, "MKA?;" returns the amplitude difference between the two markers. Specifying the marker amplitude moves the marker to the point of the trace closest to the given marker amplitude.

If the trace data format P (TDF P), is used with MKA, the result is one real value in the current amplitude units (AUNITS can be used to change the current amplitude units).



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## Example

```
OUTPUT 718;"TDF P;AUNITS DBM;MKA?;"
```

*This returns the amplitude value of the marker (amplitude unit is dBm).*

If the trace data format is used with trace data format A, the result depends on the setting of the MDS command.

## Example

```
OUTPUT 718;"TDF A;MDS B;MKA?;"
```

*Returns one byte representing the marker vertical position (-32,768 to 32,767) divided by 32 and then ANDed with 255.*

```
OUTPUT 718;"TDF A;MDS W;MKA?;"
```

*Returns two bytes in a binary word format that has a value from -32,768 to 32,767. The value represents the binary trace amplitude value.*

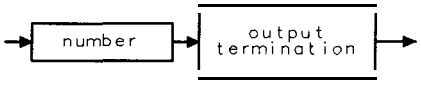
Using the trace data format I is equivalent to the TDF A format. If the trace data format is used with trace data format M, the result is returned in ASCII measurement units (-32,768 to 32,767).

## Example

```
OUTPUT 718;"TDF M;MKA?;"
```

*Returns one vertical position value in measurement units.*

## Query Response




QQ1

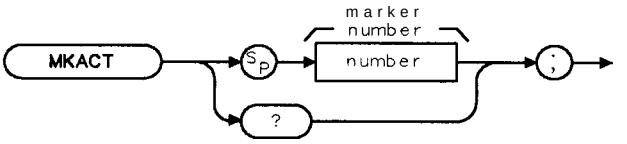


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# MKACT
# Activate Marker

Specifies the active marker.

## Syntax




XMKACT

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. Default value is 1. | 1 to 4. |

Equivalent **Softkey:** SELECT 1 2 3 4 .
Related Commands: MA, MKA, MKF.

## Example

```
OUTPUT 7 18 ; "MKACT 4 ;"
```
*Marker 4 becomes **marker** 1.*

## Description

There can be four different markers, but only one marker can be active at any time.

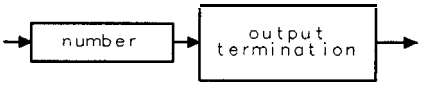
When this command is used, the following results occur:

- The marker number supplied by the command is made marker 1, the active marker.
- If the marker number is not already on, the marker is turned on with preset type (position), and the marker is placed at center screen. The trace chosen is the first displayed trace found: trace A, trace B, trace C.

**Note** Using MKACT replaces marker 1 with the new marker function. The amplitude and frequency for the previous marker are not saved.

## Query Response

"MKACT?; " returns the marker number.




QQ1



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# MKACTV
# Marker As the Active Function

Makes the current active marker the active function.

## Syntax




XMKACTV

Equivalent **Softkey:** MKACTV is equivalent to turning on a marker with **MARKER <number>** ON OFF (ON is underlined).

Related Commands: MKACT, MKN, MKTYPE.

## Example

| | |
|---|---|
| OUTPUT 7 18;"MKACT 2;" | *Makes marker number 2 the active marker:* |
| OUTPUT 7 18;"MKACTV;" | *Makes **marker** number 2 the active **function**.* |

## Description

If you have more than one marker displayed on the spectrum analyzer display, you need to make the desired marker the active function before you can manipulate the marker.

To make the marker the active function:

1. Select the desired marker with the MKACT command (MKACT makes the specified marker the active marker).
2. Execute MKACTV to make the active marker the active function.

If there is no active marker, executing MKACTV makes marker 1 the active marker and the active function. MKACTV makes the marker an active function according to its marker type (see "MKTYPE" for more information about marker type).

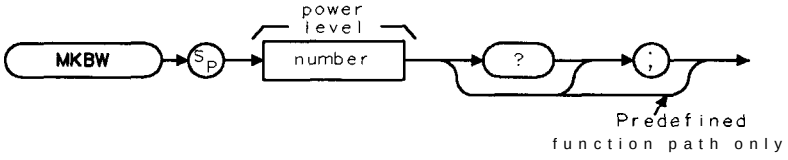


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# MKBW
# Marker Bandwidth

Returns the bandwidth at the specified power level relative to an on-screen marker (if present) or the signal peak (if no on-screen marker is present).

## Syntax




XMKBW

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid negative integer. | 0 to the amplitude of the noise floor. |

## Example

```
OUTPUT 718;"IP;"                          Initializes spectrum analyzer.
OUTPUT 718;"CF 300MHZ;SP100MHZ;SNGLS;"    Changes the center frequency and span,
                                          then activates the single-sweep mode.
OUTPUT 7 18 ; "TS ; MKPK HI ;"            Updates the sweep, places marker on signal
                                          peak.
OUTPUT 718 ; "MKBW -3 ;"                  Uses the MKBW function to find the signal
                                          bandwidth at -3 dB below the marker.
```

## Description

The MKBW command also displays (in the message area) the bandwidth at the power level in dB below the current marker position or the current signal peak.

MKBW finds the bandwidth at the specified power level for one measurement sweep. If you want the spectrum analyzer to find the bandwidth at the specified power level during every measurement sweep, use the NDBPNT command instead of MKBW.



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# MKCF
# Marker to Center Frequency

Sets the center frequency equal to the marker frequency and moves the marker to the center of the screen.

## Syntax




Equivalent Softkey: MARKER -> CF.
Related Commands: CF, MKF.

## Example

This example provides a quick way to center the desired frequency on the spectrum analyzer screen.

```
10 OUTPUT 718;"IP;SP 1MHZ;SNGLS;"
20 INPUT "ENTER IN DESIRED STATION
   FREQUENCY, IN MHZ", Freq
30 OUTPUT 718;"CF ";Freq;"MHZ;"
40 OUTPUT 718;"TS;MKPK HI;MKCF;TS;"
60 END
```

*Initializes spectrum analyzer, activates single-sweep mode.*

*Changes spectrum analyzer center frequency.*

*Updates the trace, places marker at the signal peak and centers it on screen.*

## Description

This command is performed only if an active marker is present on screen.



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# MKCONT
# Marker Continue

Resumes the sweep after execution of a MKSTOP command.

## Syntax




XMKCONT

Related Commands: MKSTOP.

## Example

```
10 OUTPUT 718;"IP;TS;"      Initializes spectrum analyzer.
20 OUTPUT 718;"MKPK HI;"    Creates an active marker:
30 OUTPUT 718;"MKSTOP;"     Stops sweep at marker:
40 OUTPUT 718; "MKCONT;"    Resumes sweep.
50 END
```

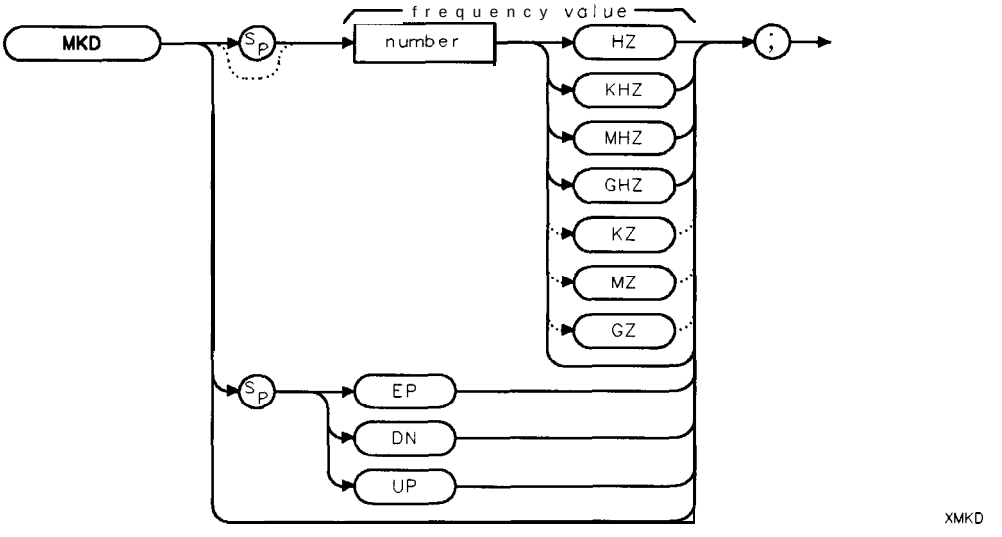


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# MKD
# Marker Delta

Activates the delta marker.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz, default value is value of the active marker. | Start frequency to stop frequency of spectrum analyzer. |

Equivalent Softkey: MARKER Δ .
Step Increment: by 1/10 of the frequency span.
Related Commands: AUTO, MA, MKCF, MKF, MKN, MKSP, MKSS, MKPK.

## Example

```
10 OUTPUT 718;"IP;"          Initializes spectrum analyzer:
20 OUTPUT 718;"MKMIN;"       Places a marker at the minimum amplitude of trace.
30 OUTPUT 718;"MKD;"         Activates marker delta.
40 OUTPUT 718;"MKPK HI;"     Places marker at highest amplitude of trace.
50 OUTPUT 718;"MKSP;"        Changes span to the values of the left and right markers.
60 END
```



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## Description

The MKD command computes the frequency and amplitude difference of the active marker and a special marker, called the delta or differential marker. These values are displayed in the display readout.

The differential value of the frequency is equal to the active marker frequency minus the delta marker frequency. The differential value of the amplitude is equal to the active marker amplitude minus the delta marker amplitude.

If an active marker is not on the screen, MKD positions an active marker at center screen. If a delta marker is not on the screen, MKD places one at the specified frequency, or at the current active marker. If the active marker is in amplitude mode, the delta marker is placed at the same amplitude as the active marker (or a specified value).

To read the amplitude, use MKA?. 'lb read the frequency, use MKF? The results are displayed on the spectrum analyzer screen.

In linear mode, MKD computes the ratio of the amplitudes of the active and delta markers rather than the difference. This results in similar treatment for logarithmic and linear data because the delta of the difference of two logarithmically generated numbers results in the logarithmically generated value of the ratio of the two numbers. (You should not change amplitude units when making a marker delta measurement, however.)

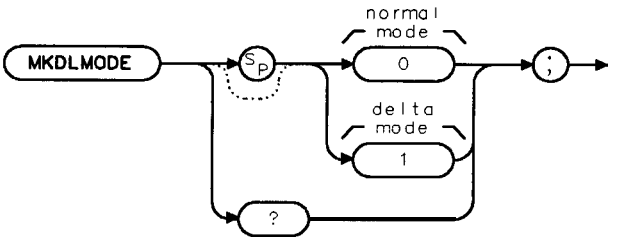


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# MKDLMODE
# Marker Delta Display Line Mode

When the marker table is turned on, MKDLMODE selects if the marker amplitude values are shown as relative to the reference level (normal mode) or relative to the display line (delta mode).

## Syntax




XMKDLMODE

Equivalent Softkey: TABLE **ΔDL NRM** .
Preset State: 0 (normal mode).
Related Commands: DL, MKTBL.

## Example

| | |
|---|---|
| `OUTPUT 718;"MOV MKTBL,1;"` | *Turns on the marker table.* |
| `OUTPUT 718;"DL -20;"` | *Sets the display line.* |
| `OUTPUT 718;"MOV MKDLMODE,1;"` | *Displays the marker amplitudes values relative to the display line.* |

## Description

If MKDLMODE is set to 0, the spectrum analyzer displays absolute marker amplitudes or marker delta amplitudes (normal mode). If MKDLMODE is set to 1, the spectrum analyzer displays the marker amplitudes relative to the display line (delta mode). Setting MKDLMODE to 1 turns on the display line automatically. Use the DL command to place the display line.

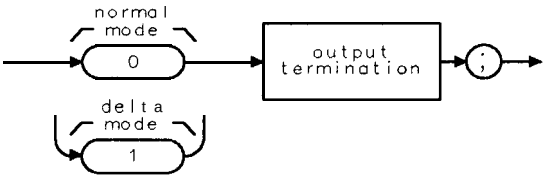
MKDLMODE determines the way the marker amplitudes are displayed in the marker table only, it does not change the marker amplitude values that are returned remotely.

You can execute the MKDLMODE command two different ways. You can either execute the MKDLMODE command directly (for example, `"MKDLMODE 1;"`) or use the MOV command to move the 1 or 0 into the MKDLMODE command (for example, `"MOV MKDLMODE,1;"`). If you use the MOV command, no text is displayed in the active function area during command execution.



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## Query Response




QMKDLMODE

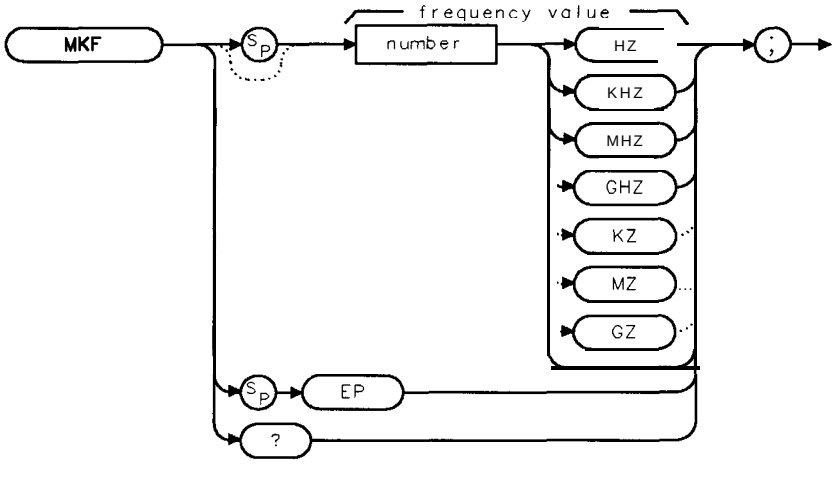


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# MKF
# Marker Frequency

Specifies the frequency value of the active marker.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | Start frequency to stop frequency of spectrum analyzer. |

Related Commands: AUTO, MKA, MKD, MKCF, MKPK.

## Example

```
OUTPUT 718;"MKF 600MHZ;"
```

*Places an active marker at 600 MHz.*

## Description

In nonzero frequency spans, MKF returns the active marker frequency as a real number when MKF is queried. In zero span, "MKF?;" returns the time value.

The data that is returned by MKF depends on many command conditions, including TDF, MKREAD, and MDS.

**MKF results with TDF set to P:** If the trace data format P is used with MKF, the result is one real value in time units or frequency units, depending on MKREAD.



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## Example

```
OUTPUT 718;"TDF P;MKREAD FRQ;MKF?;"
```
*This returns a frequency value (in Hz) if not in zero-span.*

```
OUTPUT 718;"TDF P;MKREAD FRQ;MKF?;"
```
*This returns a **time** value (in seconds) if in **zero**-span.*

```
OUTPUT 718;"TDF P;MKREAD PER;MKF?;"
```
*This returns the time value (in seconds) of **1/(marker frequency)**.*

```
OUTPUT 718;"TDF P;MKREAD SWT;MKF?;"
```
*This returns the **marker time** value (in seconds).*

```
OUTPUT 718;"TDF P;MKREAD IST;MKF?;"
```
*This returns the frequency value (in Hz) for **1/(marker time)**.*

```
OUTPUT 718;"TDF P;MKREAD FFT;MKF?;"
```
*This returns the frequency value (in Hz).*

**MKF results with TDF set to A or I:** If the trace data format is used with trace data format A, the result depends on the setting of the MDS command.

## Example

```
OUTPUT 718;"TDF A;MDS B;MKF?;"
```
*Returns **one** byte representing the marker position.*

```
OUTPUT 718;"TDF A;MDS W;MKF?;"
```
*Returns two bytes in a binary word **format** that has a value from 1 to 401.*

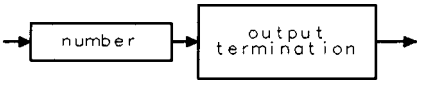
Using the trace data format I is equivalent to the TDF A format.

**MKF results with TDF set to M:** If the trace data format is used with trace data format M, the result is the marker horizontal position value, from 1 to 401, in ASCII.

## Example

```
OUTPUT 718;"TDF M;MKF?;"
```
*Returns marker **horizontal** position value in ASCII.*

## Query Response




QQ1

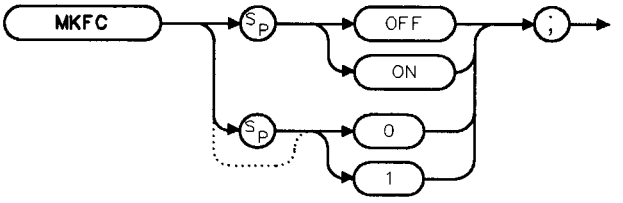


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# MKFC
# Marker Counter

Turns on or off the marker frequency counter.

## Syntax




XMKFC

Equivalent **Softkey: MK COUNT** ON OFF .
Model Required: HP 85913, HP 85933, HP 85943, HP 85953, HP 85963, or HP 8590L with Option 013.
Related Commands: MKFCR, MKN.
Restrictions: Not available with Analog+ display mode. See “ANLGPLUS” for more information. Not available with the marker table (MKTBL).

## Example

```
OUTPUT 718 ;"MKFC ON ;"
```
*Turns on the marker counter.*

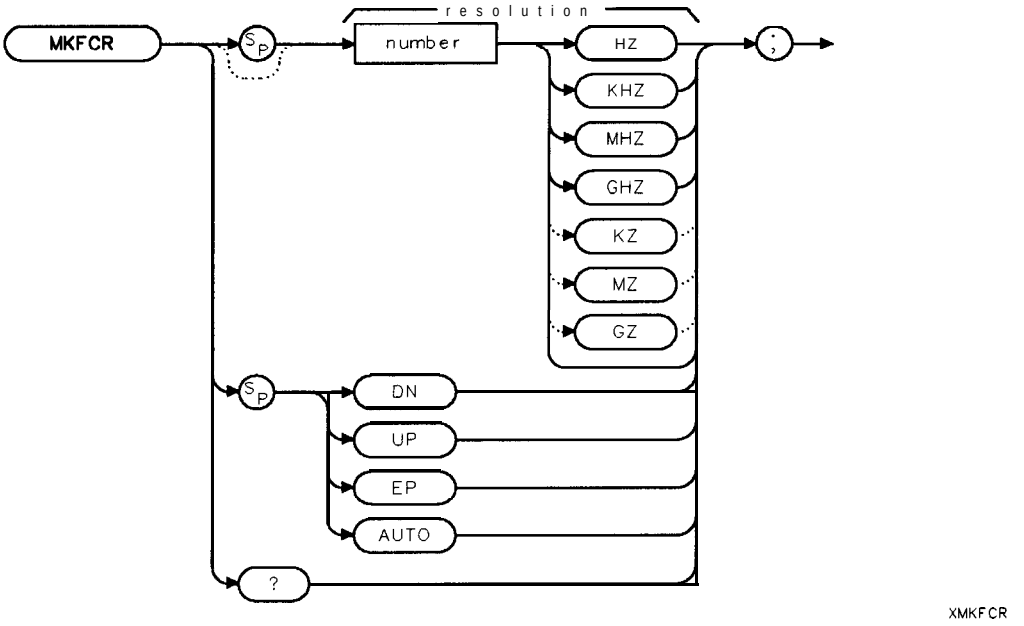


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# MKFCR
# Marker Counter Resolution

Sets the resolution of the marker frequency counter.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | 0 Hz to 100 **kHz**. |

Equivalent **Softkey: CNT RES AUTO** NAN .
Model Required: HP 85913, HP 85933, HP 85943, HP 85953, HP 85963, or HP 8590L with Option 013.
Preset State: Marker counter resolution is set to AUTO. The calculated value for the marker counter resolution is returned if the MKFCR is queried.
Related Commands: AUTO, MKFC.

## Example

```
OUTPUT 718;"MKFCR 10KHZ;"   Sets the marker counter resolution to 10 kHz.
OUTPUT718;"MKFCR?;"         Queries the marker counter resolution.
ENTER 718;A                 Gets the query response.
DISP A                      Displays the marker counter resolution.
```



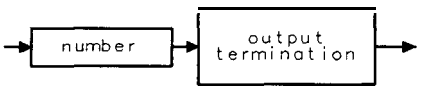
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**MKFCR Marker Counter Resolution**

## Description

Executing either “MKFCR 0;” or “MKFCR AUTO; ” auto-couples the marker counter resolution to the frequency span.

## Query Response




QQ1



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# MKMIN
# Marker Minimum

Moves the active marker to the minimum value detected.

## Syntax




XMKMIN

Related Commands: MKPK, SMOOTH, TH, VAVG.

## Example

```
10 OUTPUT 718;"IP;SNGLS;"
20 INPUT "ENTER IN THE START FREQUENCY,
   IN MHZ",Start_freq
30 INPUT "ENTER IN THE STOP FREQUENCY,
   IN MHZ",Stop_freq
40 OUTPUT 718;"FA ";Start_freq;"MHZ"
50 OUTPUT 718;"FB ";Stop_freq;"MHZ"
60 OUTPUT 718;"TS;MKPK HI;MKD;MKMIN;MKF?;"
70 ENTER 718;Delta_freq
80 PRINT "DIFFERENCE IN FREQUENCY IS ",
   Delta_freq,"HZ"
90 END
```

*Initializes spectrum analyzer, activates single-sweep mode.*

*Sets the start frequency.*

*Sets the stop frequency.*

*Updates trace, finds trace peak, turns on marker delta function, finds the minimum value of trace, and return the frequency delta.*

*Gets the result from spectrum analyzer*

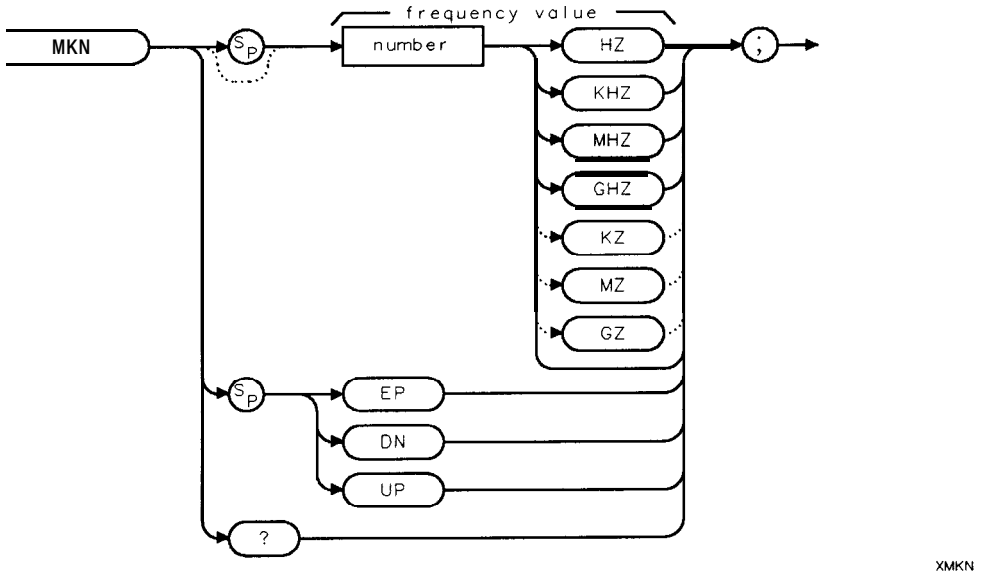


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# MKN
# Marker Normal

Activates and moves the marker to the specified frequency.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. Default value is the center frequency of the spectrum analyzer. | Start frequency to stop frequency of spectrum analyzer. |

Equivalent Softkey: MARKER NORMAL .
Step Increment: by 1/10 of the frequency span.
Related Commands: AUTO, DEMOD, MKA, MKD, MKF, MKPK.



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## Example

```
10 INPUT "ENTER IN THE START FREQUENCY, IN MHZ",Start_freq
20 INPUT "ENTER IN THE STOP FREQUENCY, IN MHZ",Stop_freq
30 OUTPUT 718;"IP;FA ";Start_freq;"MHZ"
```

*Initializes spectrum analyzer and changes the start frequency.*

```
40 OUTPUT 718;"FB ";Stop_freq;"MHZ"
```

*Changes the stop frequency.*

```
50 OUTPUT 718; "MKN EK;"
```

*Enables the front-panel knob.*

```
60 PRINT "PLACE MARKER ON THE DESIRED SIGNAL"
70 PRINT "PRESS HOLD THEN PRESS CONTINUE"
80 PAUSE
90 OUTPUT 718;"MKN?;"
```

*Gets the frequency of the marker:*

```
100 ENTER 718;Mkr
```

*Puts the frequency value into the computer variable, Mkr.*

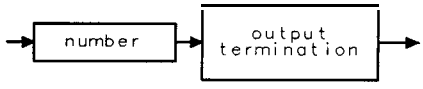
```
110 PRINT "MARKER FREQUENCY IS ",Mkr,"Hz"
120 END
```

*Prints the result.*

## Description

In nonzero span, "MKN?;" returns the frequency value. In zero span, "MKN?;" returns the time value.

## Query Response




QQ1

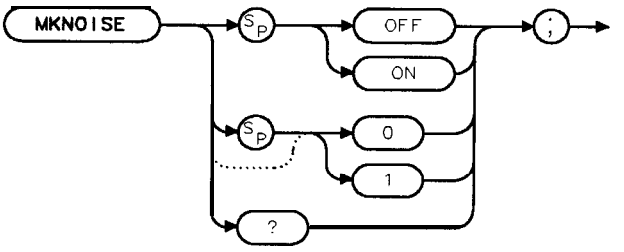


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## MKNOISE
## Marker Noise

Displays the average noise level at the marker.

### Syntax




XMKNOISE

Restrictions: Not available with the marker table (MKTBL).
Equivalent **Softkey**: MK **NOISE** ON OFF .
Related Commands: MKA, MKF, MKMIN, MKN.

### Example

```
OUTPUT 718;"IP;CF 300MHZ;SNGLS;"
```
*Initializes spectrum analyzer, changes center frequency, activates single-sweep mode.*

```
OUTPUT 718;"SP 10MHZ;DET SMP;TS;"
```
*Changes span, activates sample detector, updates trace.*

```
OUTPUT 718;"MKPK HI;MKA?;"
```
*Places marker on highest point of trace, queries marker amplitude.*

```
ENTER 718;Amp_one
```
*Pats the spectrum analyzer response* in *the computer variable, Amp-one.*

```
OUTPUT 718;"MKD UP;UP;MKNOISE ON;MKA?;"
```
*Moves marker and turns on the marker noise function.*

```
ENTER 718;Amp_two
```
*Puts the spectrum analyzer response in the computer variable, Amp-two.*

```
OUTPUT 718;"MKNOISE OFF;"
```
*Turns off the marker noise function.*

```
DISP Amp-two
```
*Displays the result.*

```
C_to_n=Amp_one - Amp-two
```
*Calculates the carrier to noise ratio.*

```
PRINT "CARRIER TO NOISE RATIO IN 1 HZ
BANDWIDTH IS ";C_to_n
PRINT " DB"
```
*Outputs result.*



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## Description

The marker value is normalized to a l-Hz bandwidth. Use "MKA?; " to read the noise marker value.

The noise marker averages 32 trace data values about the location of the marker on the frequency or time scale. The 32 values averaged, except for the first 15 or last 14 values in the trace, commence with the 16th point to the left of the marker, and end with the 15th point to the right of the marker. Note that the data values averaged are not exactly symmetrical with respect to marker position. At the trace end points, the spectrum analyzer uses the nearest 32 data values. So while the marker may be moved to trace position 1 to 15, the actual amplitude value returned will be the same value for any marker position from 1 to 15. A similar situation applies for markers at the end of the trace.

A nominal correction for equivalent noise bandwidths is made by the firmware based on a nominal 3 dB resolution bandwidth. The firmware assumes the noise bandwidth is 1.12 times the resolution bandwidth. This means the shape of the resolution bandwidth filters cause the noise power to be overstated by 1.12 times. The detection mode also affects the measurement. If in log mode, the log detector understates the noise response. lb compensate, 2.5 dB is added to the measurement. If the detector is in linear mode, the firmware uses 1.05 dB as a correction value.

In log detector mode, the final reported value will then be, with the result reported in dBm in a l-Hz bandwidth:

(Averaged value over 32 values) – 10 x (log[1.12 x Resolution bandwidth]) + 2.5 dB

In linear detector mode (dBm) units, the final reported value will then be, with the result reported in dBm in a l-Hz bandwidth:

(Averaged value over 32 values) – 10 x (log[1.12 x Resolution bandwidth]) + 1.05 dB

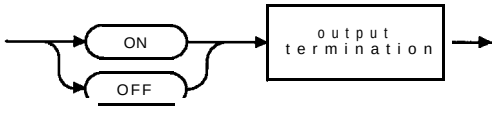
In linear detector mode with the normal display of voltage units, the noise marker voltage value will be related to the present marker voltage by this relation.

$(V_noise_marker)^2$ = (V-average)' x 1.12 x Resolution bandwidth x 0.7824

V-noise-marker = V-average/( 1.12 x Resolution bandwidth x $0.7824)^{0.5}$

V-noise-marker = V-average x $1.06633/(\text{Resolution bandwidth})^{0.5}$

## Query Response




QQ2

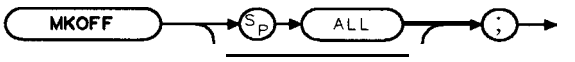


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## MKOFF
## Marker Off

Turns off either the active marker or all the markers.

### Syntax




XMKOFF

Equivalent **Softkey: MARKER** ALL OFF .
Related Commands: MKA, MKACT, MKACTV, MKCF, MKD, MKF, MKN, MKPK.

### Example

```
OUTPUT 718;"MKOFF ALL;"
```

*Turns off all the on-screen markers.*

### Description

If the ALL parameter is omitted, only the active marker is turned off.

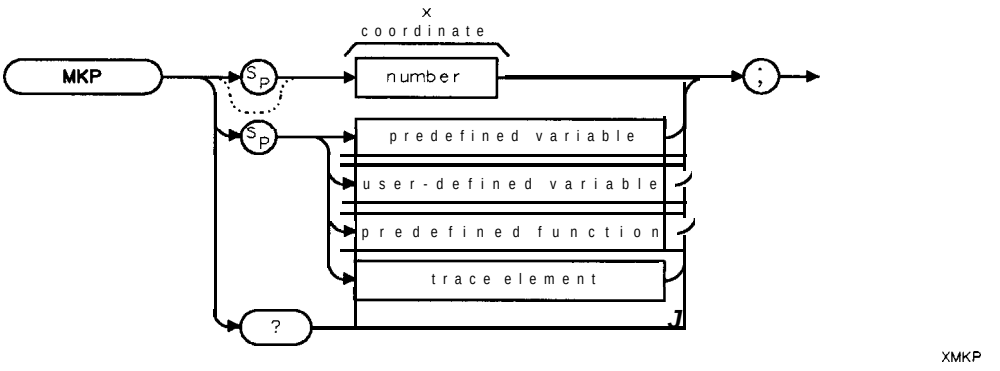


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# MKP
# Marker Position

Places the active marker at the given x-coordinate.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | -401 to 401. |
| User-defined variable | A variable **defined** by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-1. | |
| **Predefined** function | Function that returns a value. Refer to Table 5-l. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: MKA, MKCF, MKD, MKMIN.

## Example

```
OUTPUT 718;"IP;"          Initializes spectrum analyzer.
OUTPUT 718;"MKP 100;"     Mioves the active marker to a element 100 of trace A.
```

## Description

If no marker is active, the marker is turned on with preset type (position) and marker is placed at the given screen position. The marker is placed on the first displayed trace that is found (in order): trace A, trace B, or trace C.

If the marker delta mode is active, the value of the marker position is relative to the fixed marker, and therefore MKP can return a negative position.

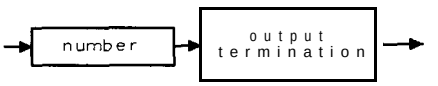
Note that MKP and MKCF commands perform different functions. MKCF sets the center frequency equal to the marker frequency and moves the marker to the center of the screen. MKP places the marker to the position of the element specified.



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**MKP Marker Position**

## Query Response




QQ1

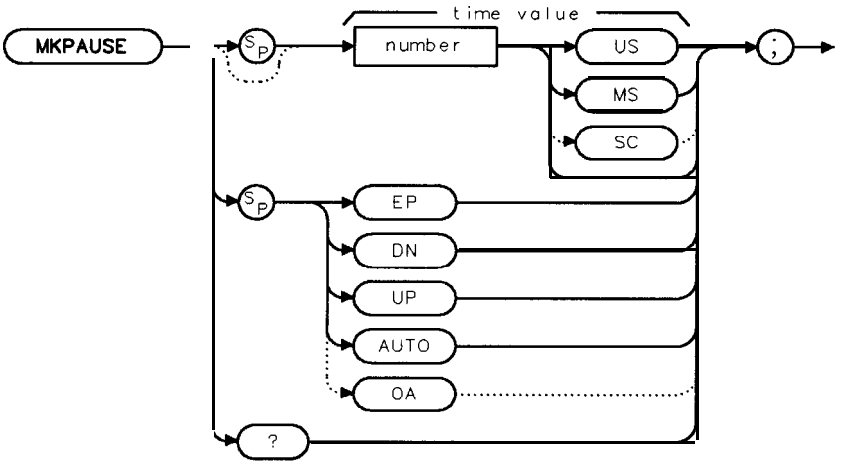


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# MKPAUSE
# Marker Pause

Pauses the sweep at the active marker for the duration of the delay period.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | 2msto 100s. |

Restrictions: Not available with Analog+ display mode. See “ANLGPLUS” for more information. Not available with negative peak detection.

Equivalent Softkey: MK PAUSE ON OFF.

Step Decrement: Time value divided by 2.
Step Increment: Time value multiplied by 2.
Related Commands: DEMOD, MKA, MKF, MKFC, MKN, MKOFF, ST.

## Example

```
OUTPUT 718;"MKPAUSE 10SC;"
```
*Changes the marker pause time to 10 seconds.*

## Description

To turn MKPAUSE off, turn off markers or send “MKPAUSE 0;“.

The MKPAUSE command requires a sweep time of 50 ms or longer. The sweep time is changed to 50 ms if MKPAUSE is used with a sweep time that is less than 50 ms.

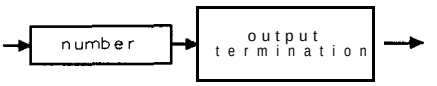
After MKPAUSE is executed, the sweep must be completed before another command will be executed.



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**MKPAUSE Marker Pause**

Query Response




QQ1

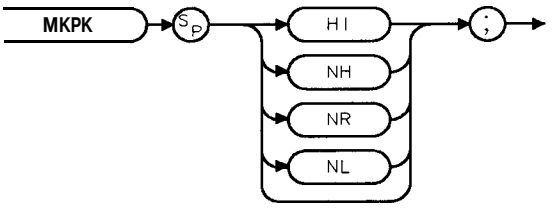


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# MKPK
# Marker Peak

Positions the active marker on a signal peak.

## Syntax




Equivalent **Softkey:** NEXT PEAK , NEXT PK RIGHT, NEXT PK LEFT, and [PEAK SEARCH].
Related Commands: MKCF, MKF, MKOFF, MKPX, TH.

## Example

```
10 OUTPUT 718;"IP;"                  Initializes the spectrum analyzer:
20 OUTPUT 718;"SNGLS;TS;MKPK HI;"    Places active marker on highest peak.
30 OUTPUT 718;"MKA?;"                Returns amplitude value of marker to the computer
40 ENTER 718;A                       Puts the spectrum analyzer response in the computer variable, A.

50 DISP A                            Displays amplitude value.
60 END
```

## Description

Executing MKPK HI, or simply MKPK, positions the active marker at the highest signal detected. If an active marker is on the screen, the MKPK parameters move the marker as follows:

| | |
|---|---|
| **HI** (highest) | moves the active marker to the highest peak. |
| **NH** (next highest) | moves the active marker to the next signal peak of lower amplitude. |
| **NR** (next right) | moves the active marker to the next signal peak of higher frequency. |
| NL (next left) | moves the active marker to the next signal peak of lower frequency. |

**Note** This function is for use with the frequency markers only.

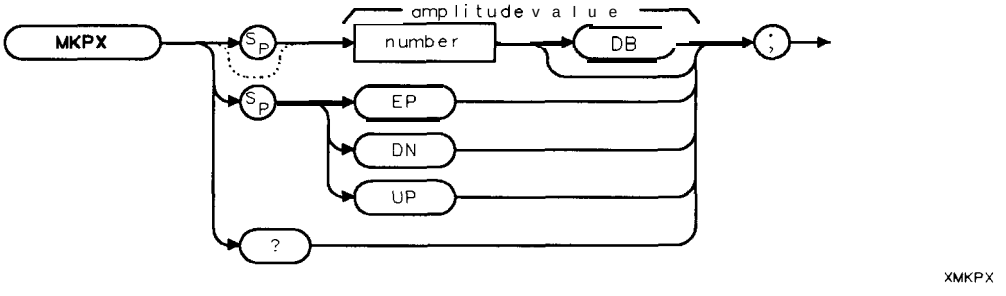


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# MKPX
## Marker Peak Excursion

Specifies the minimum signal excursion for the spectrum analyzer's internal peak-identification routine.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is dB. | Oto 100 dB. |

Equivalent Softkey: PEAK EXCURSN .
Preset State: 6 dB.
Step Increment: by 1 dB.
Related Commands: MKPK, PEAKS.

### Example

```
10 OUTPUT 718;"IP;CF 300MHZ;SP 1GHZ;"

20 INPUT "ENTER IN PEAK EXCURSION, IN DB ",Excursion
30 OUTPUT 718;"MKPX ";Excursion;"DB;"
40 OUTPUT 718;"TS;MKPK HI;MKPK NH;"

50 OUTPUT 718;"MKF?;"

60 ENTER 718;Freq


70 IF Freq <> 0 THEN

80 PRINT "PEAK FOUND"
90 ELSE

100 PRINT "NO PEAKS FOUND"
110 END IF
120 END
```

*Initializes spectrum analyzer; changes start and stop frequencies.*

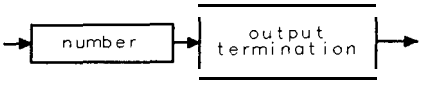
*Changes peak excursion level.*
*Searches for highest peaks of trace.*
*Finds frequency difference between peaks.*
*Puts the spectrum analyzer response in the computer variable, Freq.*
*Outputs results if marker amplitude was not 0.*

*Prints "NO PEAKS FOUND" if Freq = 0.*



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## Query Response



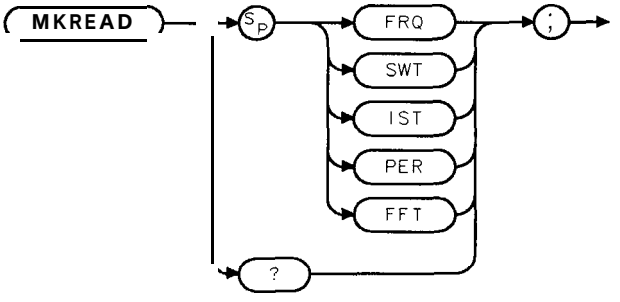



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# MKREAD
## Marker Readout

Selects the type of active trace information displayed by the spectrum analyzer marker readout.

### Syntax




XMKREAD

Equivalent **Softkey**: **MK READ** F T I P provides the marker readouts in the frequency, sweep time, inverse sweep time, and period. The fast Fourier transform readout is not available with the **softkey**, however.
Related Commands: FFT, MKF, MKTYPE.

### Example

```
OUTPUT 718;"MKREAD FFT;"
```

### Description

The MKREAD command can select the following types of active trace information:

**FRQ** frequency

**SWT** sweep time

**IST** inverse sweep time

**PER** period

**FFT** Fast Fourier Transform Readout

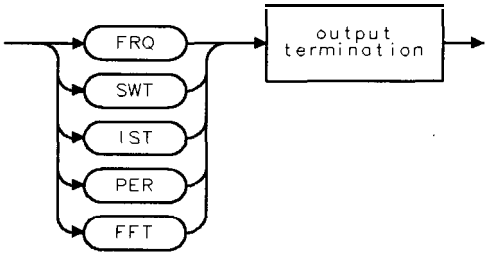
The results of the data depend on the MKREAD parameter, the frequency span, and if the marker delta function is used.



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| MKREAD Type | Non-Zero Span | Non-Zero Span Delta | Zero Span | Zero Span Delta |
|---|---|---|---|---|
| FRQ | Reads frequency | Reads delta frequency | Reads time | Reads delta time |
| SWT | Reads time since the start of sweep | Reads delta time between end points | Waveform measurements of detected modulation | Waveform measurements of detected modulation |
| IST | N/A | N/A | N/A | Computes frequency corresponding to delta of markers. Performs $1/(T_1 - T_2)$ |
| PER | Period of frequency | (Pulse measurement) delta time | N/A | N/A |
| FFT | N/A | N/A | Reads frequency corresponding the to FFT bucket | Reads delta frequency corresponding to delta FFT bucket |

## Query Response




QMKREAD



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# MKRL
# Marker to Reference Level

Sets the reference level to the amplitude value of the active marker.

## Syntax




Equivalent **Softkey: MARKER -> REF** LVL .
Related Commands: **MKOFF**, RL.

## Example

```
10 OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;"
20 OUTPUT 718;"TS;MKPK HI;MKRL;TS;"
30 OUTPUT 718;"RL?;"
40 ENTER 718 USING "K";Ref_level
50 OUTPUT 718;"AUNITS?;"
60 ENTER 718;Aunits$
50 PRINT "REFERENCE LEVEL IS",Ref_level,Aunits$
60 END
```

*Initializes spectrum analyzer, changes center frequency and span.*

*Places a marker on trace peak, sets the reference level to the amplitude of the active marker, updates the sweep.*

*Gets the reference level.*

*Puts the spectrum analyzer response in the computer variable, Ref_level.*

*Gets the current amplitude units.*



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# MKSP
# Marker to Span

Sets the start and stop frequencies to the values of the delta markers.

## Syntax




XMKSP

Equivalent Softkey: MKR Δ -> SPAN.

Related Commands: MKD, SI?

## Example

```
10 OUTPUT 718;"IP;"          Initializes spectrum analyzer.
20 OUTPUT 718;"MKMIN;"       Places a marker at the minimum amplitude of trace.
30 OUTPUT 718;"MKD;"         Activates marker delta.
40 OUTPUT 718;"MKPK HI;"     Places marker at highest amplitude of trace.
50 OUTPUT 718;"MKSP;"        Changes span to the values of the left and right markers.
60 END
```

## Description

The left marker specifies start frequency, and the right marker specifies stop frequency. If MKD is off, no operation is performed.



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# MKSS
# Marker to Step Size

Sets the center-frequency step-size to the marker frequency.

## Syntax




XMKSS

Equivalent Softkey: MARKER -> CF STEP .

Related Commands: CF, MKA, MKCF, MKD, MKF, SS.

## Example

This example measures a harmonic of the CAL OUT signal.

```
10 DISP "CONNECT THE CAL OUT TO THE INPUT"
20 OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;TS;"
30 OUTPUT 718;"MKPK HI;MKSS;MKD;CF UP;TS;MKPK HI;"
40 OUTPUT 718;"MKA?;"
50 ENTER 718;Delta_amp
60 OUTPUT 718;"MKF?;"
70 ENTER 718;Delta_freq
80 PRINT "DIFFERENCE IN AMPLITUDE IS ",Delta_amp,"dB"
90 PRINT "DIFFERENCE IN FREQUENCY IS ",Delta_freq,"Hz"
100 END
```

*Initializes spectrum analyzer, activates single-sweep mode, changes center frequency and span, updates trace.*

*Places the marker on the highest point of the trace, changes the step size to the marker frequency, activates marker delta, increase center frequency, update trace, places the marker at highest point of the trace.*

*Gets the amplitude of the marker:*

*Puts the spectrum analyzer response in the computer variable, Delta-Amp.*

*Gets the frequency of the marker.*

*Puts the spectrum analyzer response in the computer variable, Delta_freq.*

## Description

Sets the center-frequency step-size equal to the marker frequency. If in the delta mode, the step size is set to the delta frequency (absolute value).



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# MKSTOP
# Marker Stop

Stops the sweep at the active marker.

## Syntax




XMKSTOP

Related Commands: MKCONT.
Restrictions: Not available with Analog+ display mode. See “ANLGPLUS” for more information.

## Example

```
10 OUTPUT 718;"IP;TS;"          Initializes spectrum analyzer.
20 OUTPUT 718;"MKPK HI;"        Creates an active marker.
30 OUTPUT 718;"MKSTOP;"         Stops sweep at marker.
40 OUTPUT 718;"MKCONT;"         Resumes sweep.
50 END
```

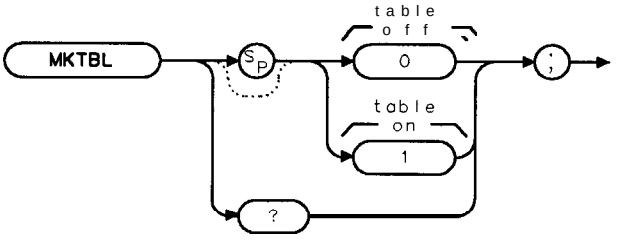


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# MKTBL
# Marker Table

Turns on or off the marker table.

## Syntax




Equivalent Softkey: MK TABLE ON OFF .
Preset State: 0 (marker table is off).
Related Commands: DL, MKDLMODE.

## Example

OUTPUT718;"MOVMKTBL,1;" *Turns on the marker table.*

## Description

When the marker table is turned on, the spectrum analyzer screen displays two windows. The upper window displays the traces and the graticule, and the lower window displays the marker table. The marker table displays the following information about the on-screen markers: the trace (trace A, B, or C) on which the marker is located, the type of marker (frequency, time, inverse sweep time, or period), the frequency or time of the marker, and the amplitude of the marker. While the marker table is turned on, the marker table data is updated at the end of every sweep, or whenever a marker is moved. (MKTBL command uses the ONMKRU command to update the marker table information).

The marker table is displayed on the spectrum analyzer display only. To obtain the information that is displayed in the marker table remotely, you must use the following programming commands.

- Use MKACT to select a marker. Use the MKACTV command makes the selected marker the active function.
- Use MKA? to determine the amplitude of a marker.
- Use MKF? to determine the frequency or time of a marker.
- Use MKREAD? to determine the type of marker.
- Use MKTRACE? to determine which trace the marker is located on.



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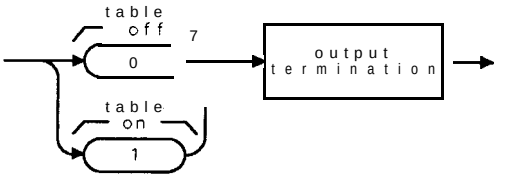
**Restrictions**

Turning on the marker table turns off following functions: windows display mode (WINON), N dB point measurement (NDBPNT), the FFT menu measurements (FFTAUTO, FFTCONTS, FFTSNGLS), gate utility functions (GDRVUTIL), TO1 measurement (TOI), peak table (PKTBL), percent AM (PCTAM), peak zoom (PKZOOM), and power menu measurements (ACP, ACPE, CHP, and OBW). Marker noise (MKNOISE) and marker counter (MKFC) are not available with the marker table.

You can execute the MKTBL command two different ways. You can either execute the MKTBL command directly (for example, "MKTBL 1; ") or use the MOV command to move the 1 or 0 into the MKTBL command (for example, "MOV MKTBL, 1; "). If you use the MOV command, no text is displayed in the active function area during command execution.

You should turn off the marker table (set MKTBL to 0) when you are done with the marker table.

## Query Response




qMKTBL

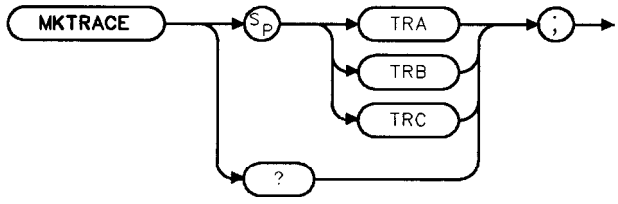


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# MKTRACE
## Marker Trace

Moves the active marker to a corresponding position in trace A, trace B, or trace C.

### Syntax



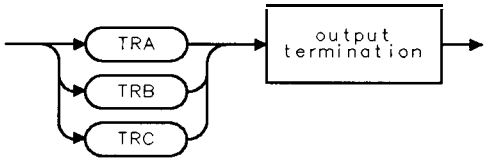

XMKTRACE

Equivalent **Softkey**: MK TRACE AUTO ABC.

### Example

```
10 OUTPUT 718;"IP;"                    Initializes spectrum analyzer
20 OUTPUT 718;"MKMIN;"                 Finds the lowest amplitude of trace.
30 OUTPUT 718;"MKTRACE TRB;"           Moves marker to corresponding position on
                                       trace B.
40 OUTPUT 718;"BLANK TRA;CLRW TRB;"    Blanks trace A and displays trace B.
50 END
```

### Query Response




QMKTRACE

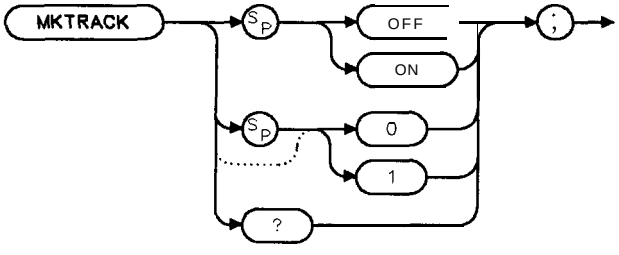


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# MKTRACK
# Marker Track

Moves the signal on which the active marker is located, to the center of the spectrum analyzer display and keeps the signal peak at center screen.

## Syntax




XMKTRACK

Equivalent **Softkey**: **MK** TRACK ON OFF .
Related Commands: MKA, MKCF, **MKF**.
Restrictions: Not available with Analog+ display mode. See “ANLGPLUS” for more information.

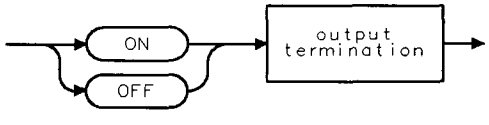
## Example

```
OUTPUT 718;"IP;"              Initializes spectrum analyzer.
OUTPUT 718;"CF 300MHZ;TS;"    Changes the center frequency.
OUTPUT 718;"MKTRACK ON;"      Activates the marker track.
OUTPUT 718;"SP 10MHZ;TS;"     Changes the span.
OUTPUT 718;"MKTRACK OFF;"     Turns off the marker track.
```

## Description

To keep a drifting signal at center screen, place the active marker on the desired signal before turning on MKTRACK.

## Query Response




QQ2

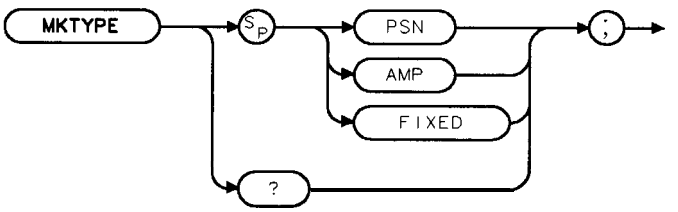


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# MKTYPE
# Marker Type

Changes the type of the current active marker.

## Syntax




xmktype

Equivalent Softkey: The functions of MKTYPE AMP and MARKER AMPTD are equivalent.
Preset State: MKTYPE PSN.
Related Commands: MKA, MKBW.

## Example

```
OUTPUT 718;"MKTYPE AMP;MKA -5;"
```

*Positions the marker at -5 dBm.*

## Description

The marker types are as follows:

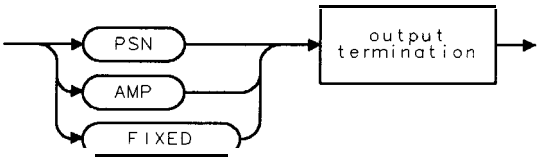
**PSN** allows markers to be positioned according to the horizontal position on the display. The marker type is set to PSN after an instrument preset.

**AMP** allows markers to be positioned according to amplitude, as shown in the example. If two or more points on the trace are at the same amplitude, the marker is moved to the closest point on the trace with the correct amplitude. If no point on the trace is at the specified amplitude, the marker is placed at the specified amplitude and not on the trace.

**FIXED** allows a marker to be placed at any fixed point on the spectrum analyzer screen. The position of the marker cannot be changed unless another marker type is used.

Use "MKTYPE PSN" to return from using the AMP, FIXED, or DELTA types.

## Query Response




QMKTYPE

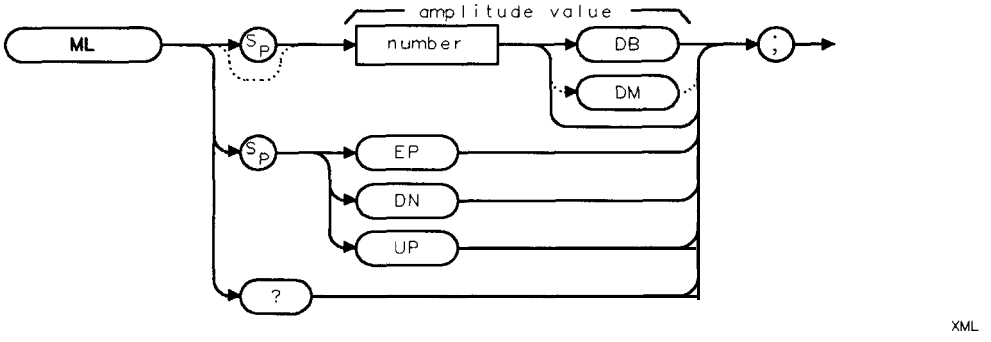


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# ML
# Mixer Level

Specifies the maximum signal level that is applied to the input mixer for a signal that is equal to or below the reference level.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is dBm. | -10 to -60 dBm. |

Equivalent Softkey: MAX MXR LEVEL .
Preset State: -10 dBm.
Step Increment: by 10 dBm.
Related Commands: AT, ROFFSET.

## Example

```
OUTPUT 7 18;"ML -40DM;"
```

*As the reference level is changed, the coupled input attenuator is changed automatically. This limits the maximum signal at the mixer input to -40 dBm for signals less than or equal to the reference level.*

## Description

The ML command specifies the maximum signal level that is applied to the input mixer for a signal that is equal to or below the reference level.

The effective mixer level is equal to the reference level minus the input attenuator setting. When ML is activated, the effective mixer level can be set from -10 dBm to -60 dBm in 10 dB steps.

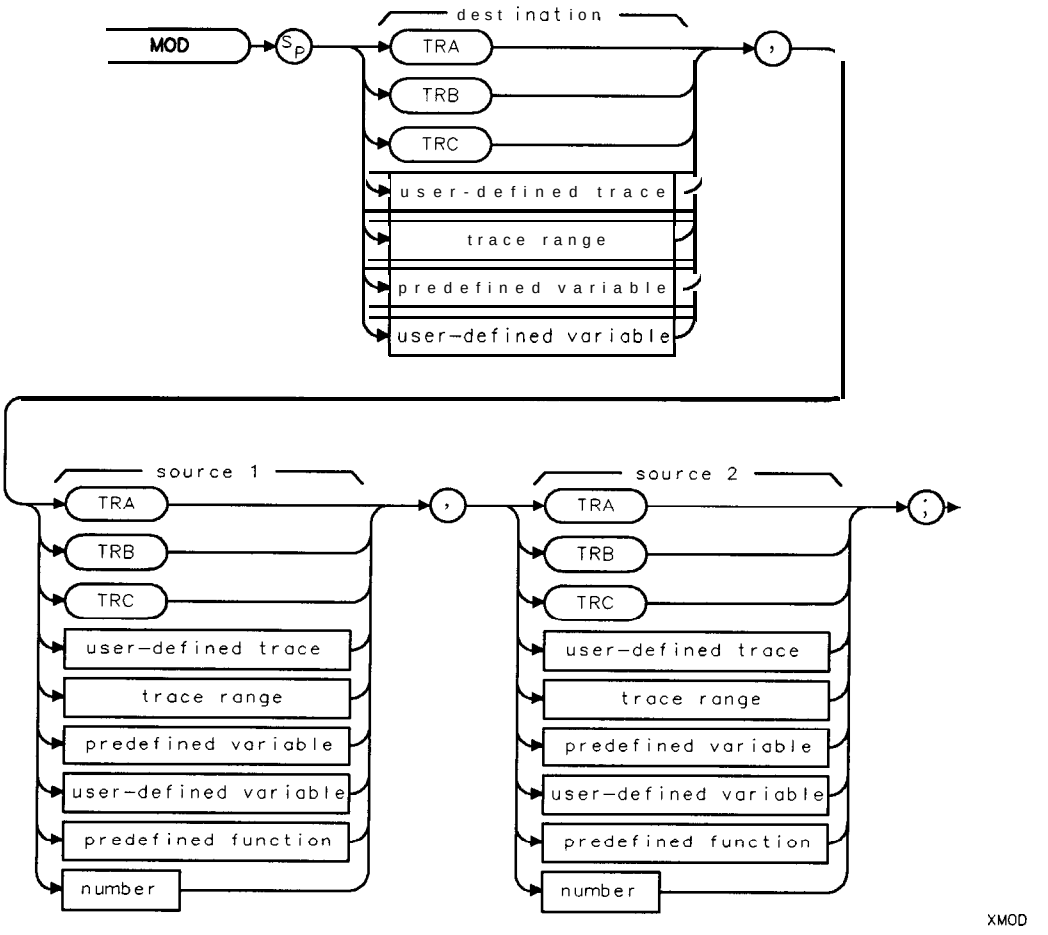


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# MOD
# Modulo

Stores the remainder from the division of source 1 by source 2 in the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-1. | |
| Predefined function | Function that returns a value. Refer to Table 5-1. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF when using a user-defined variable. TS when using trace data.
Related Commands: DIV.



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## Example

```
10 OUTPUT 718;"VARDEF S_ONE,15;"          Places 15 into S-ONE.
20 OUTPUT 718;"VARDEF S_TWO,4;"           Places 4 into S-TWO.
30 OUTPUT 718;"VARDEF D_EST,0;"           D-EST holds the result.
40 OUTPUT 718;"MOD D_EST,S_ONE,S_TWO;"
50 OUTPUT 718;"D_EST?;"                   Moves the result to the computer:
60 ENTER 718;Number                       Puts the spectrum analyzer response
                                          in the computer variable, Number:
70 DISP Number                            Displays a 3.
80 END
```

## Description

If source 1 is a negative number and source 2 is a positive number, the MOD function returns a negative remainder. If both sources are negative, the MOD function returns a negative remainder.

Integer values are used when a trace is the destination or one of the sources. If trace data is used as the source and the destination, the MOD function is done with 32-bit arithmetic using 16-bit integer data. If a user-defined variable or predefined variable is used as the source or destination, the MOD function is done in floating point format. If a real number is used as a source, but the destination is an integer value, the result is truncated. If a trace is used as a source, be sure the trace contains a complete sweep of measurement information before executing MOD.

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

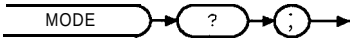


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# MODE
# Mode

Returns a "0" if the mode of operation is spectrum analysis. A number other than "0" is returned if the operating mode is other than spectrum analysis.

## Syntax




XMODE

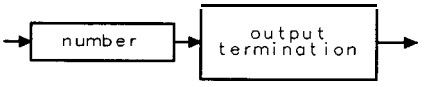
## Example

```
OUTPUT 7 18 ; "MODE? ;"
```

## Description

All spectrum analyzers have the spectrum analyzer mode of operation. If a program (also called a downloadable program or personality) has been loaded into the spectrum analyzer's memory, and the spectrum analyzer is using the personality mode, the number that is returned by MODE may be modified.

## Query Response




QQ1

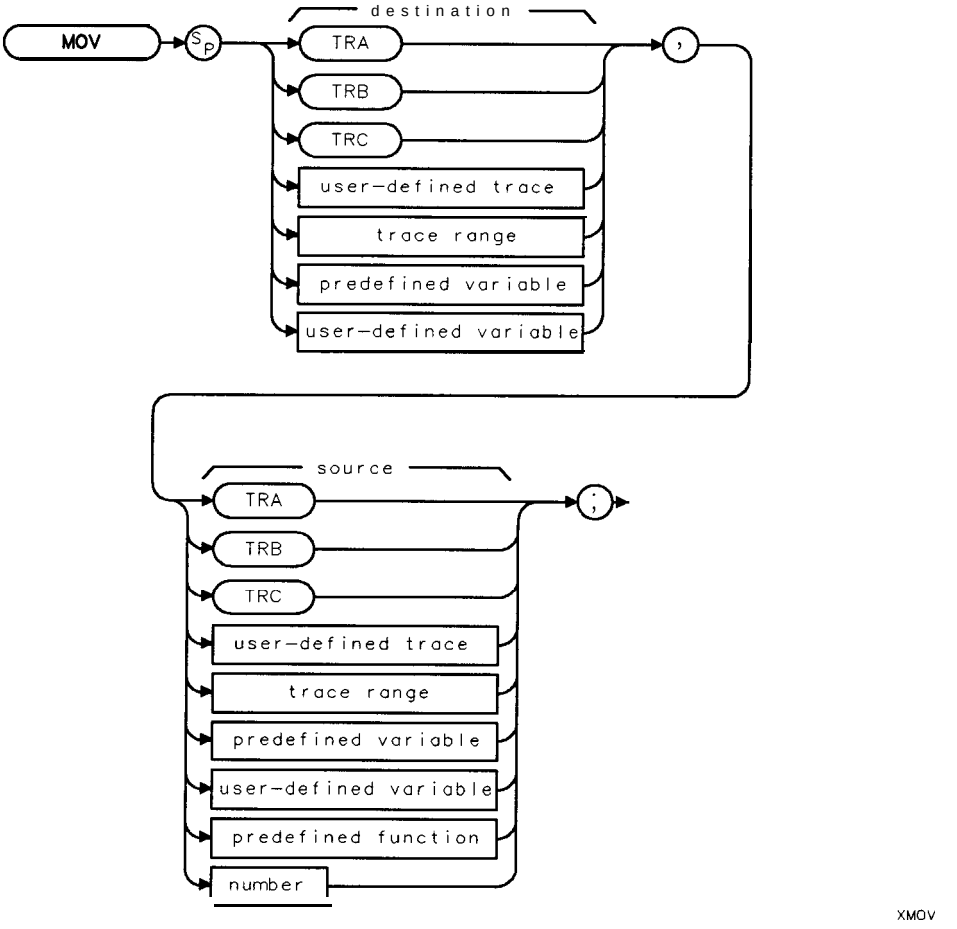


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# MOV
# Move

Copies the source values into the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable **defined** by VARDEF or ACTDEF commands. | Any valid variable name. |
| **Predefined** variable | A command that acts as a variable. Refer to **Table** 5-l. | |
| Predeflned function | Function that returns a value. Refer to Table 5-l. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF when using a user-defined variable.



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## Example

```
10 CLEAR 718                                  Clears the HP-IB bus and spectrum analyzer.
20 OUTPUT718;"IP;"                            Initializes spectrum analyzer
30 OUTPUT718;"FA 100MHZ;FB 1100MHZ;"          Sets up the measurement range.
40 OUTPUT 718;"TS;MKPK HI;"                   Places a marker at the highest peak.
50 OUTPUT 718; "DL ON; "                      Turns on display line.
60 OUTPUT 718;"MOV DL,MKA;"                   Sets the display-line value equal to the marker
                                              amplitude by storing the value of the marker
                                              amplitude variable, MKA, in the display line
                                              variable, DL.
70 END
```

## Description

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

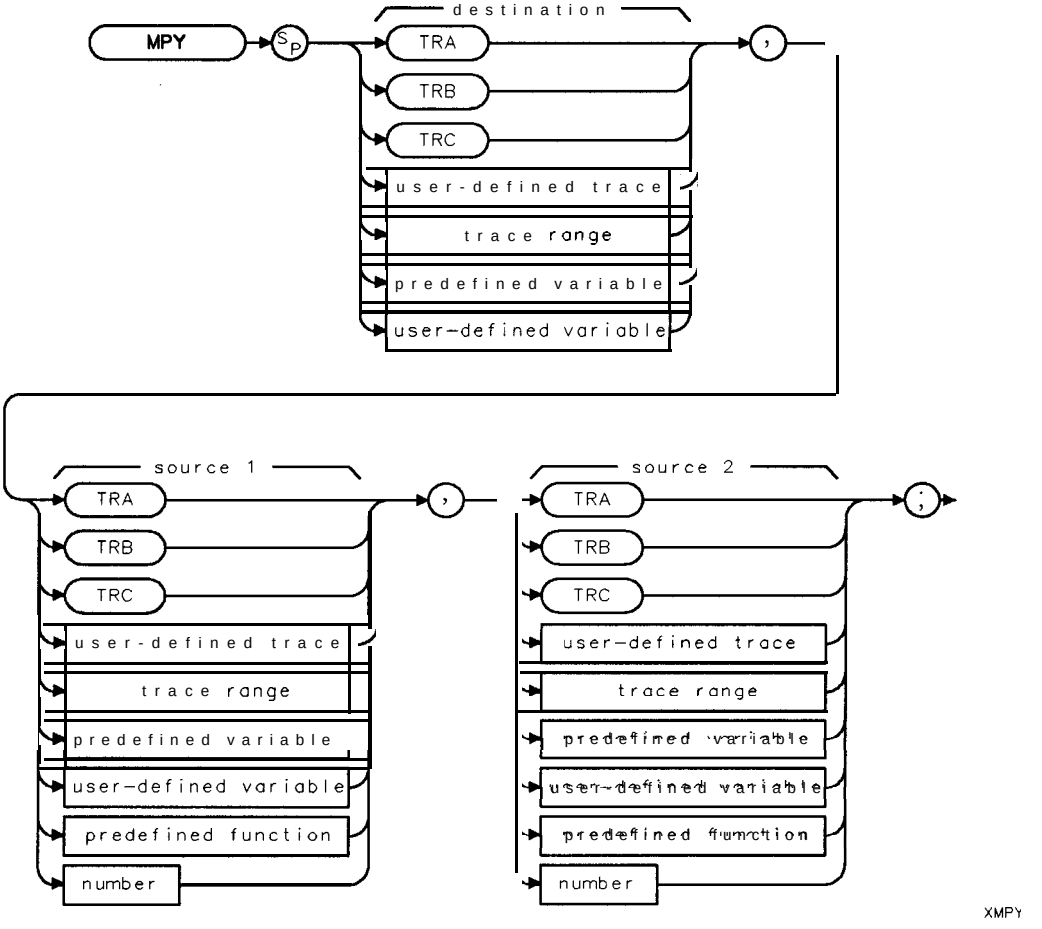


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# MPY
# Multiply

Multiplies the sources, point by point, and places the results in the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| **Predefined** variable | A command that acts as a variable. Refer to Table 5-l. | |
| Predeflned function | Function that returns a value. Refer to **Table** 5-l. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF when using a user-defined variable. TS when using trace data.



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## Example

```
OUTPUT 718;"MPY CF, CF,2;"   Doubles the center frequency.
```

## Description

Traces, user-defined traces, and trace ranges are multiplied as 16-bit integers. Negative numbers are represented in two's complement format. Single variables and numbers are treated as floating point numbers and must be within the real number range as defined in Table 5-l.

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

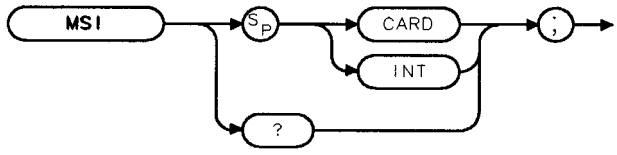


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# MSI
## Mass Storage Is

Allows you to specify the current mass storage device as the spectrum analyzer memory or a memory card.

### Syntax




XMSI

Related Commands: CAT, SAVRCLN.

### Example

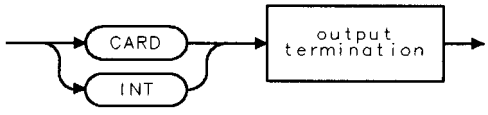
OUTPUT 718;"MSI CARD;" Selects *the memory card as the current mass storage device.*

### Description

If you specify INT, the current mass storage device is set to spectrum analyzer memory. If you specify CARD, the current mass storage device is set to the memory card. *For the HP 859OL* or *HP 8592L only:* Your spectrum analyzer must have Option 003 installed in it to select the memory card as the mass storage device.

If MSI is used as a predefined variable, it returns a "0" if the mass storage device is the spectrum analyzer memory and a " 1" if it is the memory card.

### Query Response




QMSI

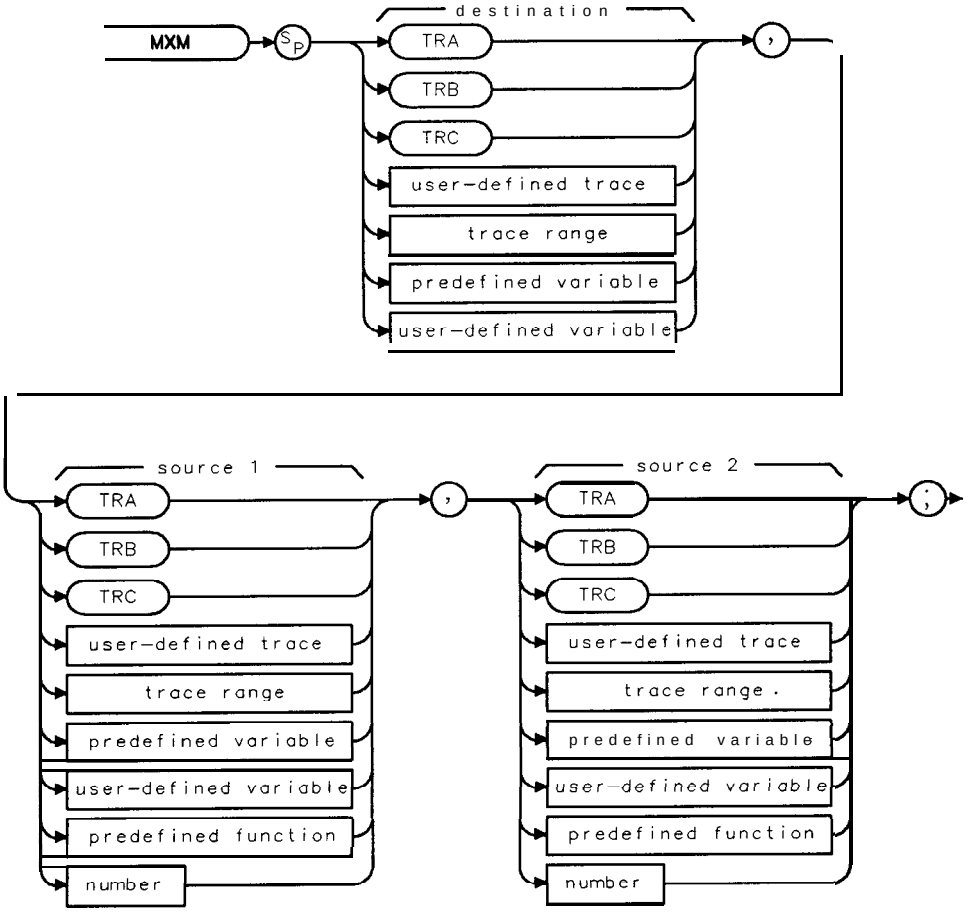


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# MXM
# Maximum

Compares source 1 and source 2, point by point, sending the greater value of each comparison to the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-l. | |
| Predefined function | Function that returns a value. Refer to Table 5-1. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF when using a user-defined variable. TS when using trace data.
Related Commands: MIN, PKPOS, TS.



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## Example

```
10 OUTPUT 718;"IP;"                    Initializes spectrum analyzer
20 OUTPUT 718;"CF 300MHZ;SNGLS;"       Changes the center frequency and activate single-
                                       sweep mode.
30 OUTPUT 718;"TS;VIEW TRA;"           Updates trace. Displays and stores the results of
                                       trace A.
40 OUTPUT 718;"MXM TRB,TRA,4000;"      Moves elements of trace A that exceed 4000 trace
                                       data points (above center screen) to trace B.
50 OUTPUT 718;"BLANK TRA;VIEW TRB;"    Displays result.
60 END
```

## Description

If one of the sources is a single value, it acts as a threshold; all values equal to or greater than the threshold pass to the destination.

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

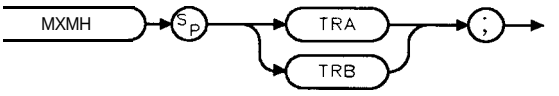


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# MXMH
# Maximum Hold

Updates each trace element with the maximum level detected.

## Syntax




XMXMH

Equivalent Softkeys: **MAX HOLD** A and MAX **HOLD** B .
Related Commands: BLANK, CLRW, MINH, VAVG, VIEW.
Restrictions: Not available with Analog+ display mode. See “ANLGPLUS” for more information.

## Example

```
OUTPUT 718;"MXMH TRA;"
```

## Description

MXMH updates the specified trace (either trace A or trace B) with a new value from a detector only if the new value is larger than the previous trace data value.

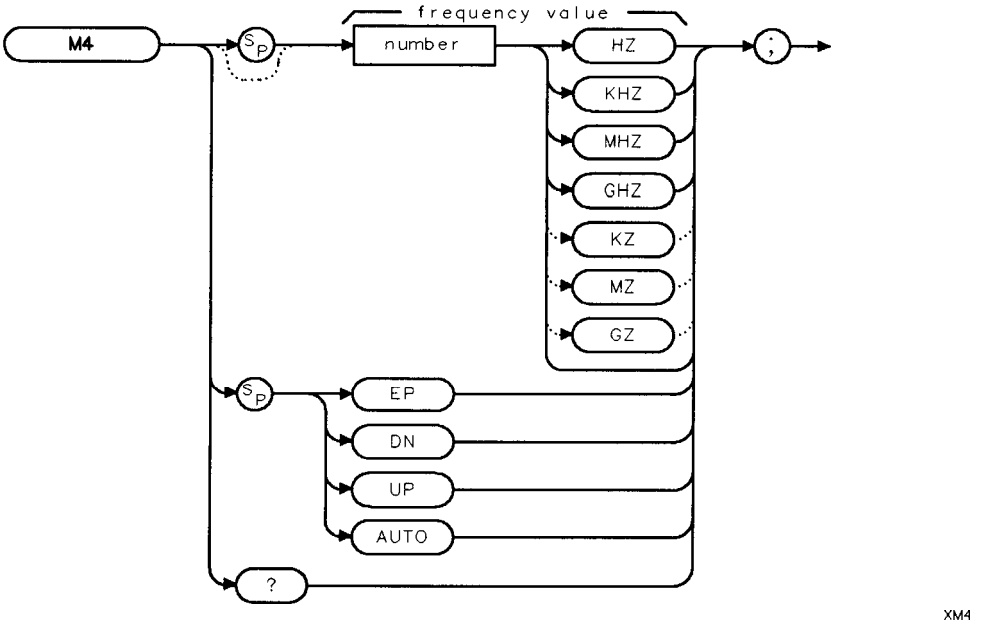


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# M4
# Marker Zoom

Activates a single marker on the trace and enables the knob to change the position of the marker. When changing the frequency span, M4 keeps the marker at center frequency.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | Start frequency to stop frequency of spectrum analyzer. |

Step Decrement: Span divided by 2.
Step Increment: Span multiplied by 2.
Related Commands: MKCF, MKN, SP.

## Example

```
OUTPUT 718;"M4;"
```

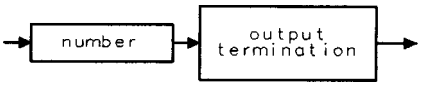


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## Description

Used with a marker on the signal peak or at a position of interest, M4 keeps the marker at center screen while the frequency span is decreased.

## Query Response




QQ1

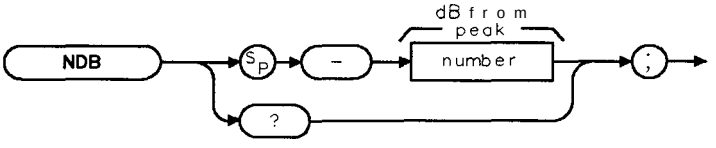


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# NDB
# Number of dB

Specifies the distance (in dB) from the signal peak for the N dB points measurement (NDBPNT).

## Syntax




XNDB

| Item | Description/Default | Range |
|---|---|---|
| Number | Any negative real or negative integer number. Default unit is dB. | –1 to -80 dB. |

Preset State: -3 dB.
Related Commands: MKBW, MKPX, NDB, NDBPNT, NDBPNTR, TH.
Restrictions: Not available for the windows display mode.

## Example

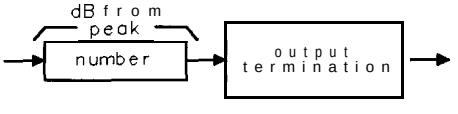
```
OUTPUT 718;"MOV NDBPNT,1;"
OUTPUT 718;"NDB -6DB;"
OUTPUT718;"NDBPNTR?;"
ENTER 718;Six
```

*Turns on the N dB points measurement.*
Sets *the N dB points measurement to measure* 6 *dB below the signal's peak.*
*Queries NDBPNTR. NDBPNTR contains the measurement results of the N dB points measurement.*
*Stores the result in the variable Six.*

## Description

When the NdB points function is turned on, the spectrum analyzer finds the bandwidth, at the number of dB down specified by the NDB command, of the highest on-screen signal. The highest on-screen signal must be greater than the peak excursion above the current threshold, but the N dB points may fall below the threshold.

## Query Response




QNDB

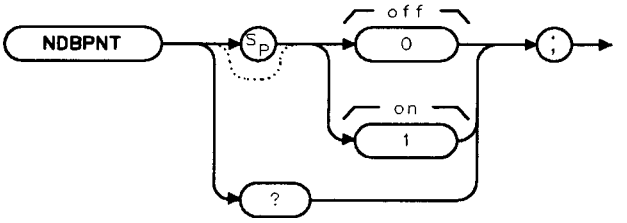


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# NDBPNT
# N dB Points

Turns on or off the N dB points function.

## Syntax




XNDBPNT

Equivalent **Softkey:** N dB PTS ON OFF.
Related Commands: MKBW, MKPX, NDB, NDBPNTR, TH.

## Example

This example finds the shape factor of a signal.

```
OUTPUT 718;"MOV NDBPNT,1;"
```
*Turns on the N dB points measurement.*

```
OUTPUT 718;"NDB -6DB;"
```
*Sets the N dB points measurement to measure 6 dB below the signal's peak.*

```
OUTPUT718;"NDBPNTR?;"
```
*Queries NDBPNTR. NDBPNTR contains the measurement results of the N dB points measurement.*

```
ENTER 718;Six
```
*Stores the result in the variable Six.*

```
OUTPUT 718;"NDB -60DB;"
```
*Sets the N dB points measurement to measure 60 dB below the signal's peak.*

```
OUTPUT718;"NDBPNTR?;"
ENTER 718;Sixty
```
*Queries NDBPNTR. Stores the result in the variable Sixty.*

```
IF Six <> -100 AND Sixty <> -100 THEN
```
*If both the measurement at -6 dB and -60 dB were valid, print the shape factor of the signal.*

```
  PRINT "Shape factor is ",Sixty/Six
```
*Prints the shape factor of the signal.*

```
ELSE
```
*If the bandwidth at -6 dB or -60 dB could not be found, an error statement is printed.*

```
  PRINT "Error, bandwidth could not be determined"
END IF
```



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OUTPUT718;"MOVNDBPNT,0;" *Turns off the N dB points measurement.*

## Description

Setting NDBPNT to 1 turns on the N dB points measurement. Setting NDBPNT to 0 turns off the N dB points measurement. When the NdB points function is turned on, the spectrum analyzer finds the bandwidth, at the number of dB down specified by the NDB command, of the highest on-screen signal. The N dB points measurement is repeated at the end of every sweep (NDBPNT uses the ONEOS command to update the measurement data) until you turn off the N dB points measurement. To determine the bandwidth measured by NDBPNT, you must query NDBPNTR.

To be able to measure a signal with NDBPNT, there must be an on-screen signal that is greater than the peak excursion (see "MKPX" for more information about the peak excursion) above the threshold, and there cannot be any other signals with amplitudes within N dB of the peak of the highest signal. If a signal cannot be found or there is more than one signal within the value of NDB of the highest signal, the value of NDBPNTR will be -100.

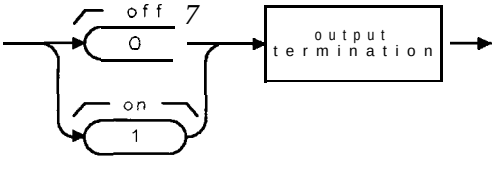
You can execute the NDBPNT command two different ways. You can either execute the NDBPNT command directly (for example, "NDBPNT 1; ") or use the MOV command to move the 1 or 0 into the NDBPNT command (for example, "MOV NDBPNT, 1; "). If you use the MOV command, no text is displayed in the active function area during command execution.

**Restrictions**

Turning on the NDBPNT function turns off the following functions: windows display mode (WINON), the FFT menu measurements (FFTAUTO, FFTCONTS, FFTSNGLS), gate utility functions (GDRVUTIL), TO1 measurement (TOI), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), peak zoom (PKZOOM), and power menu measurements (ACP, ACPE, CHP, and OBW).

You should turn off the N dB points measurement (set NDBPNT to 0) when you are done with the N dB points measurement.

## Query Response




QNDBPN1

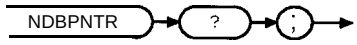


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# NDBPNTR
# N dB Points Bandwidth

Returns the bandwidth measured by the N dB points measurement (NDBPT).

## Syntax




XNDBPNTR

Related Commands: MKPX, NDB, NDBPNT, TH.

## Example

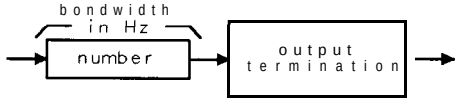
```
OUTPUT 718;"MOV NDBPNT,1;"
OUTPUT 718;"NDB -6DB;"
OUTPUT 718;"NDBPNTR?;"
ENTER 718;Six
```

*Turns on the N dB points measurement.*
*Sets the N dB points measurement to measure 6 dB below the signal's peak.*
*Queries NDBPNTR. NDBPNTR contains the measurement results of the N dB points measurement.*
*Stores the result in the variable Six.*

## Description

NDBPNTR returns a -100 if the NDBPNT function has not been turned on, or if NDBPNT did not find a signal to measure. (For NDBPNT to be able to measure a signal, there must be an on-screen signal that is greater than the peak excursion above the threshold, and there cannot be any other signals with amplitudes that are within N dB of the peak of the highest signal.)

## Query Response




QNDBPNTR

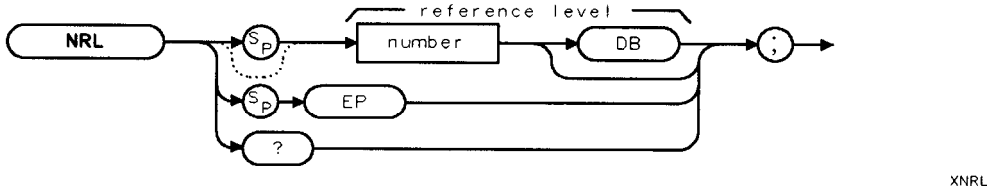


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# NRL
# Normalized Reference Level

Sets the normalized reference level.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is dBm. | |

Preset State: 0 dB.
Related Commands: MEASURE, RL, RLPOS.

## Example

```
10    OUTPUT 718;"IP;"                    Initializes spectrum analyzer.
20    OUTPUT 718;"SRCPWR -10DB;"          Sets tracking generator output.
30    PRINT "CONNECT TRACKING GENERATOR OUTPUT TO INPUT"
40    PRINT "THEN PRESS CONTINUE"
50    PAUSE
60    OUTPUT 718;"MEASURE SR;"            Sets the measurement mode
                                          to stimulus-response.
70    OUTPUT 718;"CLRW TRB;TS;"           Takes a measurement sweep
                                          of thejlatness of the system.
80    OUTPUT 718;"BLANK TRB;"
so    PRINT "CONNECT DEVICE TO ANALYZER"
100   PRINT "THEN PRESS CONTINUE"
110   PAUSE
120   OUTPUT 718;"CLRW TRA;TS;"           Takes a measurement sweep
                                          of the device under test in
                                          the system.
130   OUTPUT 718;"AMBPL ON;"              Normalizes the response.
140   OUTPUT 718;"RLPOS 4;"               Changes the location of the
                                          reference level to thefourth
                                          graticule from the bottom.
150   OUTPUT 718;"NRL 40DB;"              Offsets trace A so it is on-
                                          screen.
160   END
```



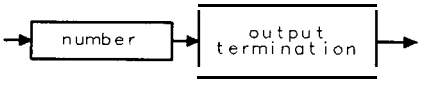
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## Description

This function is a trace-offset function that enables you to offset the displayed trace without introducing hardware-switching errors into the stimulus-response measurement. The input attenuator and IF step gains are not affected when using NRL.

In absolute power mode (dBm), reference level affects the gain and RF attenuation settings of the instrument, which affects the measurement or dynamic range. In normalized mode (relative power or dB-measurement mode), NRL offsets the trace data on-screen and does not affect the instrument gain or attenuation settings. This allows the displayed normalized trace to be moved without decreasing the measurement accuracy due to changes in gain or RF attenuation. If the measurement range must be changed to bring trace data on-screen, then the range level should be adjusted. Adjusting the range-level normalized mode has the same effect on the instrument settings as does reference level in absolute power mode (normalize off).

## Query Response




QQ1

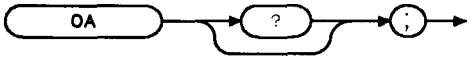


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# OA
# Output Active Function Value

Sends the value of the active function to the controller.

## Syntax



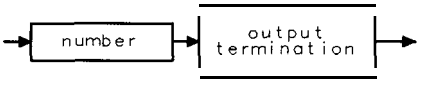

XOA

## Example

```
10 OUTPUT 718;"ST 3SC;OA;"
20 ENTER 718;Number
30 DISP Number
40 END
```

*Changes the sweep time, activates the OA command.*
*Gets the response from the spectrum analyzer*
*Displays "3" on the computer screen.*

## Query Response




QQ1



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# OBW
# Occupied Bandwidth

Performs the occupied bandwidth measurement using the value for occupied bandwidth percent (OBWPCT). For example, if OBWPCT is set to 99 percent, OBW determines the 99 percent power bandwidth.

## Syntax




XOBW

Equivalent **Softkey:** OCCUPIED BANDWDTH .

Related Commands: ACPPAR, ACPSNGLM, ACPCONTM, ACPSP, OBWPCT.

## Example

```
OUTPUT 718;"OBW;"
```

## Description

OBW measures the power bandwidth of the measured spectrum based on the value of occupied bandwidth percent (OBWPCT). OBW also measures transmit frequency error (the difference between the center frequency and the midpoint of the percent occupied bandwidth), and the total power of the occupied bandwidth. OBW performs the measurement using the value for channel spacing (ACPSP).

To use OBW:

1. Set the center frequency to the carrier's frequency.
2. For best accuracy, set the reference level so that the carrier signal peak is within the first (top) division of the screen graticule.
3. Select the channel spacing with the ACPSP command.
4. If you want the spectrum analyzer settings to be set automatically, ensure that ACPPAR is set to 1. If you want to set the spectrum analyzer settings manually, set ACPPAR to 0. See "ACPPAR" for more information about selecting the spectrum analyzer settings manually.
5. If the spectrum analyzer is in the continuous-sweep mode, use the single sweep command (SNGLS) to select the single-sweep mode.
6. Execute the OBW command.
7. Query OBWBW, OBWLOWER, OBWUPPER, OBWFERR, and OBWPWR variables for the numeric results of the OBW measurement. See the following table for more information about these variables.
8. Query trace A (TRA) for the trace results of the OBW measurement.

**Measurement Results:** The results of the OBW command are stored in the variables and trace in the following table.



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**OBW Measurement Results**

| Variable or Trace | Description | units |
|---|---|---|
| OBWBW | A variable that contains the bandwidth measured by OBW. | HZ |
| OBWLOWER | A variable that contains the relative lower frequency limit of the occupied bandwidth. The lower frequency limit is relative to the center frequency of the spectrum analyzer. The lower frequency limit is equal to the frequency of the lower occupied bandwidth edge minus the center frequency of the spectrum analyzer. | Hz |
| OBWUPPER | A variable that contains the relative upper frequency limit of the occupied bandwidth. The upper frequency limit is relative to the center frequency of the spectrum analyzer. The upper frequency limit is equal to the frequency of the upper occupied bandwidth edge minus the center frequency of the spectrum analyzer. | Hz |
| OBWFERR | A variable that contains the occupied bandwidth transmit frequency error. This error is equal to the following: $Frequency_{error} = \frac{(OBWUPPER + OBWLOWER)}{2}$ | Hz |
| OBWPWR | A variable that contains the total power in the occupied bandwidth. The total power of the occupied bandwidth is a summation of the power over the measured occupied bandwidth. | Determined by AUNITS command. Default unit is dBm. |
| TRA | TRA is trace A. Trace A contains the swept RF spectrum that was used to measure occupied bandwidth. | Determined by the trace data format (TDF) command. |

## Restrictions

Executing OBW turns off the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), the FFT menu measurements (FFIAUTO, FFTCONTS, FFTSNGLS), gate utility functions (GDRVUTIL), TO1 measurement (TOI), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), and peak zoom (PKZOOM).

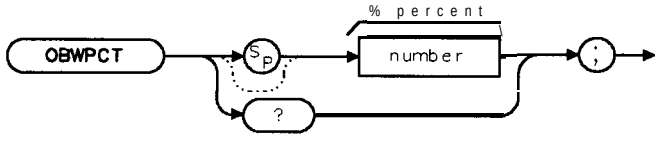


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# OBWPCT
# Occupied Bandwidth Percent

Specifies the percent of total power that is to be used in calculating the occupied bandwidth (OBW).

## Syntax




XOBWPCT

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | 1% to 99.99%. |

Equivalent Softkey: OCC BW % POWER.
Initial Value: 99.
Preset State: Last value entered.
Related Commands: OBW.

## Example

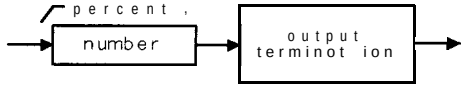
```
OUTPUT 718;"MOV OBWPCT,50;"     Sets the occupied bandwidth percent to 50%.
OUTPUT 718; "OBW; "             Performs the occupied bandwidth measurement.
```

## Description

Once you enter a value into OBWPCT, that value is retained until you change it, or execute DISPOSE ALL. Pressing PRESET or turning the spectrum analyzer off does not change the value of OBWPCT.

You can execute the OBWPCT command two different ways. You can either execute the OBWPCT command directly (for example, "OBWPCT 50 ;") or use the MOV command to move the value into the OBWPCT command (for example, "MOV OBWPCT ,50 ;"). If you use the MOV command, no text is displayed in the active function area during command execution.

## Query Response




QOBWPCT

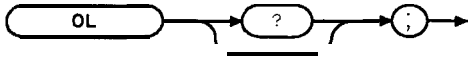


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# OL
# Output Learn String

Transmits information to the controller that describes the state of the spectrum analyzer when the OL command is executed.

## Syntax




XOL

Related Commands: RCLS, SAVES.

## Example

```
10 DIM Learn-String$ [202]          Allocates memory space for the Learn_String.
20 OUTPUT 718;"OL ;"                Asks for first state.
30 ENTER 718 USING "#,202A"; LEARN-STRINGS   Computer receives the information.
40 DISP "CHANGE ANALYZER TO ANOTHER STATE,
    THEN CONTINUE TO RESTORE FIRST STATE;"
50 PAUSE
60 OUTPUT 718; LEARN-STRING$        Returns the spectrum analyzer to its former
                                    state (when OL was first activated
                                    in line 20).
70 END
```

## Description

The information received from the spectrum analyzer is called the learn string. The learn string can be sent from the controller back to the spectrum analyzer to restore the spectrum analyzer to its original state.

The learn string requires 202 bytes of storage space. See "Saving and Recalling Instrument States," in Chapter 3 for more information.

To restore the spectrum analyzer to the learn string state, you must return the learn string to the spectrum analyzer. The learn string contains information to tell the spectrum analyzer that it is learn string data. (Also see "RCLS" and "SAVES.")

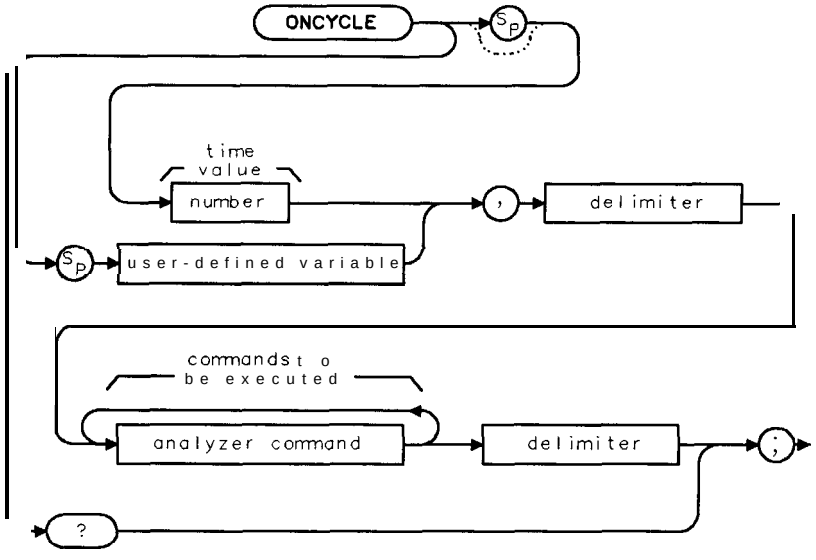


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# ONCYCLE
# On Cycle

Executes the list of analyzer commands periodically.

## Syntax




XONCYCLE

| Item | Description/Default | Range |
|---|---|---|
| Number | A valid number. | 0 to 2,147,483 seconds. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Analyzer command | Any spectrum analyzer command. | |

Related Commands: CAT, DISPOSE, ERASE, IP, ONDELAY, ONEOS, ONMKR, ONSRQ, ONSWP, ONTIME.

## Example

```
OUTPUT718;"ONCYCLE 86400,!MKPK HI;!;"
```

*Places a **marker** on the highest **signal** peak **every** 24 hours (86,400 **equals** 24 hours × 60 minutes × 60 seconds).*



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## Description

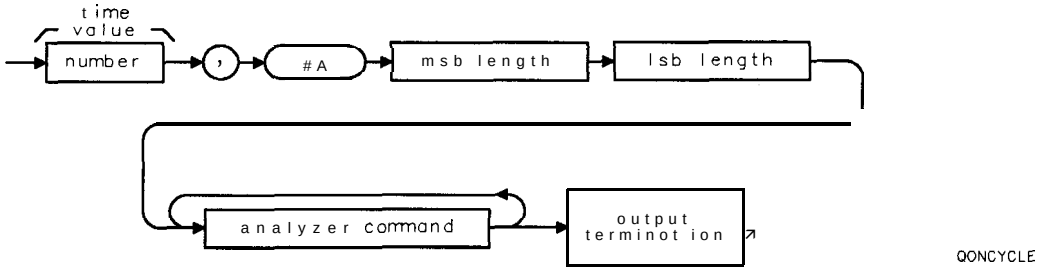
The ONCYCLE command performs the list of spectrum analyzer commands

periodically. In contrast, the ONDELAY command performs the list of spectrum analyzer commands once after the elapsed time interval. After the ONCYCLE function has been created, the first execution of the spectrum analyzer commands does not occur until the time value has elapsed.

Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.

**Clearing the ONCYCLE definition:** IP clears the ONCYCLE definition. You can use the DISPOSE command to clear the ONCYCLE definition also.

## Query Response



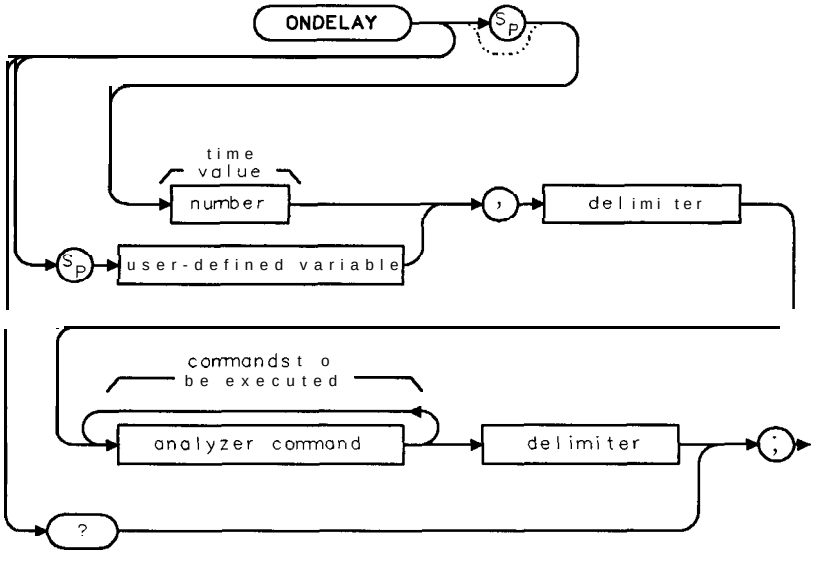



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# ONDELAY
## On Delay

Executes the list of analyzer commands after the time value has elapsed.

### Syntax




XONDELAY

| Item | Description/Default | Range |
|---|---|---|
| Number | A valid number. | 0 to 2,147,483 seconds |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Analyzer command | Any spectrum analyzer command. | |

Related Commands: CAT, DISPOSE, ERASE, IP, ONCYCLE, ONEOS, ONMKR, ONSRQ, ONSWP, ONTIME.

### Example

```
OUTPUT 718;"ONDELAY 000030,!CF 1.2GHZ;!;"
```

*Changes the center frequency after 30 seconds.*



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**ONDELAY On Delay**

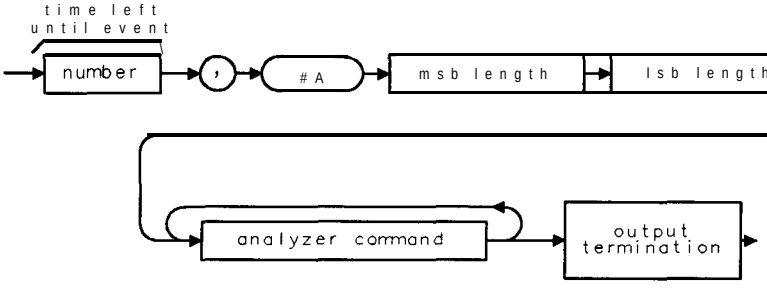
## Description

The ONDELAY command performs the list of spectrum analyzer commands once after the elapsed time interval; the ONCYCLE command performs the list of spectrum analyzer commands periodically.

Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.

**Clearing the ONDELAY definition:** IP clears the ONDELAY definition. You can use the DISPOSE command to clear the ONDELAY definition also.

## **Query** Response




QONDELAY

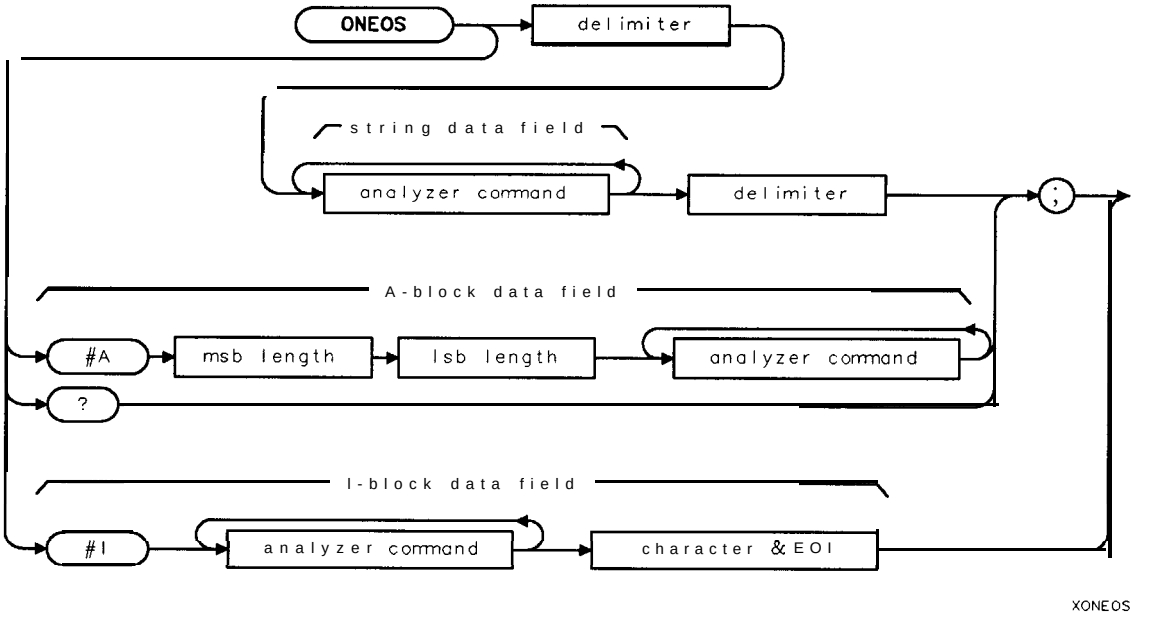


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# ONEOS
# On End of Sweep

Executes the contents of the data field after the end of the sweep.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Analyzer command | Any spectrum analyzer command except TS. | |
| Msb length | Most significant byte of a two-byte word that describes the number of bytes transmitted. | |
| Lsb length | Least significant byte of a two-byte word that describes the number of bytes transmitted. | |
| Character & EOI | Any valid character and END. | |

Related Commands: CAT, DISPOSE, ERASE, IP, ONSWP.

## Example

```
OUTPUT 718;"ONEOS!CF 100MHZ;!"
```
*Center frequency is changed at the end of the sweep.*



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**ONEOS On End of Sweep**

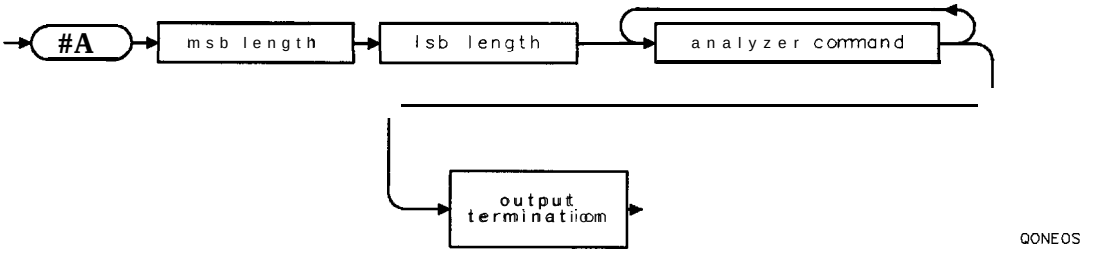
## Description

**Restrictions:** The list of analyzer commands should not include a take sweep (TS). Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.

The #A, msb length, LSB length, and character data form a A-block data field. The A-block data field is used when the length of the character data is known. The #I, character data, and EOI (END) form and I-block data field. The I-block data field is used when the length of the character data is unknown. The I-block data field is available for HP-IB interface only.

**Clearing the ONEOS definition:** IP clears the ONEOS definition. You can use the DISPOSE command to clear the ONEOS definition also.

## Query Response



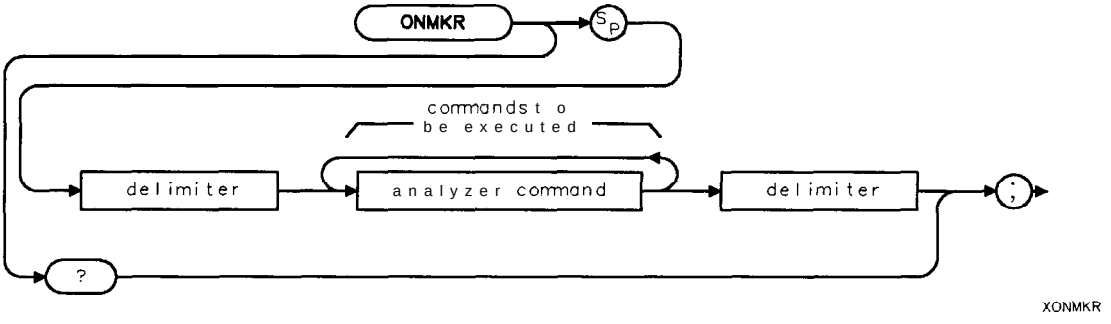



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# ONMKR
# On Marker

Performs the list of spectrum analyzer commands when the sweep reaches the marker position.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Analyzer command | Any spectrum analyzer command. | |

Related Commands: CAT, DISPOSE, ERASE, IP, **ONCYCLE, ONDELAY,** ONEOS, ONSRQ, ONSWP, **ONTIME.**
Restrictions: Not available with Analog+ display mode. See "ANLGPLUS" for more information.

## Example

```
OUTPUT 718;"ONMKR !PU,PA 100,100;TEXT@CONNECT CAL
OUT TO INPUT@;!;"
```

*The text is displayed on the spectrum analyzer screen when the sweep reaches the marker position.*

## Description

The ONMKR command performs the list of spectrum analyzer commands when the sweep reaches the marker. The sweep resumes after the list of spectrum analyzer commands is executed, provided the list of spectrum analyzer commands does not halt execution.

Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.

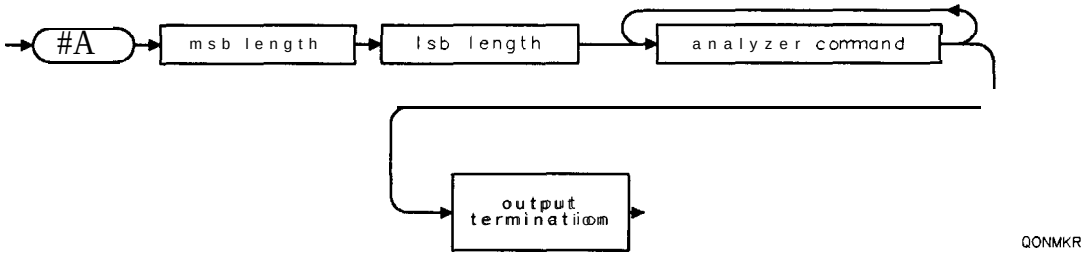
**Clearing the ONMKR definition:** IP clears the ONMKR definition. You can use the DISPOSE command to clear the ONMKR definition also.



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**ONMKR On Marker**

## Query Response




QONMKR

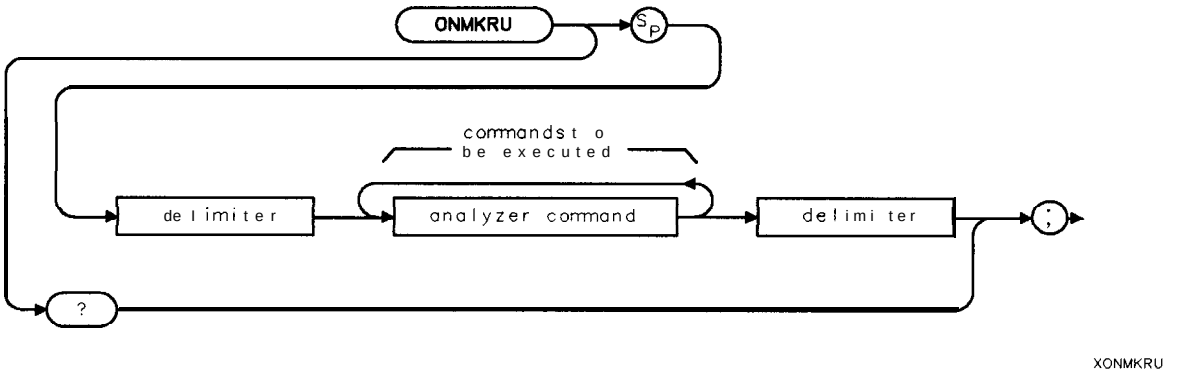


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# ONMKRU
# On Marker Update

Executes the Iistofspectrum analyzer commands whenever the value or the units of the active marker are changed.

## Syntax




Related Commands: DISPOSE, IP.

## Example

The following example uses ONMKRU to display the marker's amplitude in watts.

```
150   ASSIGN @Sa TO 718                    Assigns the IO path to spectrum analyzer.
160   !
170   OUTPUT@Sa;"VARDEFT_EMP,0;";          Defines a variable called T_EMP.
180   !
190   OUTPUT@Sa;"ONMKRU$";                 Starts the ONMKRU definition.
200     OUTPUT@Sa;"EXPT_EMP,MA,10;"        Changes the marker's amplitude value
                                           to milliwatts and places it in T_EMP.
210     OUTPUT@Sa;"MPYT_EMP,T_EMP,1000;";  Changes the value of T-EMP to µwatts.
220     OUTPUT@Sa;"MOVDA,0;";              Changes the display address to 0 to
                                           reset the display list.
230     OUTPUT@Sa;"PUPA10,101;";           Positions the pen.
240     OUTPUT@Sa;"TEXT^Power:^;";         Displays a label for the results.
250     OUTPUT@Sa;"DSPLYT_EMP,9.4;";       Displays the results.
260     OUTPUT@Sa;"TEXT^uW^;";             Displays the units.
270   OUTPUT@Sa;"$;";                      Ends the ONMKRU definition.
280   !
290   OUTPUT@Sa;"CF300MZ;"                 Sets the center frequency to the cali-
                                           bration signal.
300   OUTPUT@Sa;"SP1MZ;"                   Changes the span to 1 MHz.
310   OUTPUT@Sa;"RL-20DM;"                 Sets the reference level.
320   OUTPUT@Sa;"RB30KZ;"                  Sets the resolution bandwidth.
```



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```
330   OUTPUT @Sa;"SNGLS;TS;"        Takes a sweep.
340   OUTPUT @Sa;"MKN;"             Activates a normal marker.
350   !
360   END
```

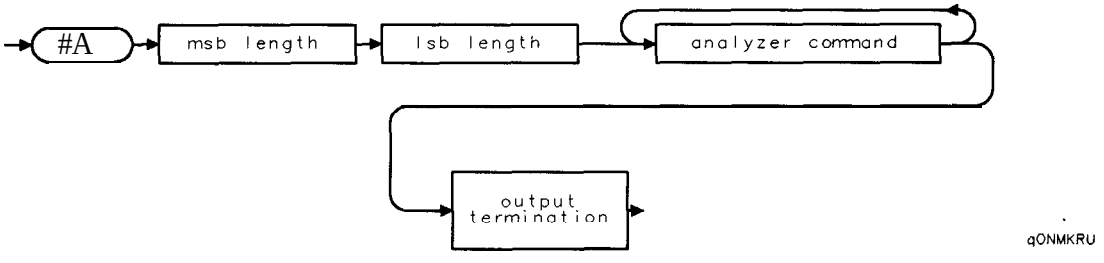
## Description

ONMKRU executes the specified user-defined function whenever the value or units of a marker are changed, While ONMKR executes the function when the marker is encountered, ONMKRU executes the function at the end of the sweep (when the marker data is updated), when the marker is moved, or if the units are changed with **AUNITS**. Executing any of the marker commands (for example, MKA, MKF, or MKNOISE) also executes the function.

**Restrictions:** The user-defined function should not include a take sweep (TS).

**Clearing the ONMKRU definition:** IP clears the ONMKRU definition. You can use the DISPOSE command to clear the ONMKRU definition also.

## Query Response



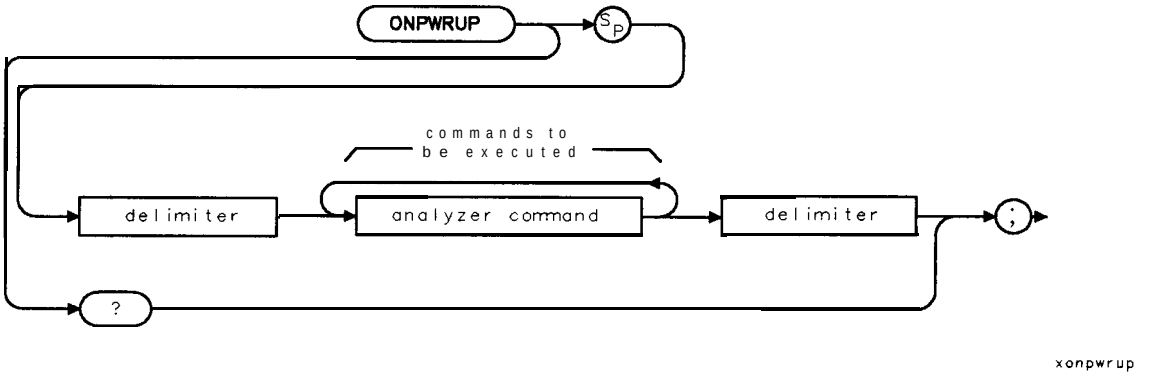



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# ONPWRUP
# On Power Up

Executes the list of spectrum analyzer commands once on power up.

## Syntax




Related Commands: CAT, DISPOSE, ERASE, ONDELAY, ONEOS, ONMKR, ONSWP, ONTIME

## Example

```
10 OUTPUT 718;"ONPWRUP! SP10MZ; CF300MZ;!;"
```

*Sets the spectrum analyzer span to 10 MHz and the center frequency to 300 MHz upon instrument power up.*

## Description

Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.

**Clearing the ONPWRUP definition:** DISPOSE.

**Note** If an infinite loop is inadvertently programmed in an ONPWRUP, press [PRESET] to terminate the ONPWRUP, then DISPOSE the ONPWRUP. Powering the spectrum analyzer on and off will not terminate the ONPWRUP.

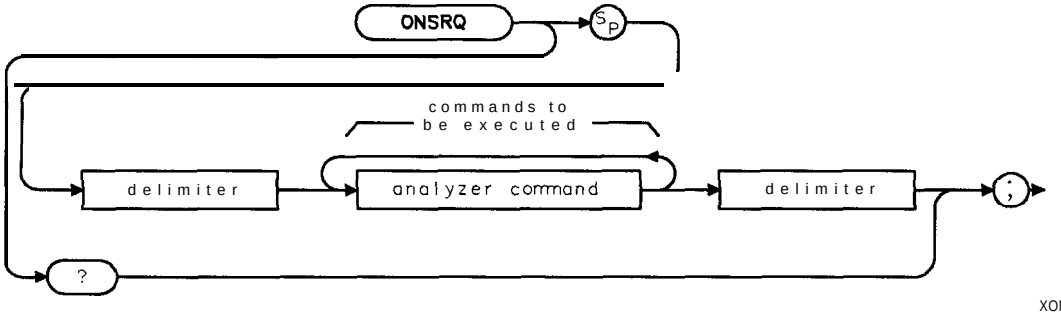


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# ONSRQ
## On Service Request

Executes the list of analyzer commands whenever a service request occurs.

### Syntax




XONSRO

| Item | Description/Default | Range |
|---|---|---|
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Analyzer command | Any spectrum analyzer command. | |

Related Commands: CAT, DISPOSE, ERASE, IP, ONDELAY, ONEOS, ONMKR, ONSWP, ONTIME, SRQ.

### Example

```
OUTPUT 718;"ONSRQ !PU;PA 100,100;TEXT QSRQ OCCURRED@; !;'"
```

*"SRQ OCCURRED" is displayed on the spectrum analyzer screen if an SRQ is encountered.*

### Description

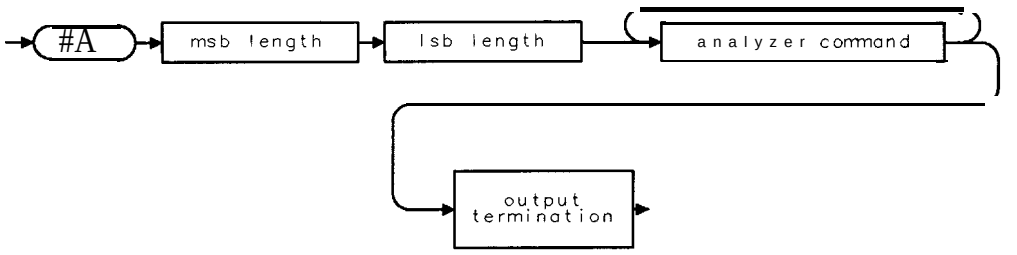
Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.

**Clearing the ONSRQ definition:** IP clears the ONSRQ definition. You can use the DISPOSE command to clear the ONSRQ definition also.



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## Query Response




OONSRO

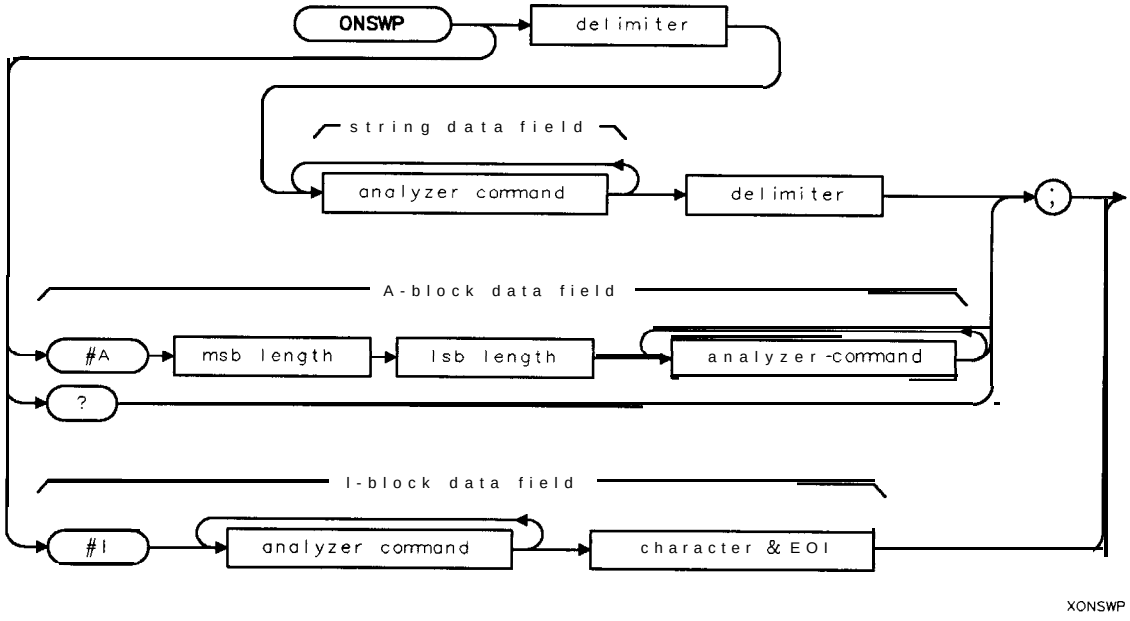


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# ONSWP
# On Sweep

Executes the list of spectrum analyzer commands at the beginning of the sweep.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Analyzer command | Any spectrum analyzer command except TS. | |
| Msb length | Most significant byte of a two-byte word that describes the number of bytes transmitted. | |
| Lsb length | Least significant byte of a two-byte word that describes the number of bytes transmitted. | |
| Character & EOI | Any valid character and END. | |

Related Commands: CAT, DISPOSE, ERASE, IP, ONDELAY, ONEOS, ONMKR, ONSRQ, ONSWP.

## Example

```
OUTPUT 718;"ONSWP!CF 100MHZ;!"
```

*The center frequency is changed to 100 MHz at the beginning of the sweep.*



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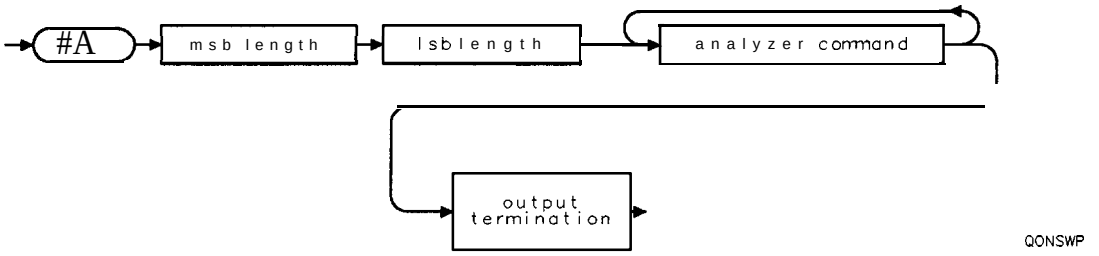
## Description

The list of analyzer commands should not include a take sweep (TS). Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.

The #A, msb length, lsb length, and character data form an A-block data field. The A-block data field is used when the length of the character data is known. To use the A-block data format, #A must precede the msb length and lsb length. The msb length and lsb length represent the length of the character data. The #I, character data, and EOI (END) form an I-block data field. The I-block data field is used when the length of the character data is unknown. The I-block data field is available for the HP-IB interface only.

**Clearing the ONSWP definition:** IP clears the ONSWP definition. You can use the DISPOSE command to clear the ONSWP definition also.

## Query Response



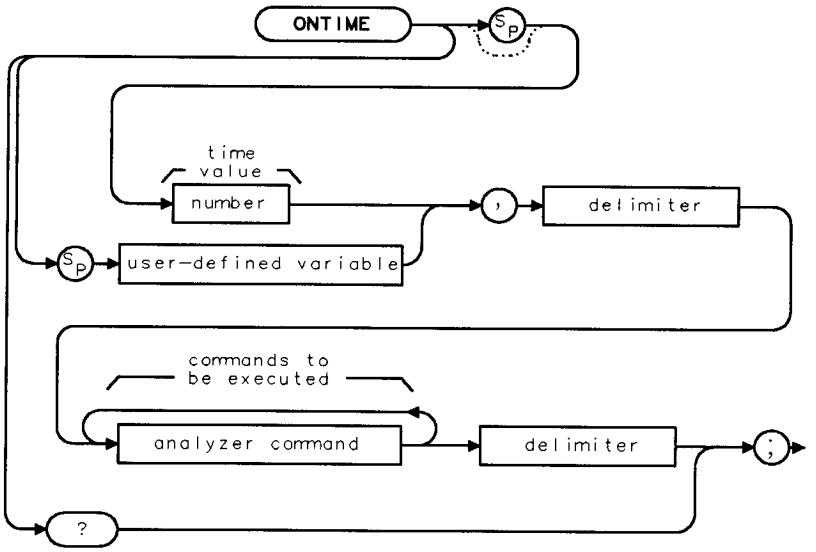



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# ONTIME
# On Time

Executes the list of spectrum analyzer commands at the specified time.

## Syntax




XONTIME

| Item | Description/Default | Range |
|---|---|---|
| Number | A valid number in the YYMMDDHHMMSS (24 hour) format. | A valid year, month, day, and time. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Analyzer command | Any spectrum analyzer command. | |

Related Commands: DISPOSE, ERASE, IP, ONDELAY, ONEOS, ONMKR, ONSWP, ONSRQ.

## Example

```
OUTPUT 718;"ONTIME 890212080000,!CF 600MHZ;!;"
```
*Changes the center frequency on 12 February 1989, at 8* AM.

```
OUTPUT 718;"ONTIME 080000,!CF 600MHZ;!;"
```
*If the YYMMDD is omitted from the time value parameter, the command list is executed at the next occurrence of the time value given.*

```
OUTPUT 718;"ONTIME 890212150000,!CF 600MHZ;!;"
```
*Changes the center frequency on 12 February 1989, at 3* PM.



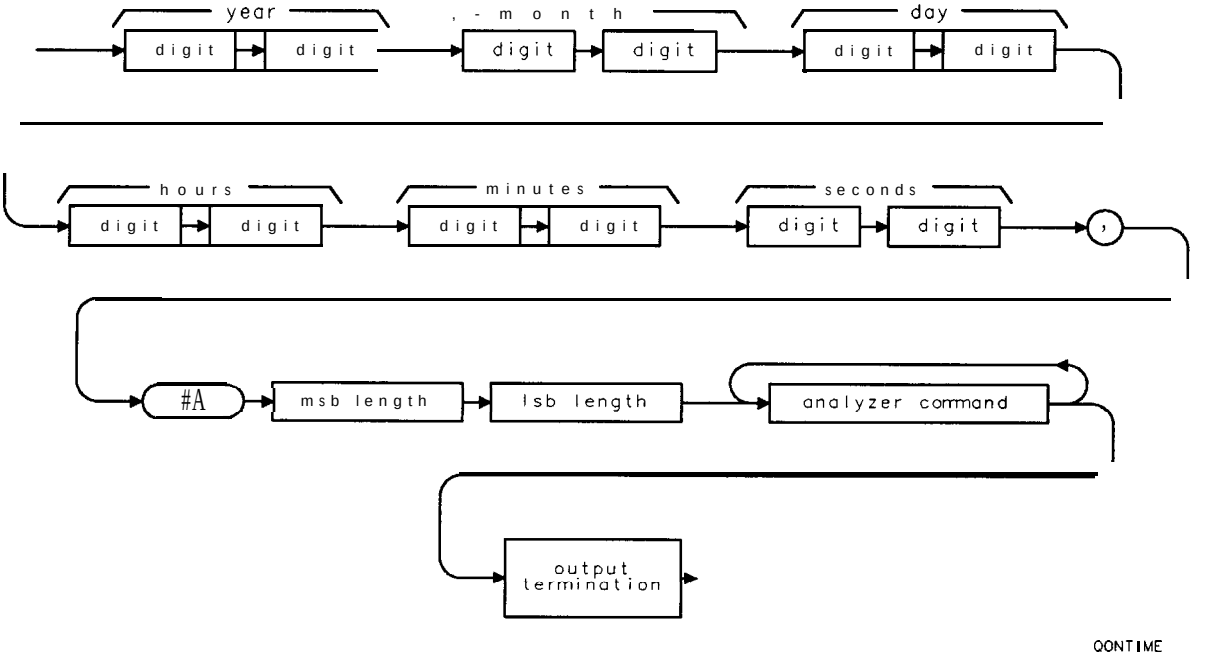
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## Description

Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.

**Clearing the ONTIME definition:** IP clears the ONTIME definition. You can use the DISPOSE command to clear the ONTIME definition also.

## Query Response




QONTIME

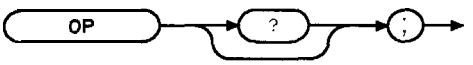


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# OP
## Output Parameter

Returns parameter values P1 and P2, which represent the x and *y* coordinates of the lower-left and upper-right spectrum analyzer display.

### Syntax




XOP

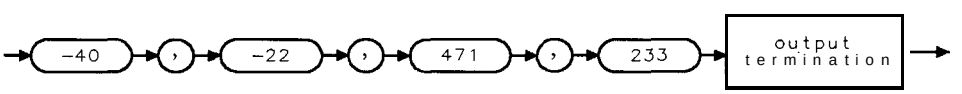
### Example

```
10 DIM A$[20]          Allocates memory space for result.
30 OUTPUT 718;"OP?;"   Gets the lower-left and the upper-right coordinates of the spectrum
                       analyzer display.
40 ENTER 718;A$        Moves result to the computer.
50 DISP A$             Displays the result.
60 END
```

### Description

The values returned represent x and y screen coordinates of the spectrum analyzer display. The screen coordinates designate the total on-screen area. The values returned are the minimum x coordinate, the minimum y coordinate, the maximum x coordinate, and the maximum y coordinate.

### Query Response




QOP

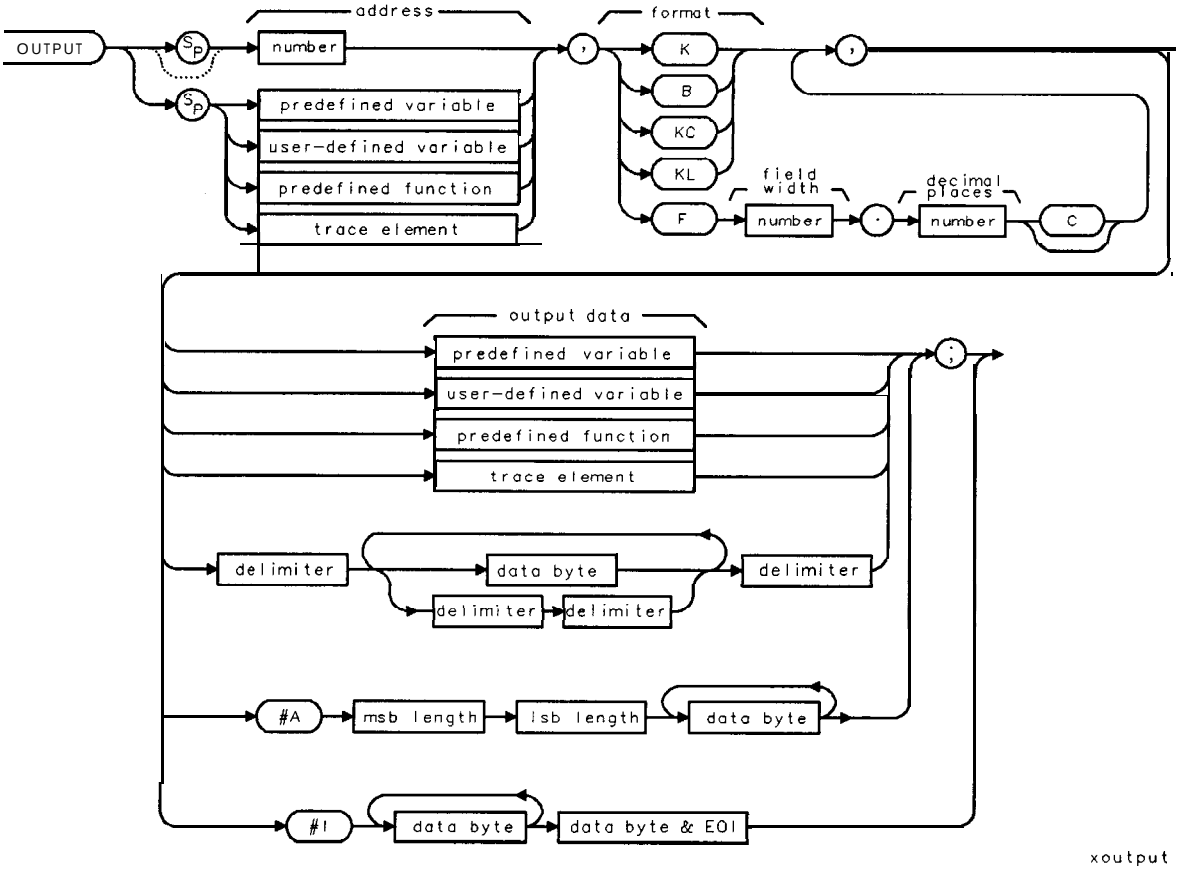


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# OUTPUT
## Output to Remote Port or Parallel Port

Allows the spectrum analyzer to send data to other devices via remote or parallel ports.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | An integer number. | 0 to 30 (remote port). |
| Number | An integer number. | 40 (parallel port). |
| Predefined function | Function that returns a value. Refer to **Table 5-1.** | |
| Predefined variable | A command that acts as a variable. Refer to **Table 5-1.** | |
| User-defined variable | A variable **defined** by VARDEF or ACTDEF commands. | Any valid variable name. |
| Trace element | An element of trace A, trace B, trace **C,** or a user-defined trace. | |
| Msb length | Most **significant** byte of a two-byte word that describes the number of bytes transmitted. | |
| Lsb length | Least significant byte of a two-byte word that describes the number of bytes transmitted. | |
| Data byte | S-bit byte containing numeric or character data. | |
| Data byte **&** EOI | **8-bit** byte containing numeric or character data followed by END. | |



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Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: ENTER, RELHPIB.

## Example

This example assumes that the plotter is at address 5 and the spectrum analyzer is at address 18. (The program is only valid for HP 9000 Series 200 and 300 computers.)

The following example uses the spectrum analyzer to send the ASCII code for OP; (output parameter) to the plotter. The ENTER command is then used to receive the coordinates from the plotter. Program lines 110 to 140 display the coordinates on the spectrum analyzer screen. **Softkey** 1 is programmed to display the plotter coordinates. **Softkey** 1 can be accessed by pressing (MEAS/USER), **User Menus** .

---

**Note** Disconnect the computer before pressing **softkey** 1 or execute ABORT 7, LOCAL 7 from the computer. The execute the **P_OP** function, the spectrum analyzer must be the only controller on the HP-IB.

---

```
10 OUTPUT 718;"VARDEF P_ONEX,1,VARDEF P_ONEY,1;"
20 OUTPUT 718;"VARDEF P_TWOX,1;VARDEF P_TWOY,1;"
30 OUTPUT 718;"FUNCDEF P_OP,@";
40 OUTPUT 718;"OUTPUT 5,B,79;";
50 OUTPUT 718;"OUTPUT 5,B,80;";
60 OUTPUT 718;"OUTPUT 5,B,59;";
70 OUTPUT 718;"ENTER 5,K,P_ONEX;";
80 OUTPUT 718;"ENTER 5,K,P_ONEY;";
90 OUTPUT 718;"ENTER 5,K,P_TWOX;";
100 OUTPUT 718;"ENTER 5,K,P_TWOY;";
110 OUTPUT 718;"PU;PA 200,190;DSPLY P_ONEX,10.2;";
120 OUTPUT 718;"PU;PA 200,180;DSPLY P_ONEY,10.2;";
130 OUTPUT 718;"PU;PA 200,170;DSPLY P_TWOX,10.2;";
140 OUTPUT 718;"PU;PA 200,160;DSPLY P_TWOY ,10.2;";
150 OUTPUT 718;"RELHPIB;";
160 OUTPUT 718;"@;"
170 OUTPUT 718;"KEYDEF l,P,OP,!DSP OP;!;"
180 END
```

*Declares the variables used to hold the plotter coordinates.*
*Declares the variables used to hold the plotter coordinates.*
*Defines a function called P_OP.*
*Sends ASCII code for "O".*
*Sends ASCII code for "P".*
*Sends ASCII code for ";".*
*Gets plotter coordinates from plotter:*
*Gets Y coordinate from plotter.*
*Gets X coordinate from plotter:*
*Gets Y coordinatefrom plotter.*
*Displays coordinate on spectrum analyzer screen.*
*Displays coordinate on spectrum analyzer screen.*
*Displays coordinate on spectrum analyzer screen.*
*Displays coordinate on spectrum analyzer screen.*
*Releases spectrum analyzer control of the HP-IB.*
Marks the *end of the* function, *P-OI?*
*Assigns the P_OP function to softkey 1.*



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## Description

Use OUTPUT to send data or instructions to an HP-IB device using the following output formats.

**K** Outputs in free-field ASCII format with no terminator.

**B** Outputs in a free-field format with no terminator, but in a single 8-bit bytes.

**KC** Outputs in free-field ASCII with a carriage return and line feed terminator.

KL Outputs in free-field ASCII with a line feed and an EOI terminator.

**F** Outputs an ASCII number with the field width and decimal places specified. For example, a number displayed as 13.3 has a field width of 13 and a decimal place of three. If a "C" follows the ASCII number, a carriage return and line feed will terminate the output.

Because HP-IB allows only one controller on the HP-IB, OUTPUT must be synchronized with a controller operation or else incorporated into user-defined functions that are executed with softkeys when the spectrum analyzer is under manual control. If another controller is detected on the HP-IB, the OUTPUT function is aborted.

Execute RELHPIB (RELEASE HP-IB) to discontinue spectrum analyzer control of HP-IB.

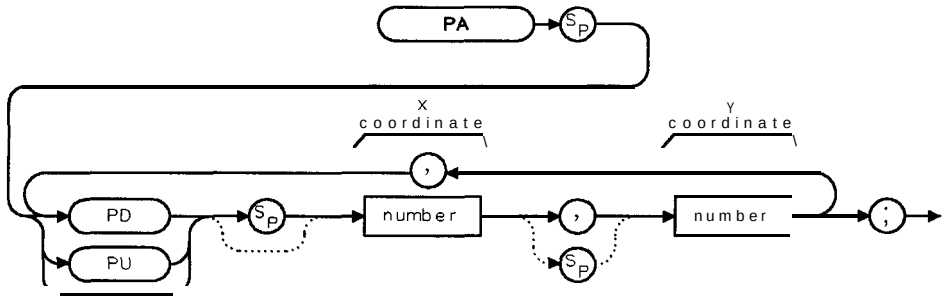


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# PA
# Plot Absolute

Moves the pen to a vector location on the spectrum analyzer screen relative to the reference coordinates (0,0) in display units.

## Syntax




XPA

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | Within screen or graticule coordinates. |

Related Commands: CLRDSP, DSPLY, TEXT, PD, PLOT, PR, PRINT, PU.

## Example

```
OUTPUT 718;"IP;BLANK TRA;"
```
*Initializes the spectrum analyzer and blanks trace A.*

```
OUTPUT 718;"ANNOT OFF;GRAT OFF;"
```
*Clears the spectrum analyzer screen.*

```
OUTPUT 718;"PU;"
```
*Pen up.*

```
OUTPUT 718;"PA 100,100;PD 100,150;"
```
*PU and PA commands prevent an initial vector from being drawn before the pen is positioned at (100, 100). PD draws a vector to (loo, 150).*

```
OUTPUT718;"150,150,150,100,100,100;"
```
*Draws the last three sides of the rectangle.*

## Description

The vector is drawn on the screen if the pen-down (PD) command is in effect. If the pen-up (PU) command is in effect, the vector does not appear on the screen.

Display units are the scaling units of the spectrum analyzer display for on screen graphics commands such as PA or PR. One display unit is the distance between two points along an the x or *y* axis. For the HP 8590 Series spectrum analyzer, there are a maximum of 511 display units (-40 to 471) along the x axis and 255 display units (-22 to 233) along the *y* axis. See Figure 5-8.



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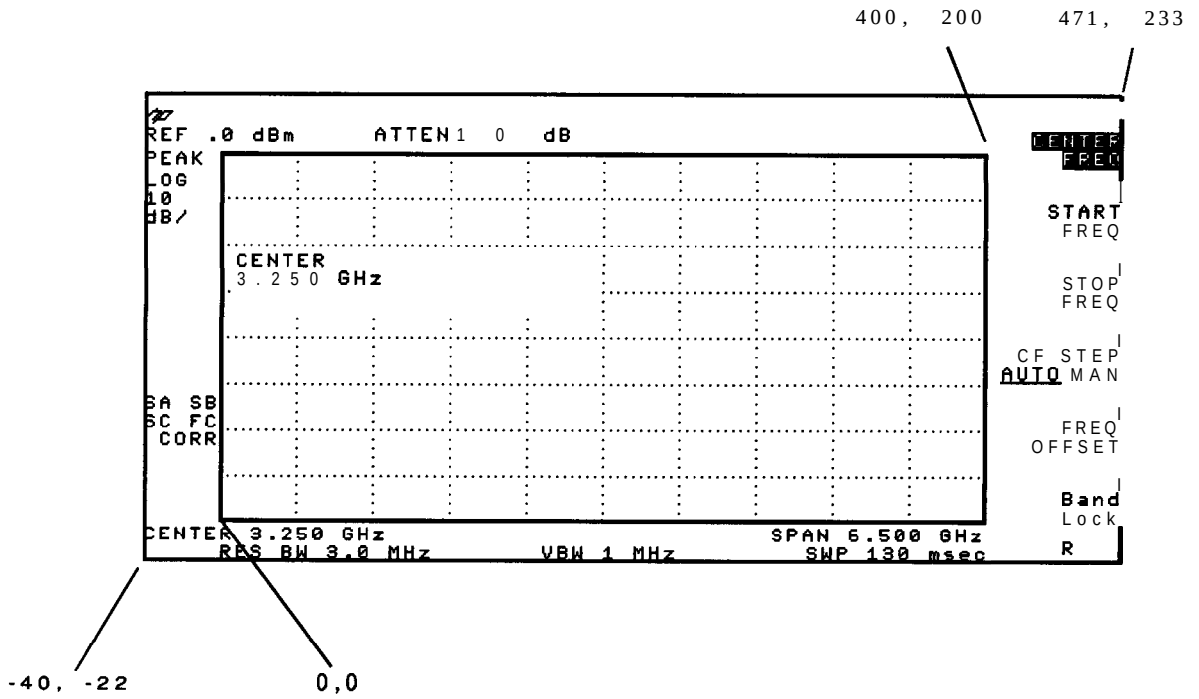



**Figure 5-8. Display Units**

The coordinates of the lower left screen corner of the screen are −40,−22 and the upper right screen corner of the screen are 471,233. For the graticule area, the coordinates of the lower left corner of the graticule are 0,0 and the coordinates of the upper right graticule area are 400,200. For example, you could execute "PU;PA 0,0;PD;PA 0,200,400,200,400,0,0,0;" to draw a box around the graticule area.

Because PA is an active function, executing PA causes the active function area on the spectrum analyzer screen to blank. lb prevent the text following PA from being written in the active function area, execute hold (HD) after PA.

PU should be executed before the first PA command, and PA should be executed before executing TEXT, PD, or DSPLY commands.

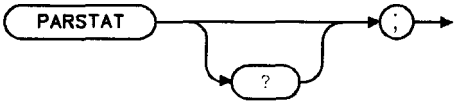


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# PARSTAT
## Parallel Status

Reports the status of the printer connected to the parallel port. (Option 024, 041, 043).

### Syntax




cu124e

Related Commands: PRINT, GETPRINT

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | 0 - 32 (Option 024)<br>0 - 128 (Option 041, 043) |

### Example

```
OUTPUT 718; "PARSTAT;"
ENTER 718;A
PRINT "A"
```

### Description

**Table 5-9. Spectrum Analyzer Status Byte (Option 024)**

| Bit Number | Decimal Equivalent | Bit Status = 0 | Bit Status = 1 |
|---|---|---|---|
| 5 | 32 | State of ACK line | State of ACK line |
| 4 | 16 | N/A | N/A |
| 3 | 8 | Printer error | |
| 2 | 4 | Off line | On line |
| 1 | 2 | | Paper end |
| 0 | 1 | | Printer busy |

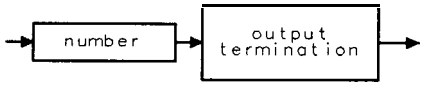


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**Table 5-9. Spectrum Analyzer Status Byte (Option 041, 043)**

| Bit Number | Decimal Equivalent | Bit Status = 0 | Bit Status = 1 |
|---|---|---|---|
| 7 | 128 | **Printer busy** | **Printer not busy** |
| 6 | 64 | State of ACK line | State of ACK line |
| 5 | 32 | | Paper end |
| 4 | 16 | Off line | **On line** |
| 3 | 8 | Printer error | |
| 2 | 4 | **N/A** | **N/A** |
| 1 | 2 | **N/A** | **N/A** |
| **0** | 1 | **N/A** | **N/A** |

## Query Response




QQ1

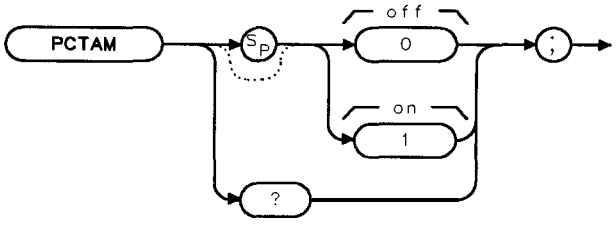


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# PCTAM
# Percent AM

Turns on or off the percent AM measurement.

## Syntax




Equivalent Softkey: % AM ON OFF.
Related Commands: MKPX, PCTAMR, TH.

## Example

```
OUTPUT 718;"MOV PCTAM,1;"
OUTPUT718;"PCTAMR?;"

ENTER718;Percent
PRINT "Percent AM is ",Percent
OUTPUT 718;"MOV PCTAM,0;"
```

*Turns on the percent AM measurement.*
*Queries PCTAMR. PCTAMR contains the results of the percent AM measurement.*
*Stores the value of PCTAMR in the variable Percent.*
*Prints the results.*
*Turns off the percent AM measurement.*

## Description

Setting PCTAM to 0 turns off the percent AM function. Setting PCTAM to 1 turns on the percent AM function. When the percent AM function is turned on, the spectrum analyzer finds the signal with the highest amplitude, and then finds two signals (with lower amplitudes) on either side of the highest signal. The highest on-screen signal is assumed to be the carrier, and the adjacent signals are assumed to be the sidebands. The amplitude levels of all three signals are measured, and the percent AM is calculated using the carrier level and the sideband with the higher amplitude level. Percent AM is calculated as follows:

$$Percent\ AM = 200 \times \frac{Level_{Carrier}}{Level_{Sideband}}$$

The percent AM measurement is repeated at the end of every sweep (PCTAM uses the ONEOS command) until you turn off the percent AM measurement. You must query PCTAMR to determine the percent AM.

PCTAM can perform the percent AM measurement only if there are three on-screen signals that have the characteristics of a carrier with two sidebands. Also, to be considered a signal, the levels of the carrier and sideband signals must be greater than the peak excursion above the threshold. If there are not three signals that fit the characteristics of a carrier with two sidebands, the value of PCTAMR will be -100.

You can execute the PCTAM command two different ways. You can either execute the PCTAM command directly (for example, `"PCTAM 1; "`) or use the MOV command to move the 1 or 0 into



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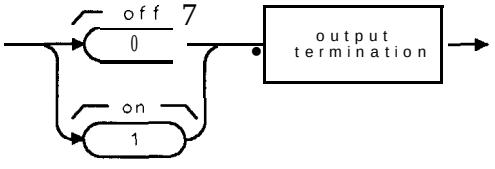
the PCTAM command (for example, `"MOV PCTAM, 1; "`). If you use the MOV command, no text is displayed in the active function area during command execution.

**Restrictions**

Turning on the PCTAM function turns off the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), the FFT menu measurements (FFTAUTO, FFTCONTS, FFTSNGLS), gate utility functions (GDRVUTIL), TOI measurement (TOI), marker table (MKTBL), peak table (PKTBL), peak zoom (PKZOOM), and power menu measurements (ACP, ACPE, CHP, and OBW).

You should turn off the percent AM measurement (set PCTAM to 0) when you are done with the percent AM measurement.

## Query Response




QPCTAM

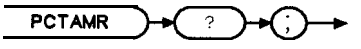


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# PCTAMR
## Percent AM Response

Returns the percent AM measured by the percent AM measurement (PCTAM).

### Syntax




XPCTAMR

Related Commands: MKPX, PCTAM, TH.

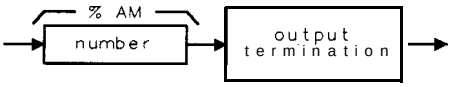
### Example

| | |
|---|---|
| `OUTPUT 718;"MOV PCTAM,1;"` | *Turns on the percent AM measurement.* |
| `OUTPUT 718;"PCTAMR?;"` | *Queries PCTAMR. PCTAMR contains the results of the percent AM measurement.* |
| `ENTER 718;Percent` | *Stores the value of PCTAMR in the variable Percent.* |
| `PRINT "Percent AM is ",Percent` | *Prints the results.* |
| `OUTPUT 718;"MOV PCTAM,0;"` | *Turns off the percent AM measurement.* |

### Description

PCTAMR returns a -100 if the PCTAM function has not been turned on, or if the on-screen signal is not valid or is not present. PCTAM can perform the percent AM measurement only if there are three on-screen signals that have the characteristics of a carrier and two sidebands. Also, to be considered a signal, the levels of the carrier and sideband signals must be greater than the peak excursion above the threshold.

### Query Response




QPCTAMR



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# PD
# Pen Down

Instructs the spectrum analyzer to plot vectors on the spectrum analyzer screen until a PU command is received.

## Syntax




XPD

Related Commands: DSPLY, PA, PLOT, PR, PU, TEXT.

## Example

```
OUTPUT 718;"IP;BLANK TRA;"
```
*Initializes the spectrum analyzer and blanks trace A.*

```
OUTPUT 718;"ANNOT OFF;GRAT OFF;"
```
*Clears the spectrum analyzer screen.*

```
OUTPUT 718;"PU;"
```
*Pen up.*

```
OUTPUT 718;"PA 100,100;PD 100,150;"
```
*PU and PA commands prevent an initial vector from being drawn before the pen is positioned at (100, 100). PD draws a vector to (loo, 150).*

```
OUTPUT718;"150,150,150,100,100,100;"
```
*Draws the last three sides of the rectangle.*

## Description

The command PD is used to enable drawing of all vectors specified by the commands PA (plot absolute), or PR (plot relative). It remains in effect until a PU command is received. PD does not need to be executed before using the TEXT or DSPLY commands.

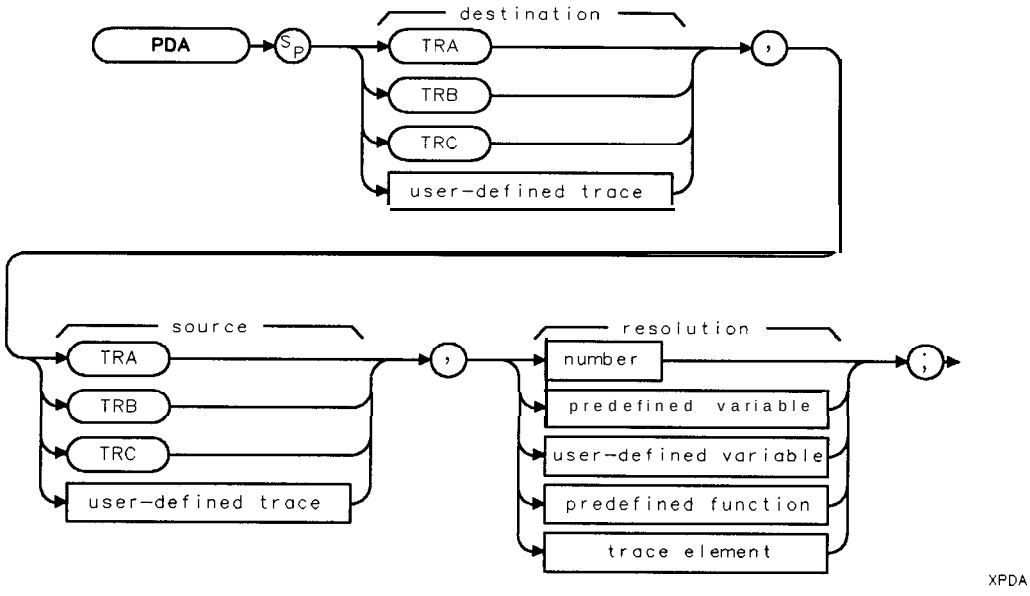


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# PDA
## Probability Distribution of Amplitude

Sums the probability distribution of amplitude in the destination trace with the amplitude distribution function of the source trace.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| Number | Any real or integer number. | Real number range. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-1. | |
| Predefined function | Function that returns a value. Refer to Table 5-1. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF for a user-defined variable. TS when using trace data.
Related Commands: PDF, RMS, STDEV.



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## Example

| | |
|---|---|
| `OUTPUT718;"IP;SNGLS;"` | *Initializes spectrum analyzer and activates the single-sweep mode.* |
| `OUTPUT 718;"VB 10KHZ;HD;TS;"` | *Changes video bandwidth, updates trace.* |
| `OUTPUT 718;"MOV TRB,0;"` | *&places trace B data with all zeros.* |
| `OUTPUT 718;"PDA TRB,TRA,1;"` | `Determines` *the distribution of trace A and sums results* `into` *trace B.* |
| `OUTPUT 718;"MPY TRB,TRB,5;"` | *Multiplies values in trace B by 5 to make the results more visible.* |
| `OUTPUT 718;"VIEW TRB;"` | *Displays the result.* |

## Description

The PDA command takes the data in the source trace on a point-by-point basis. Each amplitude value is divided by 100 times resolution value, and the result of the division is rounded to an integer. If the result falls within the range of the buckets of the destination trace, the content of the corresponding destination trace element is increased by one. For example, to show the distribution of amplitudes on a trace with values ranging from 0 to 8000, a resolution value of 1 dB would result in 81 buckets ((8000/(1 x 100))+ 1). Amplitude values ranging from 0 to 99 would go to bucket 1, values from 100 to 199 would go into bucket 2, and so forth. Finally, values from 7900 to 7999 would go to bucket 400. An amplitude value of 8000 would fall into bucket 81.

Due to the summing nature of the PDA command, the destination trace should always be initialized to all zeros.

The PDA function is similar to the probability density function in statistics. The probability density function has the y-axis as the probability of an occurrence, where the PDA function of the HP 8590 Series spectrum analyzer has the number of occurrences as its y-axis. The PDA could be converted to a probability density function by dividing, in an external controller, the value of each bucket by the total number of source elements. Note that performing the divide inside the spectrum analyzer would not be appropriate because the result is less than 1, which would be truncated to 0.

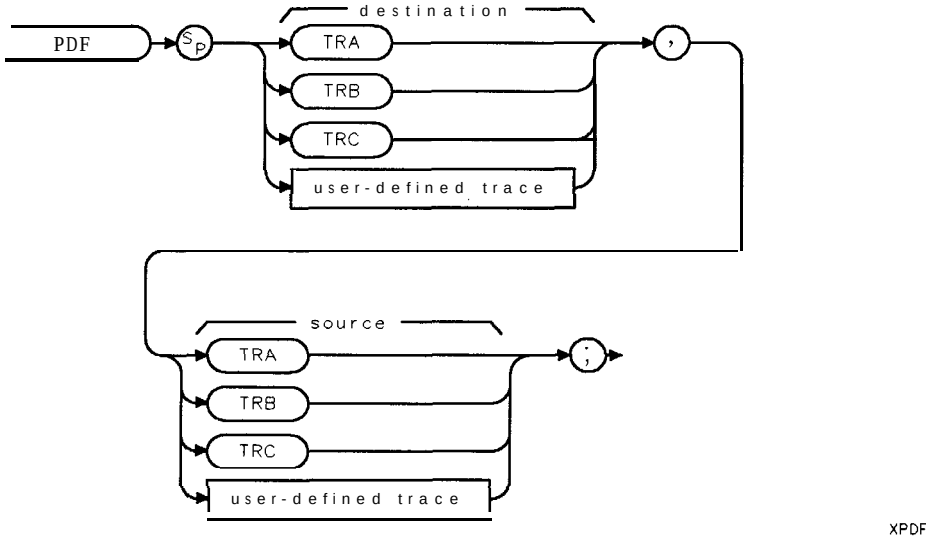


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# PDF
## Probability Distribution of Frequency

Increments an element of the destination trace whenever the corresponding element of the source trace exceeds a threshold. This is useful for constructing a frequency probability density function.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| **User-defined** trace | **A** trace defined by the TRDEF command. | Any valid trace name. |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.
Related Commands: PDA, TH.



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## Example

This example finds the portions of the frequency band where no signals above -50 dBm are observedin an hour time frame.

```
10 OUTPUT 718;"IP;";                          Initializes spectrum analyzer.
20 OUTPUT 718;"SP 100MZ;CF 300MZ;"            Changes the span and center frequency.
30 OUTPUT 718;"TH -50 DM;TS;"                 Activates the threshold level, take a
                                              sweep.
40 OUTPUT 718;"VIEW TRB;CLRW TRA;MOV TRB,0;"  Sets trace B to zeros.
50 OUTPUT 718;"ST?;"                          Gets the sweep time.
60 ENTER 718;Sweep_time                       Returns the sweep time to the controller:
70 Sup-retrace = Sweep_time+.1                Calculates the total sweep time, in-
                                              cluding the retrace time.
80 Num,sweeps = 3600/Swp_retrace              Calculates the number of sweeps in
                                              one hour:
90 FOR I = 1 TO Num_sweeps                    This finds the maximum number of
                                              sweeps that can be taken before nu-
                                              merical overflow (greater than 32,767.)
100 OUTPUT 718;"TS;PDF TRB,TRA;"              When I = Num_sweeps, trace B con-
                                              tains the number of sweep that had
                                              amplitudes at or above the threshold
                                              level of -50 dBm.
110 NEXT I
120 END
```

## Description

The TH command permits the user to set an amplitude threshold value. When PDF is performed, measurement buckets of the source trace that exceed the threshold increment the corresponding frequency bucket in the destination trace.

The destination trace should be set to zeros before PDF is executed for the first time. Subsequent calls to PDF increment the destination trace.

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination. The PDF function is similar to the probability density function in statistics. The probability density function has the y-axis as the probability of an occurrence, where the PDF function of the HP 8590 Series spectrum analyzer has the number of occurrences as its y-axis. The PDF could be converted to a probability density function by dividing, in an external controller, the value on each bucket by the total number of buckets. Note that performing the division inside the spectrum analyzer would not be appropriate because the result is less than 1, which would be truncated to 0.

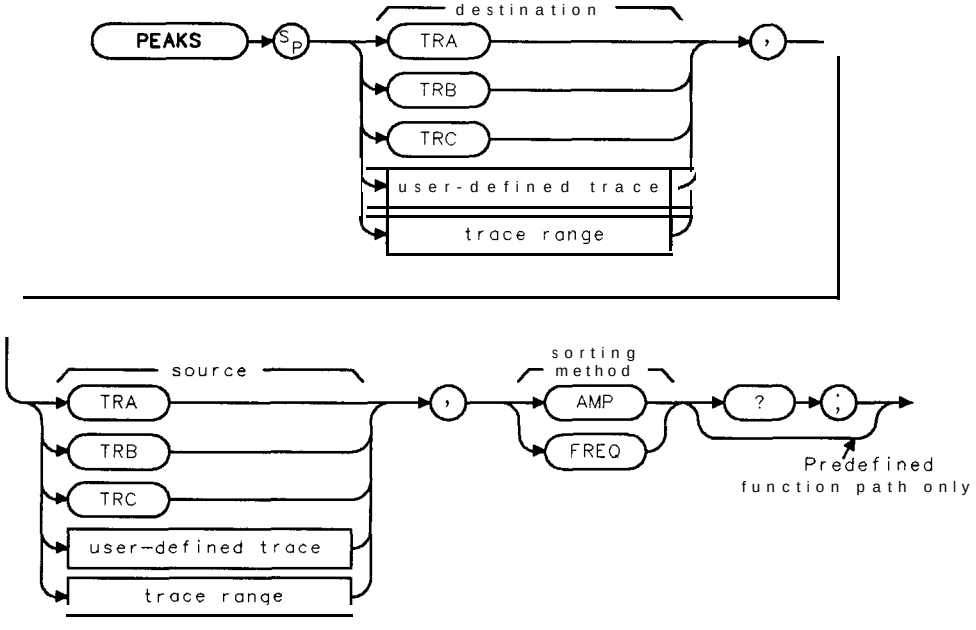


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# PEAKS
## Peaks

Sorts signal peaks by frequency or amplitude, stores the results in the destination trace, and returns the number of peaks found.

### Syntax




XPEAKS

| Item | Description/Default | Range |
|---|---|---|
| User-defied trace | **A** trace defined by the TRDEF command. | Any valid trace name. |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.
Related Commands: MKPX, TH.



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## Example

Connect CAL OUT to the spectrum analyzer input.

```
OUTPUT 718;"IP;"                                  ! Initializes spectrum analyzer
OUTPUT 718;"CF 300MHZ;SP 1500MHZ;RB 30KHZ;SNGLS;" ! Changes the center frequency,
                                                  ! span, bandwidth. Activates single-
                                                  ! sweep mode.
OUTPUT 718;"TH -60DM;MKPX 10DB;TS;"               ! Sets up threshold, sets mini-
                                                  ! mum peak excursion.
OUTPUT 718;"PEAKS TRB,TRA,FRQ?;"                  ! Returns the number of peaks in
                                                  ! trace A above the threshold.
ENTER 718;Number                                  ! Gets the number of peaks from
                                                  ! the spectrum analyzer
DISP Number                                       ! Displays the result on the com-
                                                  ! puter screen.
FOR I=1 TO Number                                 ! For one to the number of peaks
                                                  ! do the following steps.
    OUTPUT 718;"MKP TRB[";I;"]";                  ! Place marker at the position of
                                                  ! the first trace B element.
    OUTPUT 718;"MKA?;"                            ! Find the amplitude of the marker
    ENTER 718;A
    OUTPUT 718;"MKF?;"                            ! Find the frequency of the marker
    ENTER 718;B
    PRINT A,B                                     ! Print the amplitude and the
                                                  ! frequency of the marker
NEXT I                                            ! Repeat the FOR NEXT loop for
                                                  ! all of the peaks that werefound.
```

## Description

When sorting by frequency (FRQ), PEAKS first computes the horizontal position of all peaks. These positions are loaded into the destination trace consecutively, with the lowest frequency value occupying the first element. Thus, signal frequencies, from low to high, determine the amplitude of the destination trace from left to right.

When sorting by amplitude (AMP), PEAKS first computes the amplitudes of all peaks in the source trace in measurement units, and sorts these values from high to low. The positions of the peaks are then loaded into the destination trace, with the position of the highest amplitude value occupying the first element.

For example, executing the programming example results in the following spectrum analyzer display:



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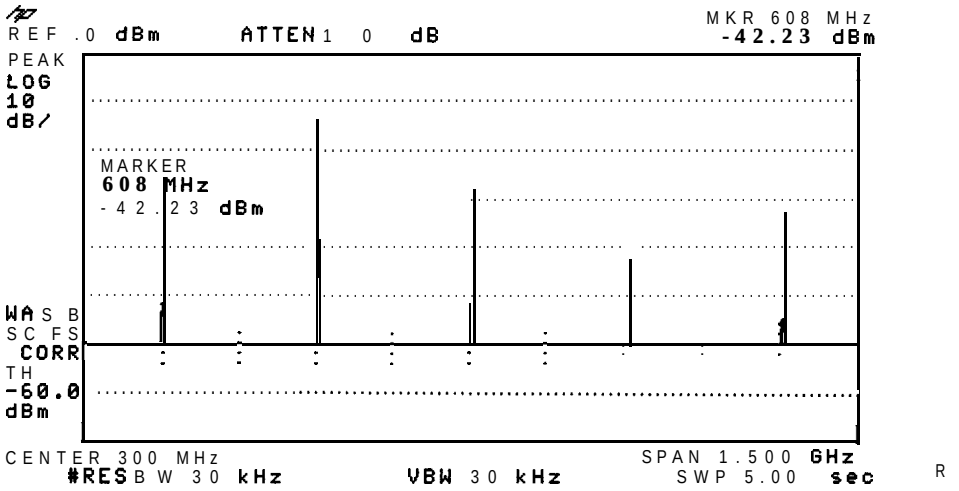



**Figure 5-9. Frequency and Amplitude of the Peaks**

If the FRQ parameter is used with the PEAKS command, the programming example returns the values that shown in the following table.

| Trace Element | Amplitude | Frequency |
|---|---|---|
| TRB[1] | −28.98 | −3E+8 |
| TRB[2] | −14.02 | 4.E+6 |
| TRB[3] | −28.21 | 3.04E+8 |
| TRB[4] | −42.29 | 6.04E+8 |
| TRB[5] | −32.69 | 9.07+8 |

If the AMP parameter is used with the PEAKS command, the programming example returns the values that are shown in the following table.

| Trace Element | Amplitude | Frequency |
|---|---|---|
| TRB[1] | -13.95 | 4.E+6 |
| TRB[2] | -28.14 | 3.04E+8 |
| TRB[3] | -28.89 | −2.96E+8 |
| TRB[4] | -32.6 | 9.07E+8 |
| TRB[5] | -42.23 | 6.08+8 |

Notice that MKA? and MKF? are used to determine the amplitude and frequency of the peak position.

PEAKS sorts only signals that are above the threshold value. To be classified as a signal peak, a signal must be MKPX above the threshold value and it must rise and fall at least the peak excursion (MKPX value). To change the threshold, use the TH command before PEAKS is executed.

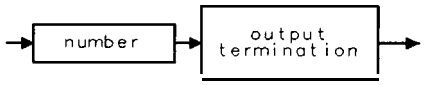
If necessary, the last sorted value is repeated to fill remaining elements of the destination trace.

PEAKS must be used as either a query or as a source in another spectrum analyzer-command function. Form a query by ending the PEAKS statement with a "?." When used as a query, PEAKS returns the number of peaks found. When querying the trace elements of destination trace, the x-axis coordinate (relative to the first trace element) of the peak is returned.



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## Query Response




QQ1

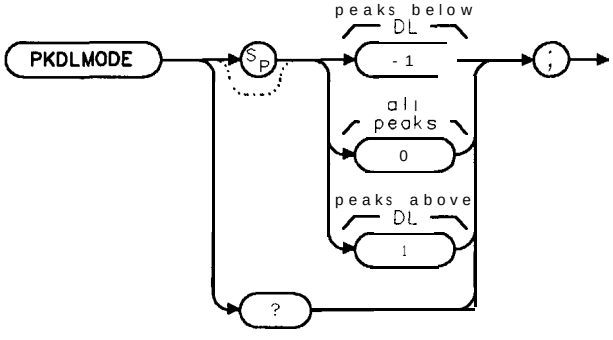


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# PKDLMODE
## Peak Table Delta Display Line Mode

Selects the signal peaks that are displayed in the peak table. The signal peaks can be selected as follows: all the signal peaks, only the signal peaks that are above the display line, or only the peaks that are below the display line.

### Syntax




XPKDLMODE

Equivalent Softkey: PK MODE <>DL NRM .
Preset State: 0 (display all the signal peaks).
Related Commands: DL, PKSORT, PKTBL.

### Example

| | |
|---|---|
| OUTPUT 718;"MOV PKTBL,1;" | *Turns on the peak table.* |
| OUTPUT 718;"DL−20;" | Sets *the display line.* |
| OUTPUT 718;"MOV PKDLMODE,1;" | *Displays the* ***only*** *the signal peaks that are* above *the display* line. |

### Description

The value of PKDLMODE determines how the signal peaks are displayed. You can set PKDLMODE to the following values:

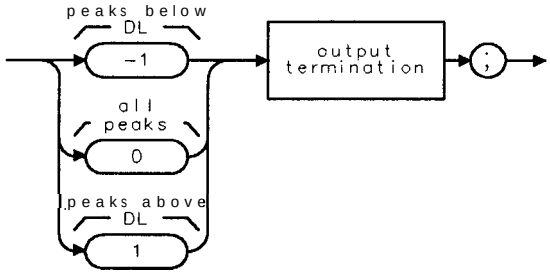
- If PKDLMODE is set to 0, all signal peaks are displayed and listed.
- If PKDLMODE is set to −1, only the signal peaks below the display line are displayed and listed.
- If PKDLMODE is set to 1, only the signal peaks above the display line are displayed and listed.

You can execute the PKDLMODE command two different ways. You can either execute the PKDLMODE command directly (for example, "PKDLMODE 1;") or use the MOV command to move the 1 or 0 into the PKDLMODE command (for example, "MOV PKDLMODE, 1;"). If you use the MOV command, no text is displayed in the active function area during command execution.



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## Query Response




QPKDLMODE

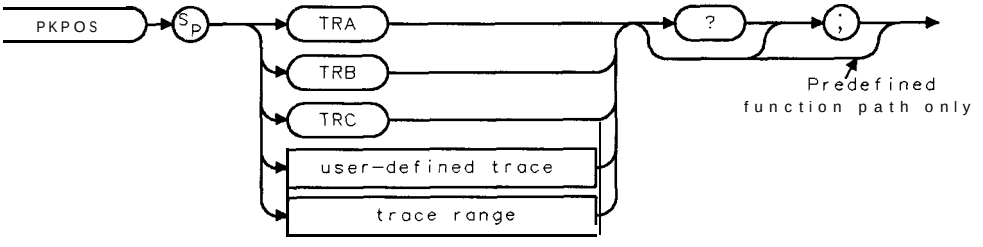


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# PKPOS
## Peak Position

Returns a value, which is the index of the maximum value in trace A, trace B, trace C, or user-defined trace.

### Syntax




XPKPOS

| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace **defined** by the TRDEF command. | Any valid trace name. |
| Trace range | A segment of trace A, trace B, trace C, or a **user-defined** trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.
Related Commands: MINPOS, MXM.

### Example

```
OUTPUT 718;"IP;"          Initializes spectrum analyzer.
OUTPUT 718;"SNGLS;TS;"    Activates single-sweep mode, takes sweep.
OUTPUT 718;"PKPOS TRA;"   Finds the position of the highest peak.
ENTER 718;Pkresult        Outputs result to the computer.
DISP Pkresult             Displays the result.
```

### Description

If a trace range is used with PKPOS, PKPOS returns a value relative to the first element of the trace range. For example, if a trace has a range of 150 to 300 elements, and the maximum value is element 200, PKPOS will return the value of 51.

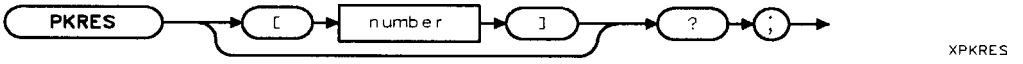


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# PKRES
## Peak Result

PKRES returns the x-axis coordinates of the peaks in the peak table.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | An integer number. | 1 to 10. |

Related Commands: DL, PKSORT, PKTBL, TDF.

### Example

```
DIM Results(10)                          Dimensions an array to hold the results.
OUTPUT 718;"TDF M;"                      Changes the trace data format to measure-
                                         ment units.
OUTPUT 718;"PKSORT 0;"                   Selects listing the peaks by decreasing amplitude.
OUTPUT 718;"MOV PKTBL,1;"                Turns on the peak table.
OUTPUT 718;"TS;"                         Performs a take sweep.
FOR I=1 TO 10                            Uses a FOR NEXT loop to get the data from
                                         PKRES
  OUTPUT718;"PKRES[";I;"]?"              Queries each PKRES element.
  ENTER718;Results(I)                    Enters the PKRES element into the Results
                                         element.
NEXT I
OUTPUT 718;"TDF P;"                      Changes the trace data format to parameter
                                         units.
PRINT"PEAK","FREQUENCY","AMPLITUDE"      Prints a heading.
FOR I=1 TO 10                            Uses a FOR NEXT loop to print the results.
  IF Results(I)>0 THEN                   Results(I) is greater than zero if peak was
                                         found.
    OUTPUT 718;"MKP ";Results(I);";"     Places a marker at the x- axis coordinate.
    OUTPUT 718;"MKF?;"                   Returns the frequency of the marker
    ENTER 718;A                          Enters the marker's frequency into A.
    OUTPUT 718;"MKA?;"                   Returns the amplitude of the marker:
    ENTER 718;B                          Enters the marker's amplitude into B.
    PRINT I,A,B                          Prints the peak number; frequency, and amplitude
  END IF                                 Ends the IF THEN statement.
NEXT I
```



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## Description

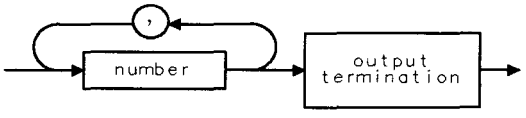
PKRES is an array that contains 10 elements. Each element of the PKRES array contains the x-axis coordinate of a signal peak, if a signal peak was found. If a signal peak was not found, the PKRES element contains a 0. The order in which the signal peaks are placed in the PKRES array depends on how the signal peaks were sorted (see "PKSORT" for more information).

You must do the following before using PKRES:

1. Set the trace data format to TDF A, TDF B, TDF I, or TDF M only. You cannot use the TDF P trace data format before PKRES is queried.
2. Use PKSORT to select sorting the signal peaks by amplitude or by frequency.
3. Turn on the peak table with PKTBL.
4. Execute a take sweep (TS) to ensure that valid data is stored in PKRES.

## Query Response

Querying PKRES returns the values of the 10 trace elements, with each value separated by a comma. Querying one element of PKRES (for example, "PKRES [1]?;") returns the value of that element, followed by the output termination.




QPKRES

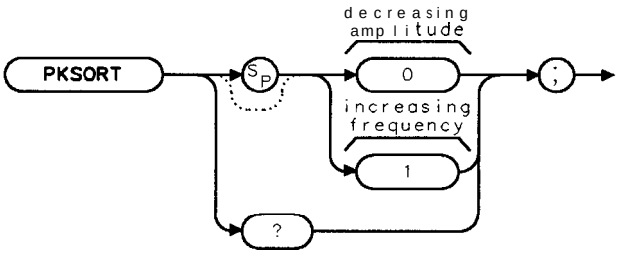


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# PKSORT
## Peak Sort

Selects how the signal peaks listed in the peak table are sorted: by decreasing amplitude or by ascending frequency.

### Syntax




XPKSORT

Equivalent Softkey: PK SORT FRQ AMP .
Preset State: 0 (sort by decreasing amplitude).
Related Commands: DL, PKSORT, PKTBL.

### Example

```
OUTPUT 718;"MOV PKTBL,1;"
OUTPUT 718;"MOV PKSORT,0;"
```

*Turns on the peak table.*
*Sorts the peaks by &creasing amplitude.*

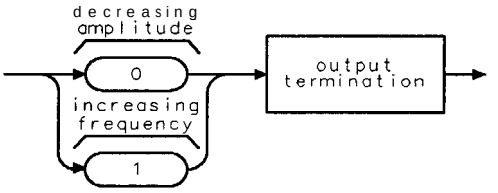
### Description

If PKSORT is set to 0, the spectrum analyzer sorts and displays the list of the peaks according to the amplitude of the peaks (highest amplitude first). If PKSORT is set to 1, the spectrum analyzer sorts and displays the list of the peaks according to frequency (lowest frequency signal peak is listed first).

See “PKRES” for information about how to get the information in the peak table remotely.

You can execute the PKSORT command two different ways. You can either execute the PKSORT command directly (for example, `"PKSORT 1; "`) or use the MOV command to move the 1 or 0 into the PKSORT command (for example, `"MOV PKSORT,1;"`). If you use the MOV command, no text is displayed in the active function area during command execution.

### Query Response




QPKSORT

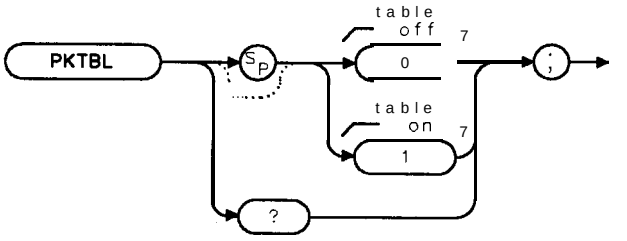


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# PKTBL
# Peak Table

Turns on or off the peak table.

## Syntax




XPKTBL

Equivalent Softkey: PK TABLE ON OFF .
Preset State: 0 (Off).
Related Commands: DL, PKRES, PKSORT, PKDLMODE.

## Example

```
OUTPUT 718;"MOV PKTBL,1;"
```
*Turns on the peak table.*

## Description

When the peak table is turned on, the spectrum analyzer screen displays two windows. The upper window displays trace A, with the signal peaks of trace A identified and numbered (the peaks are numbered according to their frequency or amplitude, see "PKSORT" for more information). The lower window displays the peak table. The peak table displays the following information about the on-screen signal peaks: the number of the peak, the frequency of the peak, and the amplitude of the peak. A signal must be equal to or exceed the peak excursion to be considered a peak. (See "MKPX" for more information about the peak excursion.) While the peak table is turned on, the frequency and amplitude of each peak is updated at the end of every sweep (PKTBL command uses the ONEOS command to update the peak table information).

See "PKRES" for information about how to get the information in the peak table remotely.

You can execute the PKTBL command two different ways. You can either execute the PKTBL command directly (for example, "PKTBL 1; ") or use the MOV command to move the 1 or 0 into the PKTBL command (for example, "MOV PKTBL , 1; "). If you use the MOV command, no text is displayed in the active function area during command execution.

### Restrictions

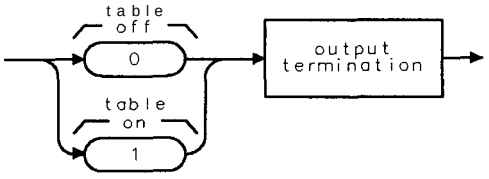
Turning on the peak table turns off the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), the FFT menu measurements (FFTAUTO, FFTCONTS, FFI'SNGLS), gate utility functions (GDRVUTIL), TOI measurement (TOI), marker table (MKTBL), percent AM (PCTAM), peak zoom (PKZOOM), and power menu measurements (ACP, ACPE, CHP, and OBW).

You should turn off the peak table (set PKTBL to 0) when you are done with the peak table.



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## Query Response




QPKTBL

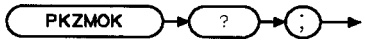


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# PKZMOK
## Peak Zoom Okay

Returns a “1” if the peak zoom routine (PKZOOM) found a valid signal, otherwise a “0” is returned.

### Syntax




XPKZMOK

Related Commands: PKZOOM.

### Example

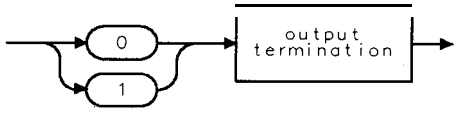
```
OUTPUT 718;"PKZOOM 1MHZ;"
OUTPUT718;"PKZMOK?;"
ENTER 718;Peak_zoom_ok
IF Peak-zoom-ok = 0 THEN

   PRINT "Signal Not Found"
ELSE
```

*Sets the final frequency span to 1 MHz.*
*Queries the value of PKZMOK.*

*If PKZMOK is equal to 0, the PKZOOM routine did not find a signal.*

### Query Response




QPKZMOK

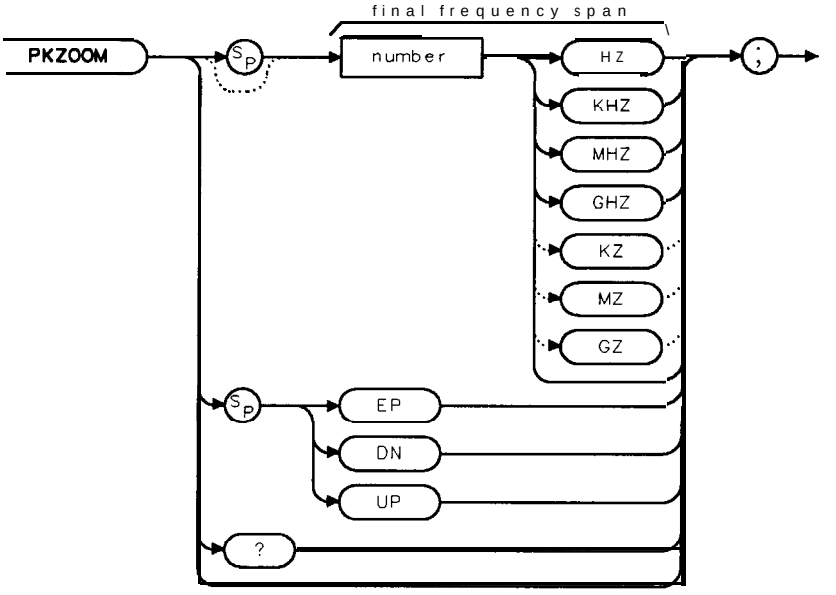


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# PKZOOM
## Peak Zoom

Automatically tunes the spectrum analyzer to the signal with the highest amplitude level while narrowing the frequency span to the specified frequency span.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | Minimum frequency span depends on model, maximum frequency span is 1 GHz. |

Equivalent **Softkey**: PEAK ZOOM.
Preset State: 1 MHz.
Related Commands: PKZMOK.

### Example

```
OUTPUT 718;"PKZOOM 1MHZ;"
OUTPUT718;"PKZMOK?;"
ENTER 718;Peak_zoom_ok
IF Peak-zoom-ok = 0 THEN

   PRINT "Signal Not Found"
ELSE
```

*Sets the **final frequency** span to 1 MHz.*
*Queries the value of **PKZMOK**.*

*If **PKZMOK** is **equal** to 0, the PKZOOM routine did not **find** a signal.*



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**PKZOOM Peak Zoom**

## Description

PKZOOM finds the highest displayed signal and narrows the frequency span to the specified value. PKZOOM ignores the spectrum analyzer's local oscillator (LO) feedthrough signal. PKZOOM sets the reference level to the signal's amplitude, sets the center frequency step size to the signal's frequency, and if the signal is within a preselected band, performs the preselector peak routine (HP 8592L, HP 85933, HP 85953, or HP 85963 only). The minimum value for the final frequency span depends on the model of the spectrum analyzer.

| Spectrum Analyzer Model | Frequency Span |
|---|---|
| HP 8590L or HP 8592L | 500 kHz |
| HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963 | 10 kHz |
| HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963 with Option 130 | 300 Hz |

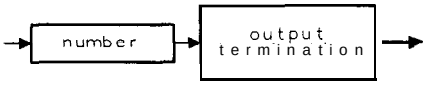
To be able to find a valid signal, PKZOOM changes the following commands:

TH Sets the threshold to 8 divisions from the top screen.
LG Changes the amplitude scale to logarithmic.
MKPX Sets the peak excursion to 6 dB.
VAVG Sets video averaging to off.
AT, RB, VB, ST Attenuation, resolution bandwidth, video bandwidth, and sweeptime are autocoupled.
MKSS The center frequency step size is set to the marker's frequency.

For a signal to be found by PKZOOM, the signal must have a peak excursion (rise and fall) of at least 6 dB.

**Restrictions**
Executing PKZOOM turns off the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), the FFT menu measurements (FF'IAUTO, FFTCONTS, FFTSNGLS), gate utility functions (GDRVUTIL), TOI measurement (TOI), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), and power menu measurements (ACP, ACPE, CHP, and OBW).

## Query Response




QQ1

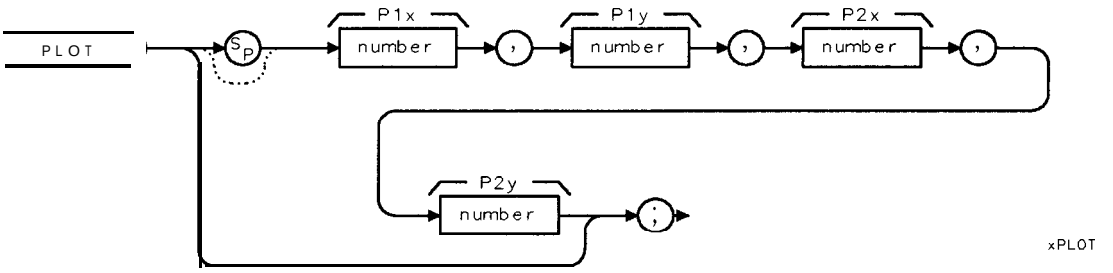


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# PLOT
# Plot

Initiates a plotter output of the screen data to the remote interface. With the appropriate HP-IB commands, the HP-IB can be configured to route the data to an external plotter.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | Number within the plotter coordinates. |

Related Commands: GETPLOT, PRINT, SNGLS, TS.
Restrictions: Not available with Analog+ display mode. See "ANLGPLUS" for more information.

## Example for the HP-IB Interface

The plotter is at address 5 and the spectrum analyzer is at address 18 in this example. (The program is only valid for HP 9000 series 200 and 300 computers.)

This example illustrates how an external controller can initiate the sending of print data to an external printer.

```
10 DIM P$[80]                          Allocates room in memory.
20 OUTPUT 705;"OP;"                    Plotter outputs lower-left and upper-right display
                                       dimensions.
30 ENTER 705;P$                        Puts the plotter response in the computer string.
40 OUTPUT 718;"PLOT";P$                Plots the spectrum analyzer display according to the
                                       dimensions stored in the computer string.
50 SEND 7 ; LISTEN 5 TALK 18 DATA      Configures the interface to output data from spectrum
                                       analyzer to plotter:
60 END
```



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## Description

The PLOT command transfers the trace data, graticule, and annotation of the spectrum analyzer screen to a plotter via the spectrum analyzer interface (**softkey** labels excluded). The data is transferred in ASCII, HPGL format.

The example routes the data to an external plotter; however, the controller can read the data into a string if desired.

When using the PLOT command, the scaling points (Plx, Ply; **P2x, P2y**) can be specified. These scaling points specify the **(x,y)** coordinates, which determine the size of the plot. **(P1x,P1y)** refers to the lower-left plotter coordinates. **(P2x,P2y)** refers to the upper-right plotter coordinates.

The PLOT command should not be used within a DLP; you should use the **GETPLOT** command instead.

---

Note — The HP **7470A** plotter does not support 2 plots per page. If you use an HP **7470A** plotter with an HP 8590 Series spectrum analyzer, you can select one plot per page or four plots per page but not 2 plots per page.

---

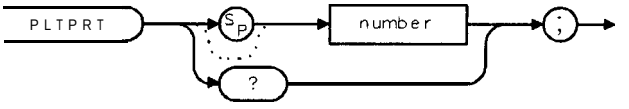


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# PLTPRT
# Plot Port

Selects which port to output plotter data from the analyzer. (Option 041 or Option 043)

## Syntax




cu122e

Related Commands: PLOT, GETPLOT, PARSTAT, PRNPRT

## Example

```
OUTPUT 718;"PLTPRT 3;"
```

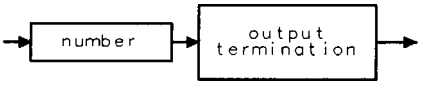
*Routes the plot information to the serial port for Option 043.*

## Description

PLTPRT 0 = HP-IB port of Option 021 or Option 041
PLTPRT 1 = serial port or Option 023
PLTPRT 2 = parallel port of Option 024
PLTPRT 3 = serial port of Option 043
PLTPRT 4 = parallel port of Option 041 or Option 043

**Note** Setting the PRNPRT to a port inconsistent with the installed hardware option is ignored, so executing PLTPRT 1 on an HP-IB equipped analyzer is ignored.

## Query Response




QQ1

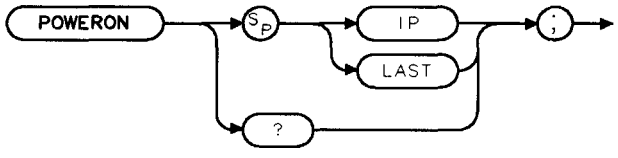


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# POWERON
## Power-On State

Selects the state of the spectrum analyzer when the spectrum analyzer is turned on: the IP state (same state as an instrument preset command) or last state (the state the spectrum analyzer was in when the spectrum analyzer was turned off).

### Syntax




XPOWERON

Equivalent **Softkey:** POWER ON IP LAST.

### Example

OUTPUT 718; "POWERON LAST;"

### Description

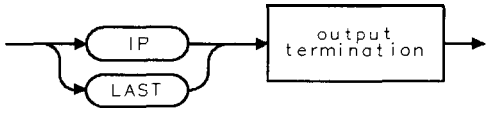
POWERON LAST restores the last state of the spectrum analyzer. Limit line testing is not considered to be a spectrum analyzer state and is not resumed after the spectrum analyzer is turned off. The limit line table will be restored even if the spectrum analyzer is turned off, however.

**Note** The last state of the spectrum analyzer is not retained in the case of battery power failure of the spectrum analyzer's internal battery.

When used as a predefined variable, POWERON returns either a "0" or a "1," depending on the setting of the POWERON parameter. Refer to the following table.

| Parameter Setting | Value Returned |
|---|---|
| IP | 0 |
| LAST | 1 |

### Query Response




QPOWERON



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# PP
# Preselector Peak

Peaks the preselector.

## Syntax




XPP

Equivalent Softkey: PRESEL PEAK .
Restrictions: Not compatible with Analog+ display mode. See “ANLGPLUS” for more information.
Model Required: HP 8592L, HP 85933, HP 85953, or HP 85963.
Related Commands: MKA, MKCF, MKD, MKF, MKN, MKPK.

## Example

```
OUTPUT 718;"IP;CF 3GHZ;SP 500KHZ;"
```
*Initializes spectrum analyzer, changes center frequency, span.*

```
OUTPUT 718;"TS;MKPK HI;MKCF;PP;"
```
*Peaks the highest on-screen signal.*

## Description

To use PP, set the desired trace to clear-write mode, place a marker on a desired signal, then execute PP. Commands following PP are not executed until after the spectrum analyzer has finished peaking the preselector.

PP automatically adjusts the preselector tracking to peak the signal at the active marker. (When the marker is tuned to a signal and PRESEL PEAK is pressed, an internal routine searches for the peak response of the preselector and adjusts the tracking accordingly.) Using preselector peak prior to measuring a signal yields the most accurate amplitude reading.

Preselector peak operates with the MARKER NORMAL or MARKER Δ markers. If the marker is OFF, pressing PRESEL PEAK initiates a peak search routine and then peaks the response at that marker; otherwise, it peaks around the active marker. The CAL : PEAKING message appears on the active graticule area to indicate operation of the peaking routine. Preselector peak only operates in the 2.75 to 22 GHz preselector bands.

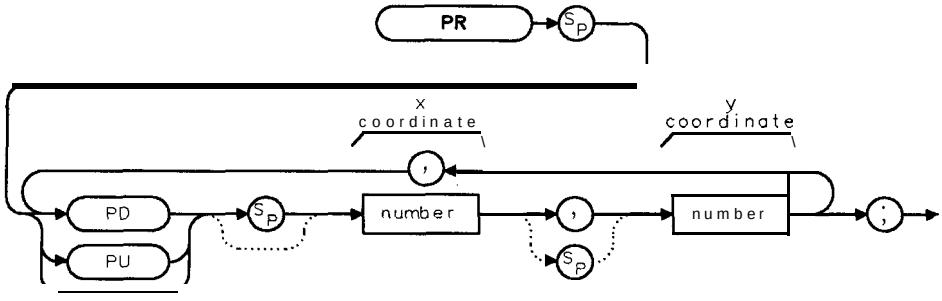


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# PR
# Plot Relative

Moves the pen to a new plot location on the spectrum analyzer screen relative to the current coordinates in display units.

## Syntax




XPR

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | Dependent on the current pen position. |

Related Commands: DSPLY, PA, PLOT, PRINT, PU, TEXT.

## Example

```
OUTPUT 718; "IP; "                                  Initializes spectrum analyzer.
OUTPUT 7 18 ; "BLANK TRA ; ANNOT OFF ;"             Clears the display.
OUTPUT 718;"GRAT OFF;"                              Turns off graticule.
OUTPUT 718;"PU;PA 0,100;"                           Positions pen.
OUTPUT 718;"PD;PR 100,0,0,-100,-100,0,0,100;"       Draws a rectangle.
```

## Description

Vector coordinate sets (**x,y** pairs) following the PR command can be either positive or negative, depending on the direction of the individual vectors to be drawn. PU (pen up) and PD (pen down) commands tell the spectrum analyzer to draw or not draw the vectors on the screen. (See "PU" and "PD.")

Display units are the scaling units of the spectrum analyzer display for on screen graphics commands such as PA or PR. See "PA" for more information about display units.

The coordinates of the lower left screen corner of the screen are −40,−22 and the upper right screen corner of the screen are 471,233. For the graticule area, the coordinates of the lower left corner of the graticule are 0,0 and the coordinates of the upper right graticule area are 400,200. For example, you could execute "PU;PA 0,0;PD;PA 0,200,400,200,400,0,0,0;" to draw a box around the graticule area.

Because PR is an active function, executing PR causes the active function area on the spectrum analyzer screen to blank. To prevent the text following PR from being written in the active function area, execute hold (HD) after PR.

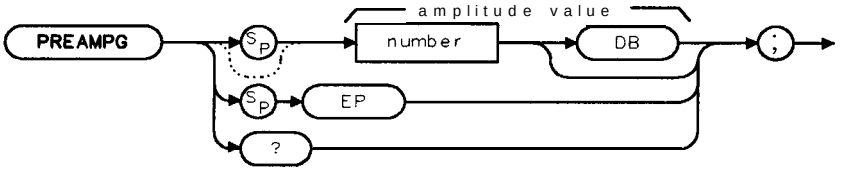


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# PREAMPG
# External Preamplifier Gain

Subtracts a positive or negative preamplifier gain value from the displayed signal.

## Syntax




XPREAMPG

## Example

OUTPUT 718; "PREAMPG **10DB;**"

## Description

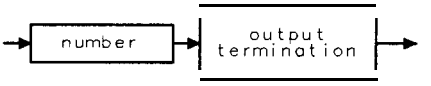
Unlike using ROFFSET, PREAMPG can change the attenuation depending on the preamplifier gain entered.

A preamplifier gain offset is used for measurements that require an external preamplifier or long cables. The offset is subtracted from the amplitude readout so that the displayed signal level represents the signal level at the input of the preamplifier or long cable. The preamplifier gain offset is displayed at the top of the screen and is removed by entering zero.

**Note** PREAMPG is not reset to 0 by an instrument preset (IP). Be sure to execute "PREAMPG 0; " when the preamplifier gain is no longer needed.

Press CAL **STORE** if you want the spectrum analyzer to use the current preamplifier gain offset when power is turned on. Preamplifier gain offset is set to zero by DEFAULT **CONFIG** .

## Query Response




QQ1

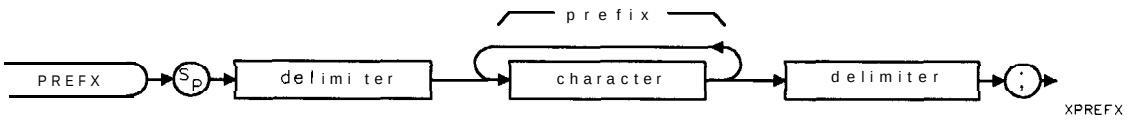


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# PREFX
# Prefix

Specifies or changes the prefix used in save and recall operations.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Character | Any valid character. | 0 to 6 characters long, A through Z and the underscore (the underscore cannot be the first character of the prefix). |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |

Equivalent Softkey: Change Prefix .
Related Commands: CAT, SAVRCLN, STOR.

## Example

OUTPUT 718;"PREFX %DAVE%;"

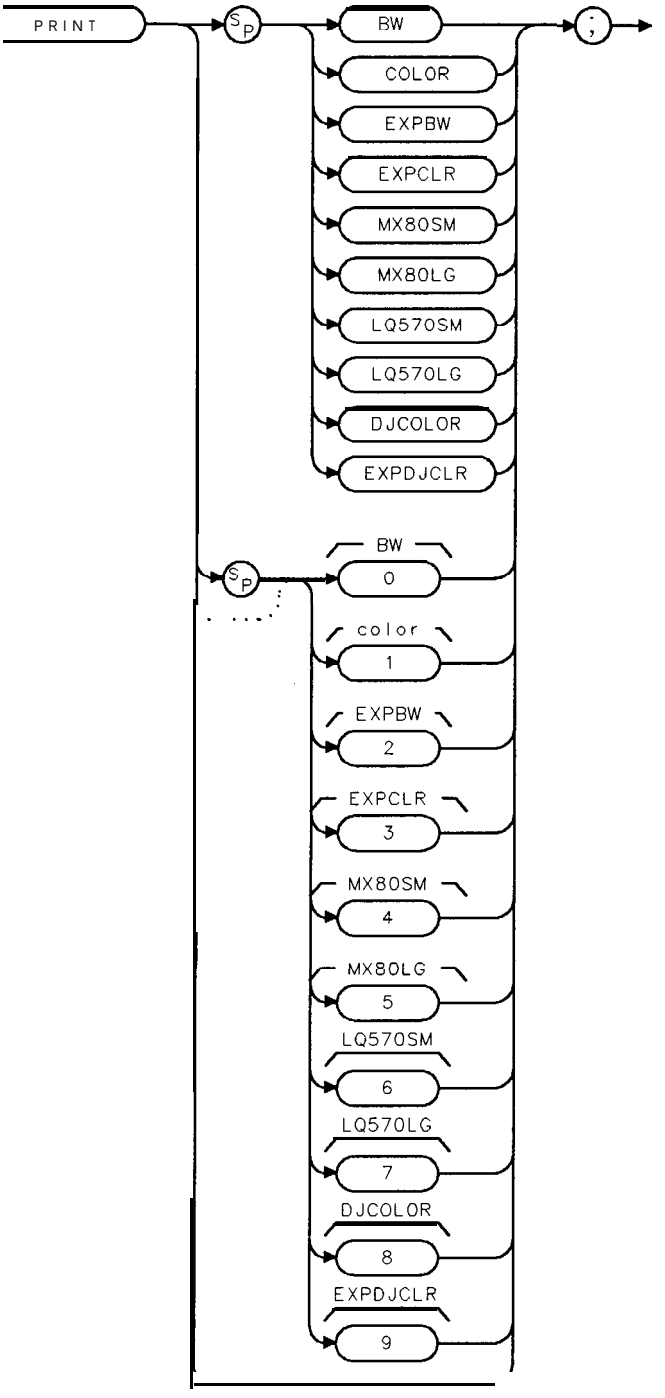


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# PRINT
# Print

Initiates a output of the screen data to the remote interface. With appropriate HP-IB commands, the HP-IB can be configured to route the data to an external printer.

## Syntax




xprint



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Related Commands: GETPRNT, PLOT.

## Example for the HP-IB Interface

The printer usually resides at address 1 and the plotter at address 5. (The program is only valid for HP 9000 Series 200 and 300 computers and HP Vectra personal computer with an HP raster graphics printer, such as the HP Thinkjet.)

This example illustrates how an external controller can initiate the sending of print data to an external printer.

```
OUTPUT 718;"PRINT:"
SEND 7;UNT UNL LISTEN 1 TALK 18 DATA Sends data to printer.
```

---

**Note** To print without disconnecting the computer, you must execute the following BASIC commands:

```
ABORT 7
LOCAL 7
```

Then press COPY.

---

## Description

The data is output in HP raster graphics format. PRINT, PRINT 0, or PRINT BW produces a monochrome printout. PRINT 1 and PRINT COLOR produces a "color format" output for an HP PaintJet printer. Execute "MENU 0;" before printing to blank the softkeys.

The PRINT command should not be used within a DLP; you should use the GETPRNT command instead.

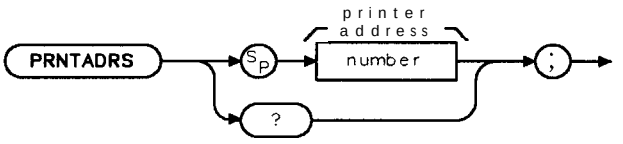


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# PRNTADRS
# Print Address

Allows you to set the HP-IB address of the printer.

## Syntax




XPRNTADRS

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer number. | 0 to 30 |

Equivalent **Softkey: PRINTER ADDRESS** .
Option Required: Option 02 1.

## Example

```
10 OUTPUT 718;"VARDEF L_OC,1;MOV L_OC,12;"
20 OUTPUT 718;"PRNTADRS 1;"
.
300 OUTPUT 718;"OUTPUT PRNTADRS,F3.0,L_OC;"
```

*Defines a variable called L_OC, and then moves 12 into L_OC.*

*Sets the HP-IB address of the printer to 1.*

*You can insert programming commands here.*

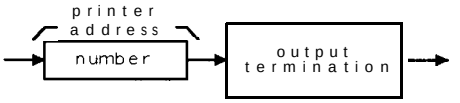
*You could use this statement within a DLP. This statement outputs the number 12 to the printer*

## Description

You may find it useful to assign PRNTADRS near the beginning of your program, and, from then on, refer to the printer address in your program as PRNTADRS. The advantage of using PRNTADRS in this way is that if you need to change the printer address, you need only change the programming line that assigns the printer address to PRNTADRS (see line 20 of the programming example).

## Query Response

PRNTADRS? returns the current HP-IB address of the printer.




QPRNTADRS

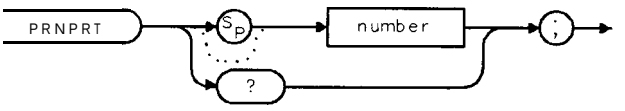


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## PRNPRT
## Print Port

Selects which port to output printer data from the analyzer. (Option 041 or Option 043)

### Syntax




cu123e

Related Commands: PRINT, GETPRINT, **PARSTAT,** PLTPRT

### Example

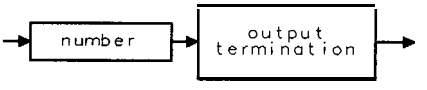
`OUTPUT 718 ; "PRNPRT 3 ;"` *Routes the print* ***information*** *to the serial port for Option 043.*

### Description

PRNPRT 0 = HP-IB port of Option 021 or Option 041
PRNPRT 1 = serial port or Option 023
PRNPRT 2 = parallel port of Option 024
PRNPRT 3 = serial port of Option 043
PRNPRT 4 = parallel port of Option 041 or Option 043

**Note** Setting the PRNPRT to a port inconsistent with the installed hardware option is ignored, so executing PRNPRT 1 on an HP-IB equipped analyzer is ignored.

### Query Response




QQ1



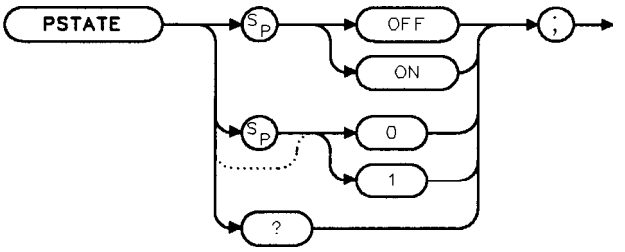
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# PSTATE
## Protect State

Protects all of the spectrum analyzer's user state and trace registers from being changed, except when ERASE MEM ALL is pressed.

**Caution** The spectrum analyzer user states are *not* protected when ERASE MEM ALL is pressed.

### Syntax



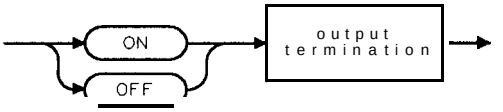

XPSTATE

Equivalent Softkey: SAV LOCK ON OFF .
Related Commands: ERASE, RCLS, SAVES.

### Example

OUTPUT 7 18;"PSTATE ON;"

### Query Response




QQ2



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# PU
## Pen Up

Instructs the spectrum analyzer not to plot vectors on the spectrum analyzer screen until a PD command is received.

### Syntax




XPU

Related Commands: DSPLY, PA, PD, PLOT, PR, TEXT.

### Example

```
OUTPUT 718;"IP;BLANK TRA;"                  Initializes spectrum analyzer, blanks trace A.
OUTPUT 718;"ANNOT OFF;GRAT OFF;"            Turns off annotation, graticule.
OUTPUT 718;"PU;"                            Prevents initial vector from being drawn.
OUTPUT 718;"PA 100,100;PD 100,150;"         Positions pen, pen down.
OUTPUT718;"150,150,150,100,100,100;"        Draws remaining 3 sides of rectangle.
```

### Description

The PU command is used before the commands PA (plot absolute), or PR (plot relative), to suppress drawing while moving to the starting point of a vector. It remains in effect until a PD command is received.

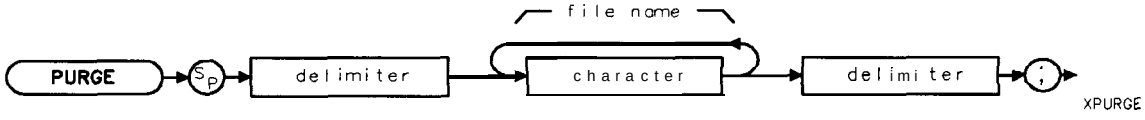


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# PURGE
## Purge. File

Deletes the specified file from the current mass storage device.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Character | Any valid character. | Any valid filename. |

Related Commands: MSI.

### Example

```
OUTPUT 718; "MSICARD;"
OUTPUT 718;"PURGE %dMYFILE%;"
```

*Selects the **memory** card as the mass storage device.*
*Deletes the **file** called "**dMYFILE**" from the **memory** card.*

### Description

Use the **MSI** command to select the mass storage device (either the spectrum analyzer memory or a memory card) before using the PURGE command. When deleting a file from a RAM card, the RAM card files are repacked automatically after a PURGE command is executed.

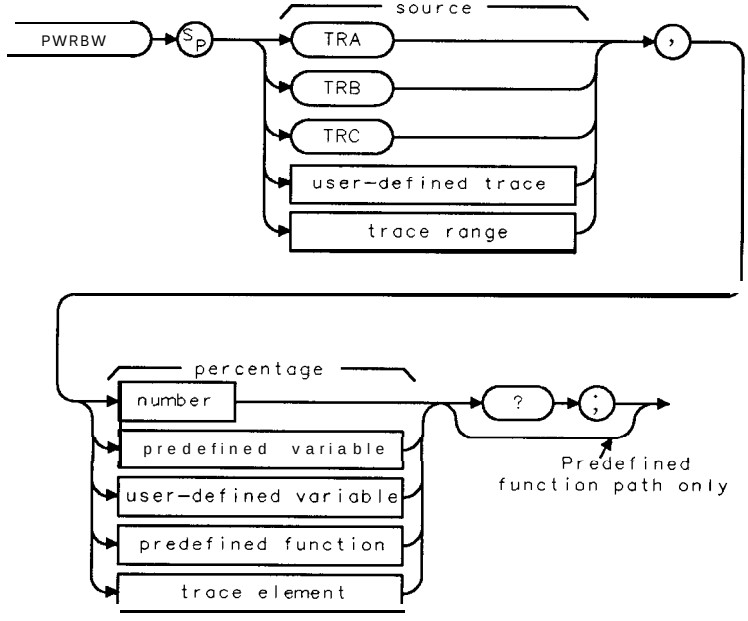


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# PWRBW
# Power Bandwidth

Computes the bandwidth around the trace center, which includes signals whose total power is a specified percentage of the total trace signal power.

## Syntax




XPWRBW

| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to 'lbble 5-1. | |
| Predefined function | Function that returns a value. Refer to lbble 5-1. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | 0 to 100. |

Parameter Values: The field used for the percentage must use a value between 0 and 100.
Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF for a user-defined variable. TS when using trace data.
Related Commands: RB, SP.



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## Example

```
DISP "CONNECT CAL OUT TO INPUT"
OUTPUT 718;"IP;"
OUTPUT 718;"SNGLS;"
OUTPUT 718;"CF 300MHZ;SP 1MHZ;RB 300KHZ;"

OUTPUT 718;"MXMH TRA;TS;TS;TS;TS;"


OUTPUT 718;"PWRBW TRA, 99.0;"

ENTER 718;P

DISP "THE POWER BANDWIDTH AT 99 PERCENT IS";P/1.0E+3;"kHz"
```

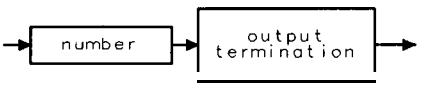
*Displays a user prompt.*
*Initializes spectrum analyzer.*
*Activates single-sweep mode.*
*Changes center frequency, span, and bandwidth.*
Activates *the maximum hold of trace A, sweep 4 times.*
*Returns the 99% power bandwidth.*
*Gets the result from the spectrum analyzer:*
*Displays the frequency of the power bandwidth specified on the computer screen.*

## Description

If trace A is the source, a delta marker is set at the start and stop frequencies.

If 100% is specified, the power bandwidth equals the frequency range of the screen display. If 50% is specified, trace elements are eliminated from either end of the array, until the combined power of the remaining signal responses equals half of the original power computed. The frequency span of these remaining trace elements is the power bandwidth returned.

## Query Response




QQ1



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# PWRUPTIME
## Power Up Time

Returns the number of milliseconds that have elapsed since the spectrum analyzer was turned on.

### Syntax




XPWRUPTIME

### Example

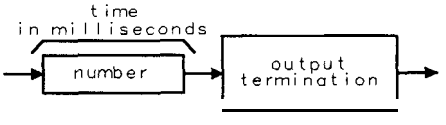
```
OUTPUT718;"PWRUPTIME;"
ENTER 718;A
A = A/1000
PRINT "Minutes elapsed ",A/60
```

*Executes PWRUPTIME.*
*Places the result of PWRUPTIME into A.*
*Changes the milliseconds to seconds.*
*Prints the number of minutes that have elapsed since the spectrum analyzer was turned on.*

### Description

PWRUPTIME can count the number of milliseconds for up to $2^{32}$ milliseconds ($2^{32}$ milliseconds is equivalent to 49.7 days). If the spectrum analyzer is left on for more than 49.7 days, PWRUPTIME is reset to 0 and restarts the count.

### Query Response




QPWRUPTIME

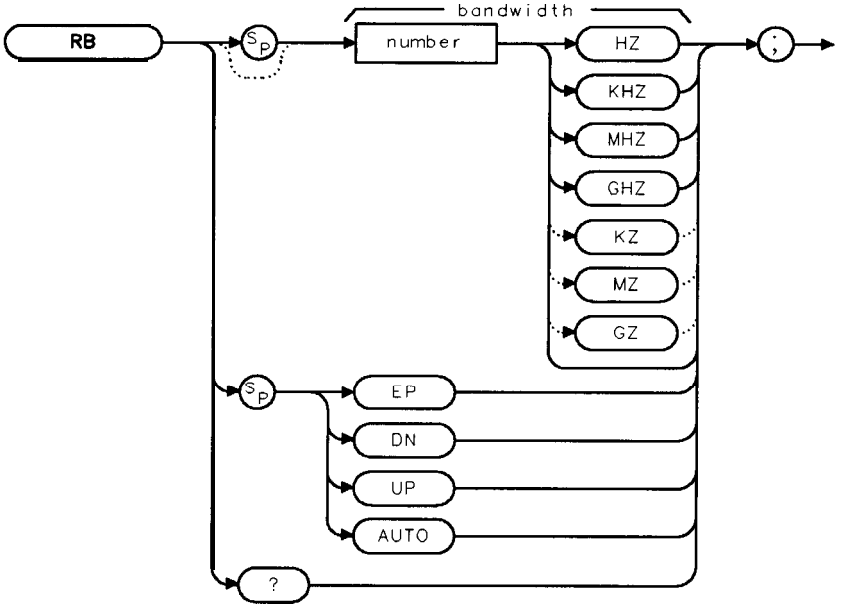


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# RB
# Resolution Bandwidth

Specifies the resolution bandwidth.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | If Option 130 is installed, 30 Hz to 3 MHz, otherwise 1 **kHz** to 3 MHz. |

Equivalent Softkey: RES BW AUTO MAN .
Preset State: 3 MHz.
Step Increment: In a 1, 3, 10.
Related Commands: AUTO, SP, ST, VB, VBR.

## Example

```
OUTPUT 718;"RB 1KHZ;"
```
*Sets the resolution bandwidth to 1 **kHz**.*



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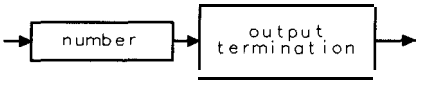
## Description

The coupling between sweep time and resolution bandwidth is terminated by this command. Execute RB AUTO to reestablish coupling. (Also see "AUTO.")

The 200 Hz, 9 kHz, and 120 kHz 6-dB resolution bandwidths (used for EMI testing) are available by specifying 200 Hz (for spectrum analyzers with Option 130 installed), 9 kHz, or 120 kHz as the frequency value; the front-panel knob, step increment keys, and auto-coupled settings provide the 1, 3, 10 resolution bandwidth sequence only. Frequencies are rounded to the nearest value in the 1, 3, 10 sequence if the frequency is other than 9 kHz, 120 kHz, 5 MHz, or in the 1, 3, 10 sequence.

The spectrum analyzer provides uncalibrated bandwidths of 300 Hz (10 Hz if the spectrum analyzer has Option 130 installed in it) and 5 MHz.

## Query Response




QQ1

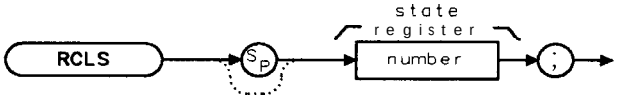


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# RCLS
# Recall State

Recalls spectrum analyzer state data from the specified state register in spectrum analyzer memory.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | 1 to 9 |

Equivalent **Softkey**: **INTERNAL -> STATE** .
Related Commands: LOAD, **POWERON**, RCLT, SAVES.

## Example

| | |
|---|---|
| OUTPUT 718;"IP;CF 300MHZ;SP 1MHZ;" | *Changes center frequency, span.* |
| OUTPUT 718;"SAVES 3;" | *Saves state* in *register 3.* |
| OUTPUT 718;"IP;" | |
| OUTPUT 718;"RCLS 3;" | *Recalls the contents of register 3.* |

## Description

You can specify a state register number from one to nine. Registers one through eight are reserved for your use. Registers one through eight contain instrument state information if instrument state information has been stored in it with the SAVES command. State register nine contains the previous state data.

**Note** The RCLS recalls state data from spectrum analyzer memory. See "LOAD" or "SAVRCLN" to recall state data from the memory card.

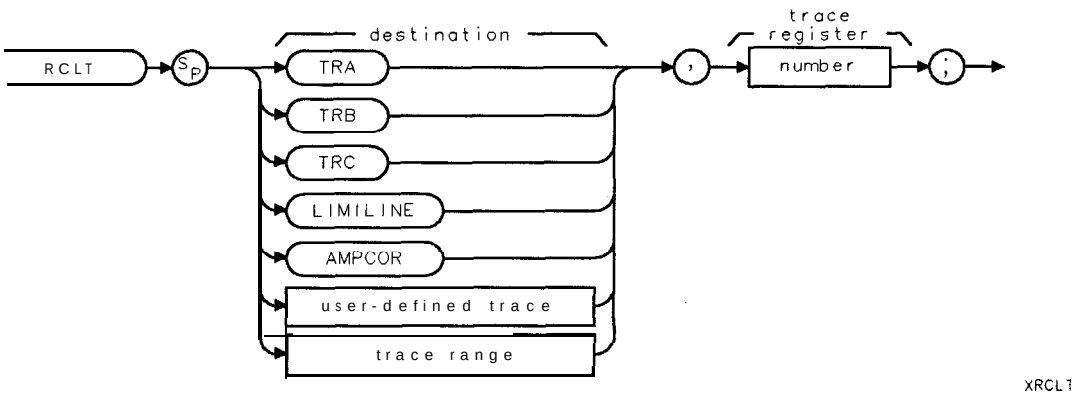


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# RCLT
# Recall Trace

Recalls previously saved trace data, amplitude factors, or limit-line data from the specified trace register in spectrum analyzer memory. Trace data is recalled with instrument state, date, and screen title.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any valid integer. | 0 to TRCMEM – 1. |

Equivalent Softkey: The RCLT command and the VIEW commands are equivalent to `Internal -> Trace`.

Parameter Value: 0 to TRCMEM – 1.

Prerequisite Commands: TRDEF when using a user-defined trace.

Related Commands: CAT, CLRW, LOAD, SAVET, SNGLS, TRCMEM, TS, VIEW.

## Example

```
10 OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;TS;"
20 OUTPUT 718;"SAVET TRA,1;"
30 OUTPUT 718;"IP;"
40 OUTPUT 718;"RCLT TRA,1;VIEW TRA;"
50 END
```

*Initializes spectrum analyzer, changes the center frequency and span.*

*Saves spectrum analyzer state and trace A data in register 1.*

*Initializes spectrum analyzer*

*Recalls spectrum analyzer state, trace data; displays the result.*



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## Description

The state and trace data are recalled when the trace destination is trace A, trace B, or trace C. When using a user-defined trace or a trace range for the trace destination, only the trace data is recalled.

When recalling frequency-amplitude correction data, you need to specify AMPCOR as the destination. When recalling limit line table data, specify LIMILINE as the destination.

To avoid overwriting the recalled trace data, the VIEW command should be performed immediately after the RCLT command when recalling trace data (see line 40 in the example).

---

**Note** The RCLT recalls trace data from spectrum analyzer memory. See "LOAD" or "SAVRCLN" to recall trace data from the memory card.

---



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# RELHPIB
# Release HP-IB

Releases spectrum analyzer control of the HP-IB.

## Syntax




XRELHPIB

Option Required: Option 021.
Related Commands: ENTER, OUTPUT.

## Example

```
OUTPUT 718 ; "RELHPIB ;"
```

*The spectrum analyzer releases control of HP-IB so that another device can control the bus.*

## Description

The RELHPIB command causes the device that is acting as the controller on the HP-IB (for example, the spectrum analyzer) to relinquish control of the bus.

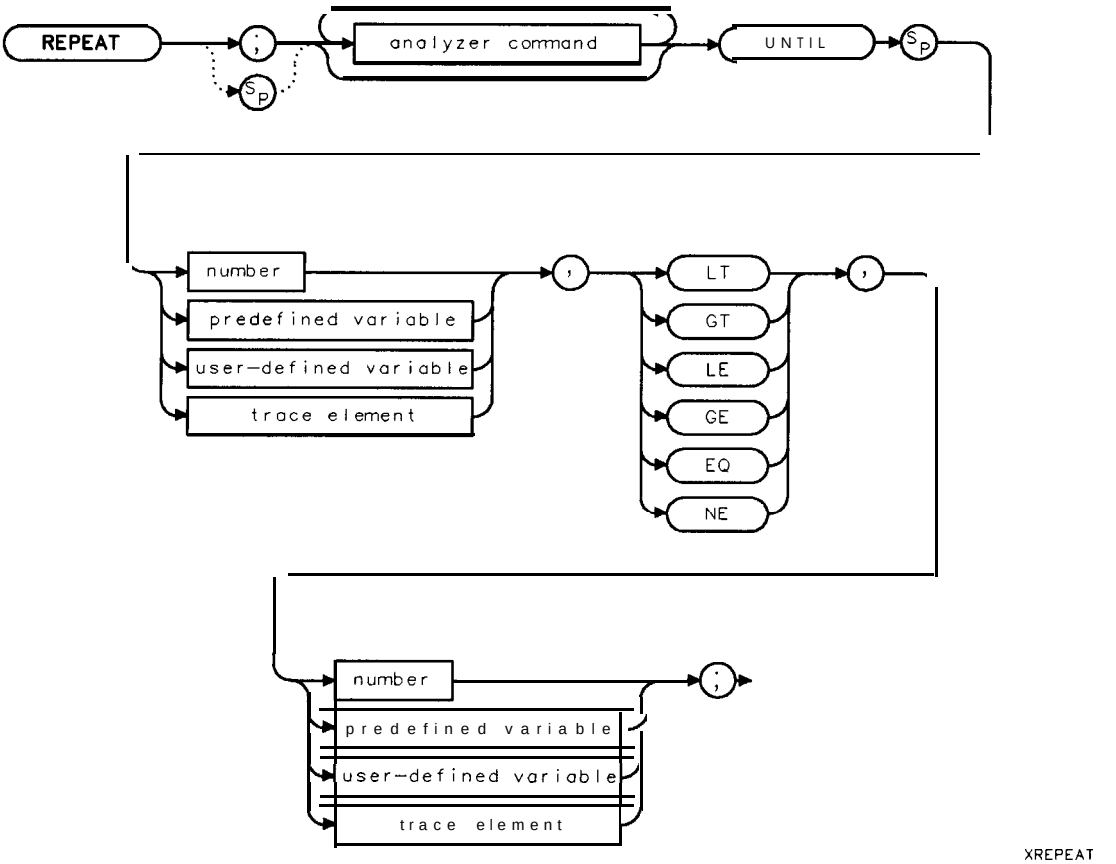


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# REPEAT UNTIL
# Repeat Until

The REPEAT and UNTIL commands form a looping construct.

## Syntax




XREPEAT

| Item | Description/Default | Range |
|---|---|---|
| Analyzer command | Any valid complete spectrum analyzer command. | |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-1. | |
| Number | Any real or integer number. | Real number range. |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: FUNCDEF when using a user-defined function. ACTDEF or VARDEF when using a user-defined variable.
Related Commands: ABORT, IF (IF/THEN/ELSE/ENDIF).



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## Example

The following program lowers any off-screen signal.

```
10 OUTPUT 718;"IP;"                          Initializes spectrum analyzer.
20 OUTPUT 718;"SNGLS;TS;MKPK HI;"            Activates single-sweep mode, takes sweep, places
                                             marker on signal peak.
30 OUTPUT 718;"IF MA,GT,RL THEN;"            Performs lines 40, 50 and 60 if the marker
                                             amplitude is greater than the reference level.
40   OUTPUT 718;"REPEAT;"                    Increases reference level, takes sweep, places
50     OUTPUT 718;"RL UP;TS;MKPK HI;"        marker on signal peak.
60   OUTPUT 718;"UNTIL MA,LE,RL;"            Does line 40 until peak amplitude is less than
                                             or equal to the reference level.
70 OUTPUT 718;"ENDIF;"                       Ends the IF THEN construct.
80 OUTPUT718:"CONTS:",,
70 END
```

## Description

All commands following the REPEAT command are executed until the comparison specified after the UNTIL command is true.

The following are used for comparing the operands:

**GT** Greater than

**LT** Less than

**LE** Less than or equal to

**GE** Greater than or equal to

**EQ** Equal to

**NE** Not equal to

When used within a downloadable program (DLP), the number of REPEAT UNTIL statements that can be nested is limited to 20.



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# RESETRL
# Reset Reference Level

Resets the reference level to its instrument preset level.

## Syntax




XRESETRL

Related Commands: AUNITS, IP, ML, RL, RLPOS.

## Example

```
OUTPUT 718;"RESETRL;"
```



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# RETURN
## Return

Stops the operation of a user-defined command and returns program operation to the point where the user-defined function was called.

### Syntax




XRETURN

Related Commands: ABORT, FUNCDEF. IF (IF/THEN/ELSE/ENDIF), REPEAT (REPEAT/UNTIL).

### Example

```
10    OUTPUT 718;"IP;"                          Initializes spectrum analyzer
20    OUTPUT 718;"SNGLS;TS;DONE?"               put in single sweep mode
30    ENTER 718;Done                            wait until done
40    !
50    OUTPUT 718;"FUNCDEF D_LP,@"               defines user defined function
60    OUTPUT 718;"CF 300MZ;SP 10MZ;TS;"         set CF and SPAN
70    OUTPUT 718;"MKPK HI;"                     marker peak
80    OUTPUT 718;"PU;PA 60,180;"                position pen, get ready for text
90    OUTPUT 718;"IF MKA,LT,-30 THEN;"          marker less than -30 dBm?
100       OUTPUT 718;"TEXT'NO SIGNAL FOUND';"
110       OUTPUT 718;"HD;"                      refresh graticule
120       OUTPUT 718;"CONTS;"                   back to continuous sweep
130       OUTPUT 718;"RETURN;"                  exit the function
140   OUTPUT 718;"ELSE;"
150       OUTPUT 718;"TEXT'SIGNAL FOUND';"
160   OUTPUT 718;"ENDIF;"
170   OUTPUT 718;"SP 5MZ;TS;MKPK;"              narrow span, marker peak
180   OUTPUT 718;"MKCF;"                        marker to CF
190   OUTPUT 718;"MKRL;TS;"                     marker to RL
200   OUTPUT 718;"HD;"                          refresh graticule
210   OUTPUT 718;"CONTS;"                       back to continuous sweep
220   OUTPUT 718;"@;"                           end of user defined function
230   !
240   OUTPUT 718;"D_LP;"                        this line executes function D-LP
250   !
260   END
```

### Description

The example shows the use of the RETURN command to exit from a user-defined function. When the RETURN is encountered, execution within the function halts and control returns to the calling context.

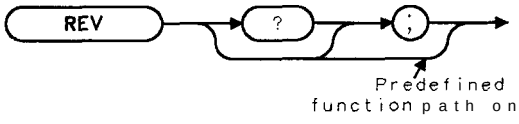


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# REV
# Revision

Returns the date code of the firmware revision date in YYMMDD format (for example, 860910 indicates 10 September 1986).

## Syntax




XREV

Equivalent **Softkey**: **SHOW OPTIONS** displays the firmware revision date.
Related Commands: ID, SER, **TIMEDATE**.

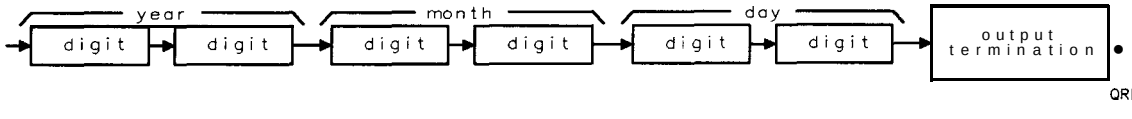
## Example

```
OUTPUT 718 ;"REV ;"   Gets the firmware revision date of spectrum analyzer.
ENTER 718;A           Puts the spectrum analyzer response in the computer variable, A.
DISP A                Displays the firmware revision date on the computer screen.
```

## Description

The date of the firmware revision also appears when the instrument is first turned on, but it is displayed in the day, month, year format.

## Query Response




QREV

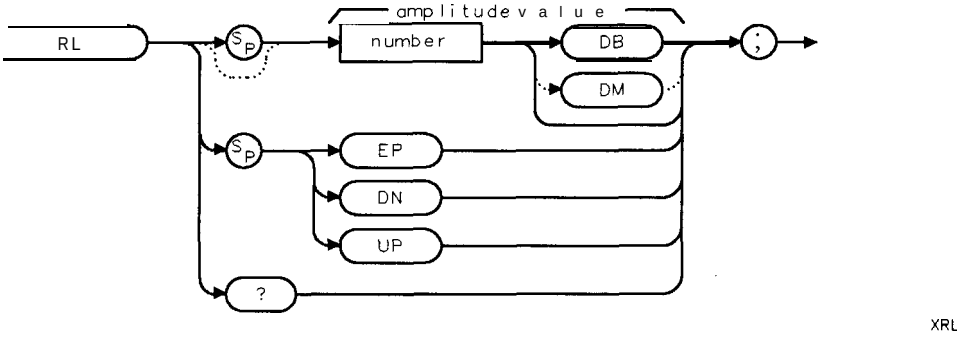


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# RL
# Reference Level

Specifies the amplitude value of the reference level.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is the current amplitude unit. | Amplitude range of the spectrum analyzer. |

Equivalent Softkey: **REF LVL** .
Preset State: 0 **dBm**.
Step Increment: by 10 **dBm**.
Related Commands: AT, MKRL, ML, RESETRL, RLPOS.

## Example

```
10 OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;"
```
*Initializes spectrum **analyzer**; activates single-sweep **mode**, changes **center frequency**, **span**.*

```
20 OUTPUT 718;"TS;MKPK HI;MKRL;TS;"
```
***Takes** sweep, places marker on signal peak, sets reference level to marker level.*

```
30 OUTPUT 718;"RL?;"
```
*Queries reference level.*

```
40 ENTER 718;Ref_level
```
*Puts the spectrum analyzer response in the computer variable, **Ref_level**.*

```
50 PRINT "REFERENCE LEVEL IS",Ref_level,"DM"
60 END
```



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## Description

The reference level and input attenuator are coupled to prevent gain compression. Signals with peaks at or below the reference level are not affected by gain compression.

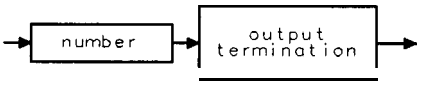
---

Caution Signal levels above +30 dBm will damage the spectrum analyzer.

---

RL may affect the attenuation value.

## Query Response




QQ1

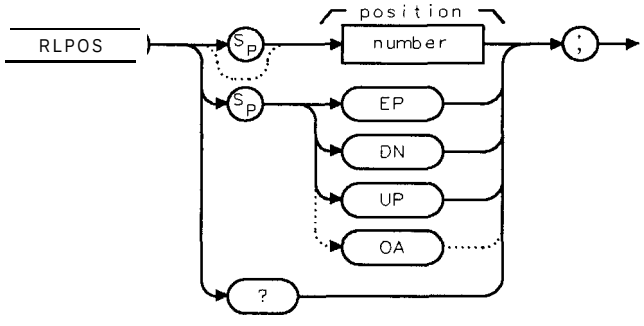


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# RLPOS
## Reference-Level Position

Selects the position of the reference level.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | 0 to 8. |

Step Increment: 1.
Related Commands: IP, MEASURE, NRL, RL.
Preset State: RLPOS 8.

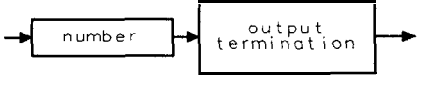
### Example

```
OUTPUT 718;"IP;"                 Initializes spectrum analyzer.
OUTPUT 718;"MEASURE NRM;"        Changes the measurement mode to normalized.
OUTPUT 718;"AMBPL ON;"           Activates trace normalization.
OUTPUT 718;"RLPOS 7;"            Positions the reference level at the seventh major graticule division.
```

### Description

The RLPOS command changes the position of the reference level during log display mode. The top and bottom graticule lines correspond to 8 and 0, respectively. RLPOS must be used with MEASURE NRM or MEASURE SR, and AMBPL ON or AMB ON. Arrows appear on the left and right side of the screen graticule when the reference level position is changed.

### Query Response



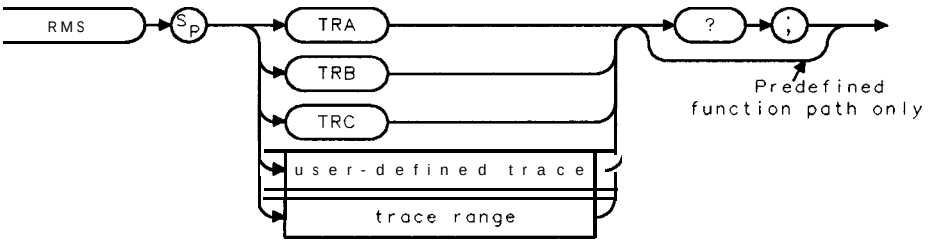



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# RMS
# Root Mean Square Value

Returns the root mean square value of the trace in measurement units.

## Syntax




XRMS

| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| Trace range | A segment of trace A; trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.
Related Commands: MEAN, PDA, PDF, STDEV, VARIANCE.

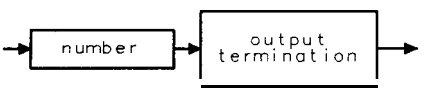
## Example

```
OUTPUT718;"IP;SNGLS;TS;"
OUTPUT 718;"RMS TRA?;"
ENTER 718;Number
DISP Number
```

## Description

Trace data, user-defined trace data, and trace range data are treated as 16-bit integers.

## Query Response




QQ1

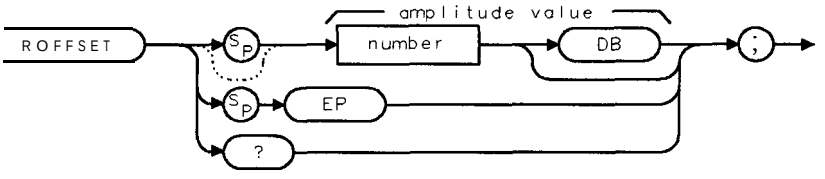


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# ROFFSET
## Reference Level Offset

Offsets all amplitude readouts without affecting the trace.

### Syntax




XROFFSET

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is **dB**. | -200 **dB** to + 200 **dB**. |

Equivalent **Softkey: REF LVL** OFFSET .
Preset State: 0 **dB**.
Related Commands: AT, RL.

### Example

```
10 OUTPUT 718; "IP;"
20 OUTPUT 718;"RL -20DB;"
30 OUTPUT 718;"ROFFSET -10 ;"

40 OUTPUT 718;"RL?;"

50 ENTER 718;Ref

60 DISP "THE NEW REFERENCE LEVEL IS ",Ref
70 END
```

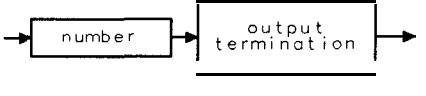
*Initializes spectrum analyzer.*
*Changes the reference level.*
*Changes spectrum analyzer reference offset value.*
*Gets the reference value from spectrum analyzer.*
*Puts the spectrum analyzer response in the computer variable, Ref.*
*Displays -30 as the new reference level.*

### Description

Once activated, the ROFFSET command displays the amplitude offset in the active function block. And, as long as the offset is in effect, the offset is displayed on the left side of the screen.

Entering ROFFSET 0 or presetting the spectrum analyzer eliminates an amplitude offset.

### Query Response




QQ1

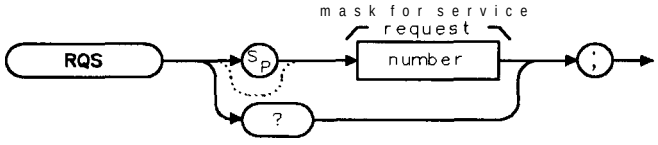


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# RQS
## Service Request Mask

Sets a bit mask for service requests (see “SRQ”).

### Syntax




XRQS

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | 0 to 62. |

Related Commands: SRQ, STB.

### Example

```
OUTPUT 718;"RQS 12;"
```
*Sends a **mask bit** for hardware broken and end of sweep.*

### Description

Assignment of values for the mask is as follows:

32 = Illegal command (bit 5)
16 = Command complete (bit 4)
8 = Hardware broken (bit 3)
4 = End of sweep (bit 2)
2 = Units key pressed (bit 1)

As shown in the example, a mask with hardware broken and end of sweep is equal to 12 (8 + 4). The mask also disables command complete and illegal command interrupts.

To activate all conditions in the mask, the mask value is equal to 62 (32 + 16 + 8 + 4 + 2). lb set the service request mask for all conditions, execute `OUTPUT 718 ; "RQS 62 ; "`.



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**RQS Service Request Mask**

Each bit in the status byte is defined as follows:

1 Indicates that the units key was pressed. SRQ 102 appears on the spectrum analyzer screen. If you activate the units key bit, it will remain active until you activate “EE” and press a units key. (See “EE.“)

2 Indicates end of sweep. SRQ 104 appears on the spectrum analyzer screen. If you send any RQS value that contains mask value 4, another sweep will be taken.

3 Indicates broken hardware. SRQ 110 appears on the spectrum analyzer screen.

4 Indicates completion of a command. It is triggered by EOI at the end of a command string or the completion of a print or plot.

5 Indicates an illegal spectrum analyzer command was used. SRQ 140 appears on the spectrum analyzer screen.

0 (LSB), 6, and 7 are not used.

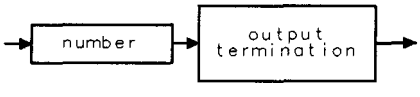
The spectrum analyzer screen numbers 102, 104, and 110 are the octal values corresponding to the status register values; that is, SRQ 102 = bit 6 = octal 100 and bit 2 = octal 2 are both true.

A service request is generated only if the proper request mask bit has been set, and either the condition itself or the Force Service Request (see “SRQ”) is sent. To set the request mask, choose the desired interrupt conditions and sum their assigned values. Executing the RQS command with this value sets the bit mask. After setting the bit mask, only the chosen conditions can produce an interrupt. Generally, you must set the bit mask using the RQS command. However, the “hardware broken” and “illegal remote command” conditions are automatically enabled after presetting or sending the IP command. Pressing PRESET or sending the IP command, then, produces the same interrupt bit mask as sending “RQS 40;” (decimal 40 is the sum of the assigned values of these two interrupt bits, 32 = Bit 5 and 8 = Bit 3).

For most conditions, the RQS mask bit stays set until the next IP or RQS command is executed. The only condition in which this does not apply is the Units Key Pressed bit. When this bit (bit 1) is set in the RQS mask, a Units Key Pressed interrupt occurs if EE (enable entry mode) is executed and a front-panel units key such as Hz, **kHz,** MHz, or **GHz** is pressed.

When a units key is pressed, the interrupt occurs and the Units Key Pressed bit in the RQS mask is reset. To reenable the Units Key Pressed interrupt, you must send a new RQS mask.

## Query Response




QQ1

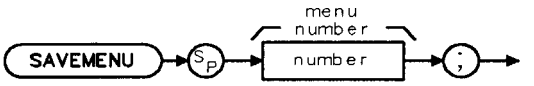


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# SAVEMENU
## Save Menu

Saves menu 1 under the specified menu number.

### Syntax




XSAVEMENU

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | 1, 101 to 200. |

### Example

```
OUTPUT 718;"MENU 1;"          Displays menu 1.
OUTPUT 718;"SAVEMENU 101;"    Copies the key functions from menu 1 into menu 101.
OUTPUT 718;"KEYCLR;"          Erases the key functions of menu 1.
PAUSE
OUTPUT 718;"MENU 101;"        Displays menu 101.
```

### Description

The **softkey** number corresponds to the menu number as follows:

**softkey** number = (menu number – 1) x 6 + **softkey** position
(The **softkey** position range is 1 through 6.)

For example:

Menu 1 contains **softkey** numbers 1 through 6
Menu 101 contains **softkey** numbers 601 to 606
Menu 200 contains **softkey** numbers 1195 to 1200

Menu 1 is can be accessed by pressing (MEAS/USER), **User** Menus .

Menus 101 through 200 as well as menu 1 can be accessed using the MENU command. See "MENU" for more information about accessing **softkeys** and menus.

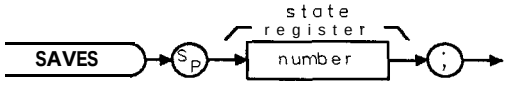


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# SAVES
# Save State

Saves the currently displayed instrument state in spectrum analyzer memory.

## Syntax




XSAVES

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | 1 to 8. |

Equivalent **Softkey**: STATE **-> INTRNL** .
Related Commands: OL, PSTATE, RCLS, SAVET, STOR.

## Example

```
OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;"
```
*Initializes spectrum analyze?; changes center frequency, span.*

```
OUTPUT 718;:"SAVES 1;"
```
*Saves spectrum analyzer state in register 1.*

## Description

The state data is saved in the specified state register if the state registers have not been locked by the PSTATE command.

Only state registers 1 through 8 are available for saving the instrument state. State register nine contains the previous state data, state register zero contains the current state.

**Note** The SAVES command saves state data in spectrum analyzer memory. See "STOR" or "SAVRCLN" to save state data on a RAM card.

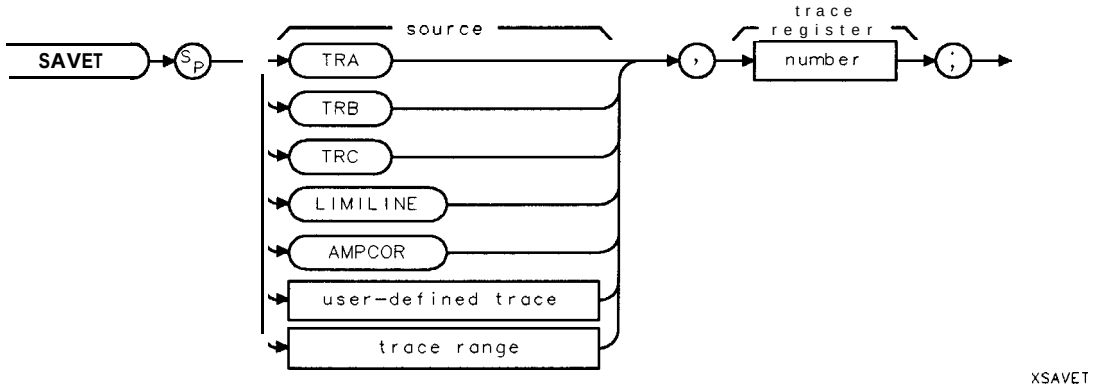


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# SAVET
# Save Trace

Saves the selected trace data and state information, amplitude correction factors, or limit-line tables in spectrum analyzer memory.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| **User-defined** trace | **A** trace defined by the TRDEF command with a length of 401 elements. | Any valid trace name. |
| Trace range | A segment of trace A, trace B, trace C, or a **user-defined** trace. | |
| Number | Any valid integer. | 0 to TRCMEM – 1. |

Equivalent **Softkey**: Trace **-> Intrnl** .
Prerequisite Commands: TRDEF when using a user-defined trace.
Related Commands: CAT, CLRW, PSTATE, RCLT, SNGLS, TS, VIEW.

## Example

```
OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;TS;"
```
*Initializes spectrum **analyzer**, changes the center frequency and span.*

```
OUTPUT 718;"VIEW TRA;SAVET TRA,1;"
```
*Puts trace A in the **view** mode, saves spectrum analyzer state and trace A **data** in register 1.*

```
OUTPUT 718;"IP;"
```
*Initializes spectrum **analyzer**.*

```
OUTPUT 718;"RCLT TRA,1;VIEW TRA;"
```
*Recalls spectrum analyzer state, trace data.*



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**SAVET Save Trace**

## Description

The trace data is saved in the specified register if the state registers have not been locked by PSTATE ON (see “SAVES”). Use AMPCOR to save amplitude correction factors, LIMILINE to save limit-line tables.

---

**Note** The TS and VIEW commands should be executed prior to saving trace data.

---

The SAVET command saves trace data, amplitude correction factors, or limit-line tables in spectrum analyzer memory. See “STOR” or “SAVRCLN” to save data on a RAM card.

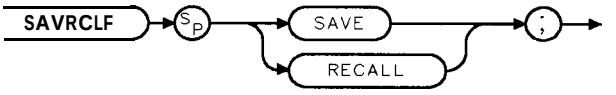


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# SAVRCLF
# Save or Recall Flag

Indicates a save or recall operation.

## Syntax




XSAVRCLF

Related Commands: MSI, PREFX, RCLS, RCLT, SAVES, SAVET, SAVRCLN, SAVRCLW.

## Example

This example allows trace A to be saved on a RAM card.

```
OUTPUT 718; "SAVRCLF SAVE; "          ! Specifies a save operation.
OUTPUT 718; "SAVRCLW TRA; "           ! Specifies the source as trace A.
OUTPUT 718; "MSI CARD; "              ! Specifies the card as the mass
                                      ! storage device.
OUTPUT 718 ; "PREFX%FRED% ; "         ! Specifies the prefix to store the
                                      ! trace data under.
OUTPUT 718;"PU;PA 0,160;TEXT%ENTER TEST NUMBER%;"
                                      ! Prompts the user for the num-
                                      ! ber to append to the prefix.
OUTPUT 718 ;" SAVRCLN EP ;"           ! After the user enters the num-
                                      ! ber; the number is to appended
                                      ! to the prefix and the data trans-
                                      ! fer is initiated.
```

The RAM card now contains a file called tFRED_(register number).

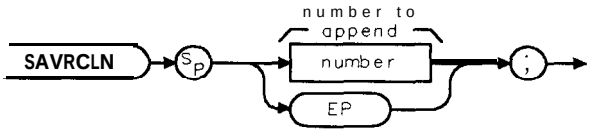


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# SAVRCLN
# Save or Recall Number

Specifies the number to append to the prefix for a save or recall operation, and initiates the transfer of data.

## Syntax




XSAVRCLN

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | Dependent on mass storage device. |

Related Commands: MSI, PREFX, RCLS, SAVES, SAVRCLF, SAVRCLW.

## Example

This example allows trace A to be saved on a RAM card.

```
OUTPUT 718;"SAVRCLF SAVE;"
OUTPUT 718;"SAVRCLW TRA;"
OUTPUT 718;"MSI CARD;"

OUTPUT 718;"PREFX %FRED%;"

OUTPUT 718;"PU;PA 0,160;TEXT%ENTER TEST NUMBER%;"

OUTPUT 718;"SAVRCLN EP;"
```

*Specifies a save operation.*
*Specifies the source as trace A.*
*Specifies the card as the mass storage device.*
*Specifies the prefix to store the trace data under.*
*Prompts the user for the number to append to the prefix.*
*After the user enters the number, the number is appended to the prefix and the data transfer is initiated.*



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## Description

SAVRCLN is used to save or recall data from spectrum analyzer memory or from a RAM card. SAVRCLN is useful if you want to write a program that allows the spectrum analyzer operator to save data in spectrum analyzer memory or on a RAM card. The SAVRCLN command uses the SAVRCLF flag information, SAVRCLW information, prefix, and mass storage device when transferring data.

Because the SAVRCLN command initiates the transfer of data, it should be the last command specified in the sequence to save or recall data.

The sequence to save or recall data is as follows:

1. Specify either a save or recall operation with SAVRCLF.
2. Indicate the type of data to be saved or recalled using SAVRCLW.
3. Specify a RAM card or spectrum analyzer memory as the mass storage device with MSI.
4. When saving to or recalling from a RAM card, specify the prefix to be used with PREFX. The prefix is ignored when saving or recalling from spectrum analyzer memory.
5. Enter the number to append to the prefix and initiate the data transfer with SAVRCLN.

When saving trace data, amplitude correction factors, or limit-line tables in spectrum analyzer memory, specify a number within the trace register number range (0 to TRCMEM – 1). When saving state data in spectrum analyzer memory, specify a number within the state number range (1 to 8).

When saving data on a RAM card, the number plus the number of characters in the prefix must not exceed eight characters.

---

**Note** With the memory card reader, the spectrum analyzer can read from either a RAM (random-access memory) card or a ROM (read-only memory card). lb write to a memory card, the memory card must be a RAM card. The spectrum analyzer cannot write to a ROM card.

---

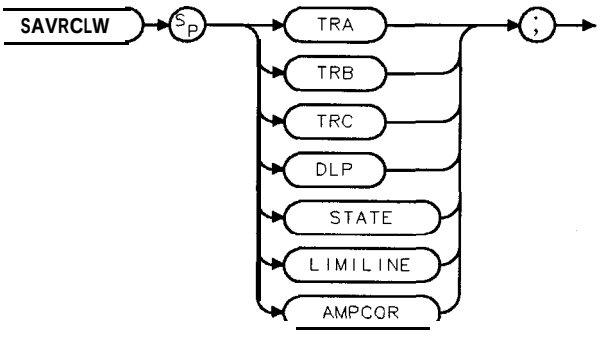


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# SAVRCLW
# Save or Recall Data

Specifies the data to be transferred: trace A, trace B, trace C, program, amplitude correction factors, limit line, or state.

## Syntax




XSAVRCLW

Related Commands: MSI, PREFX, RCLS, RCLT, SAVES, SAVET, SAVRCLF, SAVRCLN.

## Example

This example allows the current spectrum analyzer state to be saved on a RAM card.

```
OUTPUT 718;"SAVRCLF SAVE;"          Specifies a save operation.
OUTPUT 718;"SAVRCLW STATE;"         Specifies the source as the current spectrum analyzer state.
OUTPUT 718;"MSI CARD;"              Specifies the card as the mass storage device.
OUTPUT 718;"PREFX %FRED%;"          Specifies the prefix to store the state data under.
OUTPUT.718;"SAVRCLN 34;"            Appends the register number 34 to the prefix and initiates
                                    the data transfer.
```

The RAM card now has a file called sFRED_34 that contains the instrument state.

## Description

SAVRCLW is used to save or recall data in spectrum analyzer memory or on a RAM card. See "SAVRCLN" for the sequence of commands to initiate a data transfer.

The SAVRCLW parameters correspond to the type of data transferred as shown in the following table.

| Parameter | Type of Data Transferred |
|---|---|
| TRA | Trace A. |
| TRB | Trace B. |
| TRC | Trace C. |
| DLP | Downloadable programs. |
| STATE | Instrument state. |
| LIMILINE | Limit lines. |
| AMPCOR | Amplitude correction factors |

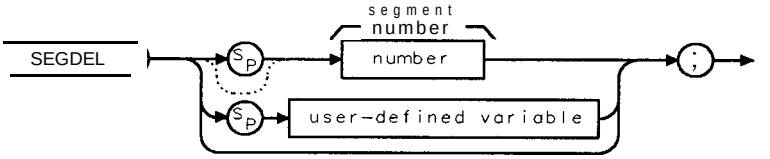


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# SEGDEL
# Segment Delete

Deletes the specified segment from the limit-line tables.

## Syntax




Related Commands: LIMIMODE, LIMISEG, LIMISEGT, SENTER, SENTERT.

## Example 1

This example uses LIMIMODE for entering segments into the upper limit-line table, then entering a segment into the lower limit-line table (upper and lower limit lines are treated as separate tables). Line 60 demonstrates the effect of deleting a segment when the upper and lower limit-line tables are treated separately.

```
10 OUTPUT 718;"LIMIDEL;"                    Deletes the current limit-line table, sets
                                            the table type to fixed.
20 OUTPUT 718;"LIMIMODE UPPER;"             Specifies the upper limit-line table.
25 OUTPUT 718;"LIMIFT FREQ;"                Limit lines to be based on frequency.
30 OUTPUT 718;"LIMISEG 300MHZ,-30DB,FLAT;"  Enters a segment into the upper limit-
                                            line table.
40 OUTPUT 718;"LIMIMODE LOWER,"             Specifies the lower limit-line table.
50 OUTPUT 718;"LIMISEG 300MHZ,-70DB,FLAT;"  Enters a segment into the lower limit-
                                            line table.
60 OUTPUT 718;"SEGDEL 1;"                   Deletes the segment from the lower limit-
                                            line table.
70 END
```



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## Example 2

With the addition of line 60, the upper and lower limit-line tables are no longer treated as separate tables, but as one table. The segment is deleted from the upper and lower limit-line tables (for the given frequency).

```
10 OUTPUT 718;"LIMIDEL;"
20 OUTPUT 718;"LIMIMODE UPPER;"
25 OUTPUT 718;"LIMIFT FREQ;"
30 OUTPUT 718;"LIMISEG 300MHZ,-30DB,FLAT;"

40 OUTPUT 718;"LIMIMODE LOWER;"
50 OUTPUT 718;"LIMISEG 300MHZ,-70DB,FLAT;"

60 OUTPUT 718;"LIMIMODE UPLOW;"

70 OUTPUT 718;"SEGDEL 1;"

80 END
```

*Deletes the current limit-line table.*
*Specifies the upper limit-line table.*
*Limit lines to be based on frequency.*
*Enters segment into the upper limit-line table.*
*Specifies the lower limit-line table.*
*Enters a segment into the lower limit-line table*
*Specifies both the upper and lower limit-line tables.*
*Deletes the segment from the upper and lower limit-line tables.*

## Description

The result of SEGDEL depends on the setting of the LIMIMODE command as shown in the following table.

| LIMIMODE Setting | Result of SEGDEL |
|---|---|
| LIMIMODE UPPER | Deletes specified segment from the upper limit-line table. |
| LIMIMODE LOWER | Deletes specified segment from the lower limit-line table. |
| LIMIMODE UPLOW | Deletes specified segment from the upper and lower limit-line table. |
| LIMIMODE DELTA | Deletes specified segment from the mid and delta limit-line table. |

You may want to query LIMIMODE before using SEGDEL if you are unsure of the LIMIMODE setting.

To determine the number of each segment, you can use the softkeys accessed by Edit Limit to display the limit-line table. (Limit-line entries are sorted according to frequency or time.)

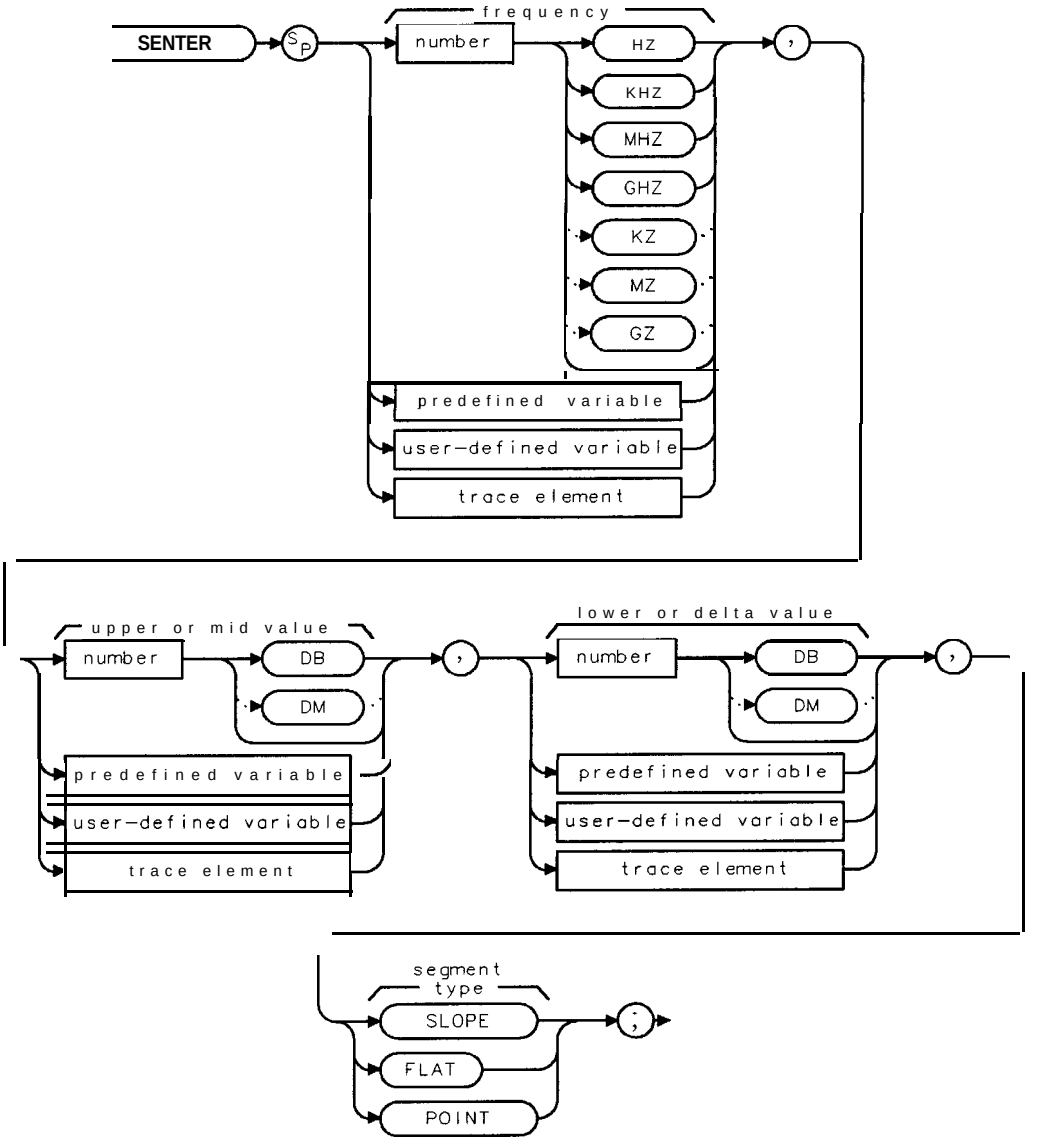


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# SENTER
# Segment Entry for Frequency Limit Lines

Enters the limit-line data in the upper and lower limit-line table or the mid and delta table for limit lines based on frequency.

## Syntax




XSENTER



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**SENTER Segment Entry for Frequency Limit Lines**

| Item | Description/Default | Range |
|---|---|---|
| **Number** | Any real or integer number. Default unit is **dBm.** | Varies with FOFFSET and ROFFSET. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| **Predefined** variable | A command that acts as a variable. Refer to Table 5-1. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |

Related Commands: LIMIMODE, LIMIREL, LIMISEG, SEGDEL, SENTERT.

## Example 1

This example enters limit-line values into the upper and lower limit-line tables.

```
OUTPUT 718;"LIMIFT FREQ;"                    Sets the limit lines to be based on frequency.
OUTPUT 718;"LIMIMODE UPLOW;LIMIREL OFF;"     Specifies the upper and lower limit-line table as fixed.
OUTPUT 718;"SENTER 300MHZ,-10DB,-50DB,FLAT;" Enters in values for a segment.
OUTPUT 718;"SENTER 350MHZ,-15DB,-60DB,FLAT;" Enters in values for a segment.
```

## Example 2

```
OUTPUT 718;"LIMIFT FREQ;"                    Sets the limit lines to be based on frequency.
OUTPUT 718;"LIMIMODE DELTA;LIMIREL OFF;"     Specifies the mid and delta table format and fixed type.
OUTPUT 718;"SENTER 300MHZ,-20DB,10DB,FLAT;"  Enters in values forasegment.
OUTPUT 718;"SENTER 350MHZ,-30DB,20DB,FLAT;" Enters in values for a segment.
```

## Description

Each limit-line segment is specified with a starting frequency, an upper or median amplitude value, a lower or delta amplitude value, and a segment type. The segment type defines how the line segment is to extend from its starting point to the next segment.

**Note** If the current limit line table contains lines based on sweep time (as opposed to a limit line based on the frequency), executing SENTER will clear the current sweep time limit line table.

The three segment types are FLAT, SLOPE, and POINT.

- FLAT draws a zero-slope line between the coordinate point of the current segment and the coordinate point of the next segment, producing limit-line values equal in amplitude for all frequencies between the two points. If the amplitude values of the two segments differ, the limit-line will “step” to the value of the second segment.
- SLOPE draws a straight line between the coordinate point of the current segment and the coordinate point of the next segment, producing limit-line values for all frequencies between the two points.



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- POINT specifies a limit value for the coordinate point, and no other frequency points, so that a POINT segment specifies a limit value for a single frequency. For an upper limit-line, a POINT segment is indicated by a line drawn from the coordinate point, vertically off the top of screen. For a lower limit-line, a POINT segment is indicated by a line drawn from the coordinate point, vertically off the bottom of screen. The POINT segment type should be used as the last segment in the limit-line table. However, if the last segment in the table is not specified as the POINT segment type, an implicit point is automatically used. If a visible POINT segment at the right-hand edge of the display is not desired, add an explicit last point segment to the limit-line table that is higher in frequency than the stop frequency.

Segments are sorted as they are entered according to starting frequency. A maximum of 20 segments can be defined using SENTER. When the type is omitted, the last type given (or SLOPE if no previous type has been given) is used.

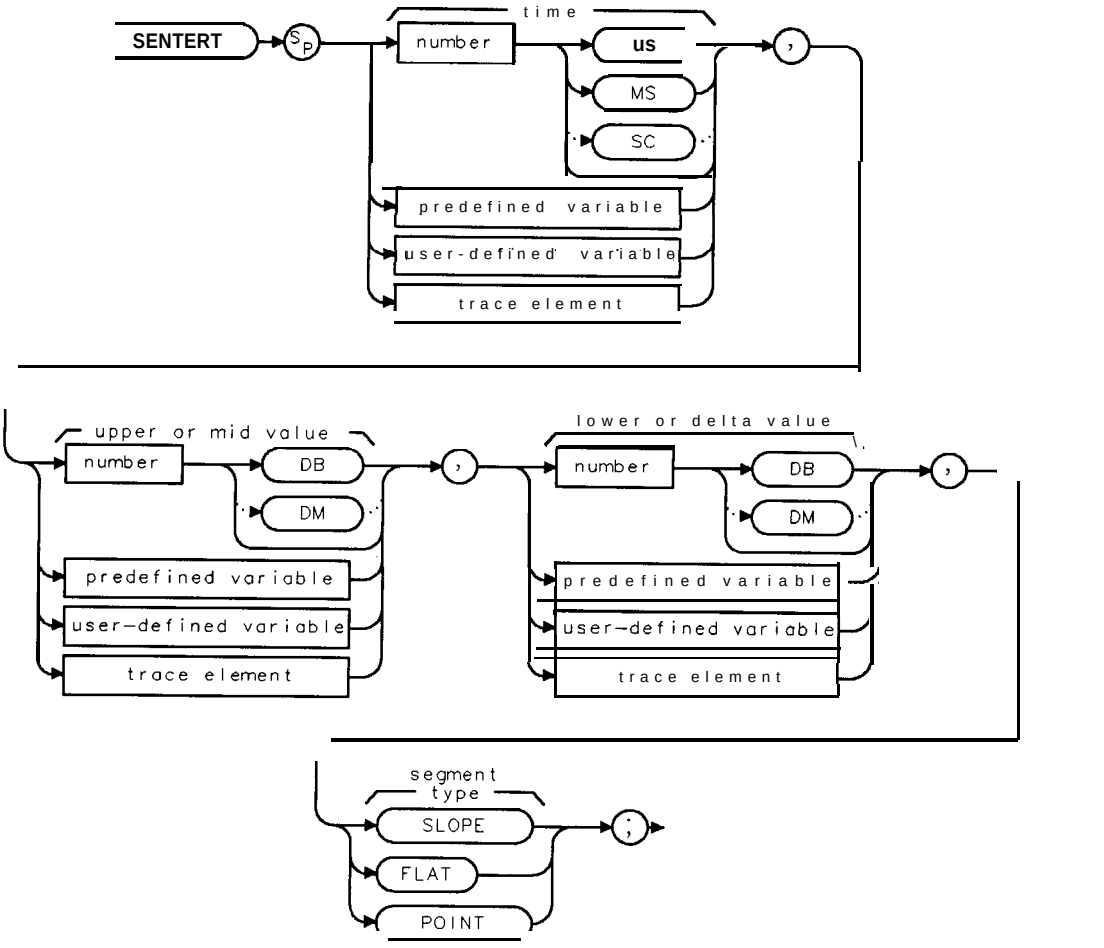


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# SENTERT
## Segment Entry for Sweep Time Limit Lines

Enters the limit-line data in either the upper and lower limit-line table or the mid and delta table for limit lines based on sweep time.

### Syntax




XSENTERT



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| Item | Description/Default | Range |
|---|---|---|
| Uumber | Any real or integer number. For amplitude, the default unit is dBm. For sweep time, the default unit is seconds. | The range for the amplitude varies with ROFFSET. The range for the sweep time is the sweep time range of the spectrum analyzer. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-1. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |

Related Commands: LIMIMODE, LIMIREL, LIMISEGT, SEGDEL, SENTER.

## Example 1

This example enters limit-line values into the upper and lower limit-line tables.

```
OUTPUT 718;"RL -10DB;"                          Sets the reference level to -10 dB.
OUTPUT 718;"LIMIDEL;"                           Erases any the current limit line table.
OUTPUT 718;"LIMIFT TIME;"                       Sets the limit lines to be based on
                                                sweep time.
OUTPUT 718;"LIMIMODE UPLOW;LIMIREL ON;"         Specifies the upper and lower limit-
                                                line table as relative.
OUTPUT 718;"SENTERT 10MS,-10DB,-50DB,FLAT;"     Enters in values for a segment.
OUTPUT 718;"SENTERT 0MS,-15DB,-60DB,FLAT;"      Enters in values for a segment.
OUTPUT 718;"LIMITEST ON;TS;"                    Turns on the limit-line testing.
```

## Example 2

```
OUTPUT 718;"LIMIFT TIME;"                       Sets the limit lines to be based on sweep
                                                time.
OUTPUT 718;"LIMIMODE DELTA;LIMIREL OFF;"        Specifies the mid and delta table format
                                                and fixed type.
OUTPUT 718;"SENTERT 10MS,-20DB,10DB,FLAT;"      Enters in values for a segment.
OUTPUT 718;"SENTERT 0MS,-30DB,20DB,FLAT;"       Enters in values for a segment.
OUTPUT 718;"LIMITEST ON;TS"                     Turns on the limit-line testing.
```

## Description

Each limit-line segment is specified with a starting sweep time, an upper or median amplitude value, a lower or delta amplitude value, and a segment type. The segment type defines how the line segment is to extend from its starting point to the next segment.



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Note — If the current limit line table contains lines based on frequency (as opposed to a limit line based on the sweep time), executing SENTERT will clear the current frequency limit line table.

The three segment types are FLAT, SLOPE, and POINT.

- FLAT draws a zero-slope line between the coordinate point of the current segment and the coordinate point of the next segment, producing limit-line values equal in amplitude for all sweep times between the two points. If the amplitude values of the two segments differ, the limit-line will "step" to the value of the second segment.
- SLOPE draws a straight line between the coordinate point of the current segment and the coordinate point of the next segment, producing limit-line values for all sweep times between the two points.
- POINT specifies a limit value for the coordinate point, and no other sweep time points, so that a POINT segment specifies a limit value for a single sweep time. For an upper limit-line, a POINT segment is indicated by a line drawn from the coordinate point, vertically off the top of screen. For a lower limit-line, a POINT segment is indicated by a line drawn from the coordinate point, vertically off the bottom of screen. The POINT segment type should be used as the last segment in the limit-line table. However, if the last segment in the table is not specified as the POINT segment type, an implicit point is automatically used. If a visible POINT segment at the right-hand edge of the display is not desired, add an explicit last point segment to the limit-line table that is higher in sweep time than the current sweep time of the spectrum analyzer.

Segments are sorted as they are entered according to starting sweep time. A maximum of 20 segments can be defined using SENTERT.

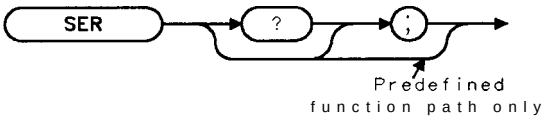


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# SER
# Serial Number

Returns the serial number suffix of the spectrum analyzer.

## Syntax




XSER

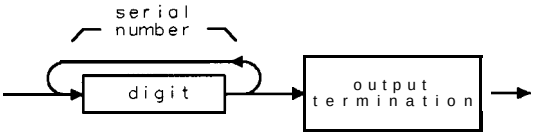
Related Commands: ID, REV.

## Example

```
DIM Serial$[24]      Reserves memory space for a string.
OUTPUT 718;"SER;"    Gets the serial number from the spectrum analyzer:
ENTER 718; Serial$   Puts the spectrum analyzer response in the computer variable.
DISP Serial$         Displays the serial number on the computer screen.
```

## Query Response

The last five digits of the serial number are returned.



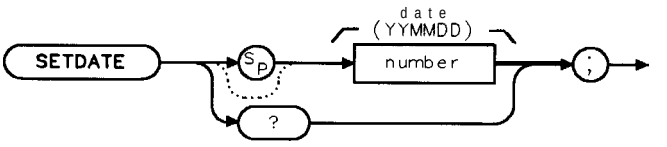



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# SETDATE
## Set Date

Allows you to set the date of the real-time clock of the spectrum analyzer.

### Syntax




XSETDATE

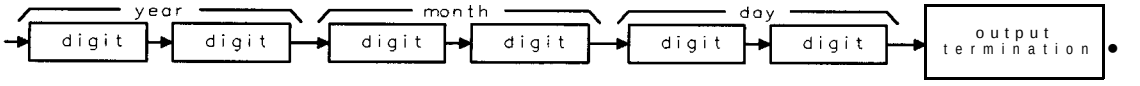
| Item | Description/Default | Range |
|---|---|---|
| Number | A number in the YYMMDD format. | Valid year, month, and day. |

Equivalent Softkey: SET DATE .
Related Commands: SETTIME, TIMEDATE, TIMEDSP.

### Example

```
OUTPUT 718;"SETDATE 890212;"
```
*Sets the date to February 12, 1989.*

### Query Response




QSETDATE

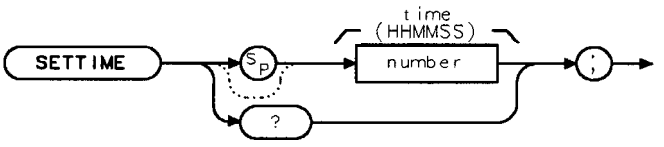


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# SETTIME
## Set Time

Allows you to set the time of the real-time clock of the spectrum analyzer.

### Syntax




XSETTIME

| Item | Description/Default | Range |
|---|---|---|
| Number | A number in the HHMMSS (24 hour) format. | 0 to 235959. |

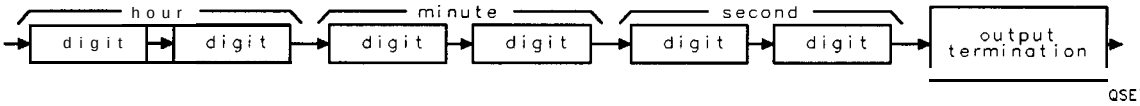
Equivalent **Softkey**: SET TIME.
Related Commands: **SETDATE**, TIMEDATE, TIMEDSI?

### Example

```
OUTPUT 718;"SETTIME 135501;"
```

Sets *the time to 1:55:01* **PM.**

### Query Response




QSETTIME

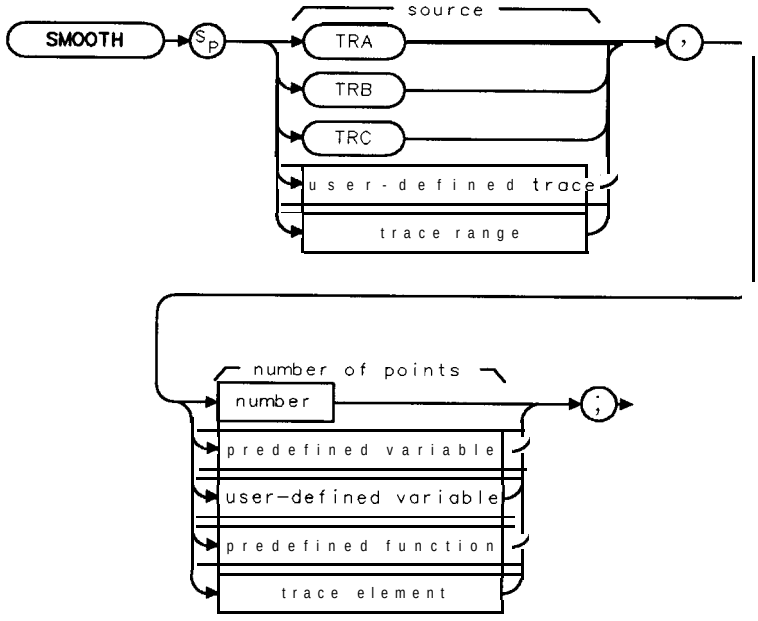


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# SMOOTH
## Smooth Trace

Smoothes the trace according to the number of points specified for the running average.

### Syntax




XSMOOTH

| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-l. | |
| Predefined function | Function that returns a value. Refer to Table 5-1. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF for a user-defined variable. TS when using trace data.
Related Commands: SNGLS, TS, VAVG.



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## Example

```
10 OUTPUT 718;"IP;"                 Initializes spectrum analyzer.
20 OUTPUT 718;"SNGLS;TS;"           Activates single-sweep mode, takes a sweep.
30 OUTPUT 718;"VIEW TRA;"           Stores results of trace A.
40 OUTPUT 718;"SMOOTH TRA,10;"      Smoothes trace A.
50 OUTPUT 718;"VIEW TRA;"           Displays the result.
60 END
```

## Description

Each point value is replaced with the average of the values (in measurement units) of the given number of points centered on it. Increasing the number of points increases smoothing at the cost of decreasing resolution. If the number of points is an even number, then the number of points is increased by one. If the number of points is larger than the size of SOURCE, then the size of SOURCE is used (unless size of SOURCE is even, in which case the size of SOURCE minus one is used). Smoothing decreases at the endpoints.

The purpose of this function is to perform a spatial video averaging as compared to the temporal version supplied by the video-average (VAVG) command. The functions of SMOOTH and VAVG are not interchangeable however. Unlike VAVG, SMOOTH averages values that occur before and after the data point in time. This can cause some display irregularities at the start and stop frequencies. Use low values for the SMOOTH parameter to avoid signal distortion.

By replacing the value of each point in a trace with the average of the values of a number of points centered about that point, any rapid variations in video noise or signals are smoothed into more gradual variations. It thereby performs a function similar to reducing the video bandwidth without the corresponding changes in sweep time. As such, it does result in a reduction of frequency resolution. Also, signal peaks are reduced with large smoothing values, and this can cause the amplitude to appear to be low.

This command requires user memory for its execution. Memory is not permanently allocated, so the largest amount of memory is available for the functions that are used in a particular application. When the command is complete, memory is returned to the free user memory.



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## SNGLS
## Single Sweep

Sets the spectrum analyzer to single-sweep mode.

### Syntax




XSNGLS

Equivalent Keys: SGL SWP or SWEEP CONT SGL (SGL is underlined).
Related Commands: CLRW, CONTS, TM, TS.

### Example

```
OUTPUT 718;"SNGLS;"
```

### Description

Each time TS (take sweep) is sent, one sweep is initiated, as long as the trigger and data entry conditions are met.

*For the HP 8592L* or *the HP 85933 only:* The frequency span that can be viewed with a single-sweep is bounded by the instrument range only; therefore, band 0 can be included in a multiband sweep in single sweep mode. This allows a 0 GHz to 22 GHz span with an HP 8592L or HP 85933 (also see "TS").

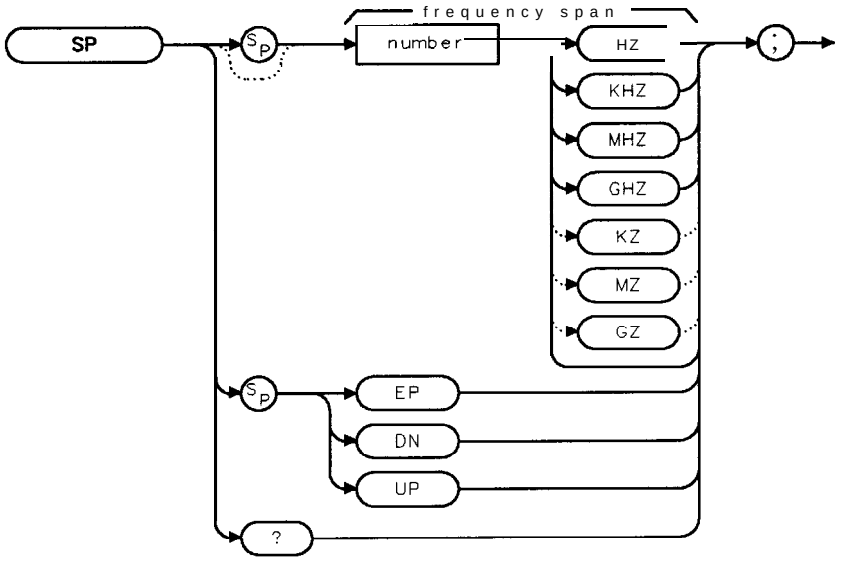


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# SP
# Span

Changes the total displayed frequency range symmetrically about the center frequency.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | Frequency span of the spectrum analyzer. |

Equivalent **Softkey**: SPAN .

Step Increment: 1, 2, 5, 10 sequence (up to the stop frequency of the spectrum analyzer).
Related Commands: CF, FA, FB, FOFFSET, FS, HNLOCK, HNUNLK, RB, ST, VB.

## Example

```
OUTPUT 718;"IP;SP 20MHZ;"
OUTPUT 718;"SP?;"
ENTER 718;Span
PRINT Span
```

*Initializes spectrum analyzer, changes frequency span.*
*Gets the span value from the spectrum analyzer.*
*Puts the spectrum analyzer response in the computer variable, Span.*
*Displays the span value.*



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**SP Span**

## Description

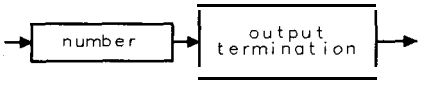
The frequency span readout refers to the displayed frequency range. Dividing the readout by 10 yields the frequency span per division.

If resolution and video bandwidths are coupled to the span width, the bandwidths change with the span width to provide a predetermined level of resolution and noise averaging. Likewise, the sweep time changes to maintain a calibrated display, if coupled. All of these functions are normally coupled, unless RB, VB, or ST have been executed.

Because span is affected by frequency, change the frequency before changing span (see "HNLOCK"). For the HP 8592L and HP 85933, the span can be set to include band 0 and band 1 except in single-sweep mode.

Specifying 0 Hz enables zero-span mode, which configures the spectrum analyzer as a fixed-tuned receiver.

## Query Response




001

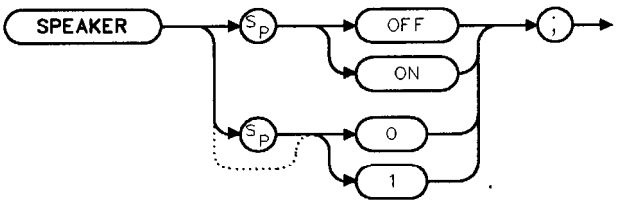


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# SPEAKER
# Speaker

Turns on or off the internal speaker.

## Syntax




XSPEAKER

Option Required: Option 102, Option 103, or Option 301.
Preset State: SPEAKER ON.
Related Commands: DEMOD, FMGAIN, SQLCH.

## Example

```
OUTPUT 718;"SPEAKER OFF;"
```



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# SPZOOM
# Span Zoom

Places a marker on the highest on-screen signal (if an on-screen marker is not present), turns on the signal track function, and activates the span function.

## Syntax




XSPZOOM

Equivalent **Softkey**: SPAN ZOOM.

Restrictions: Not available with Analog+ display mode. See "ANLGPLUS" for more information.

## Example

```
OUTPUT 718;"IP;CF 300MZ;TS;"
OUTPUT 718;"SPZOOM;"
```

## Description

If a marker is present before SPZOOM is executed, SPZOOM turns on the signal track function and activates the span function.

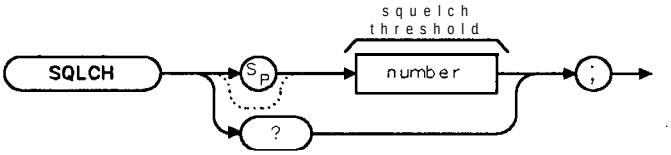


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# SQLCH
# Squelch

Sets the squelch threshold by setting the squelch level.

## Syntax




XSQLCH

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | 0 to 100. |

Equivalent Softkey: SQUELCH .
Option Required: Option 102, 103, or 301.
Preset Value: 0.
Related Commands: DEMOD, FMGAIN, SPEAKER.

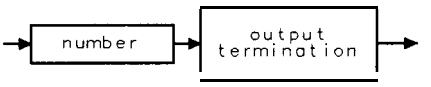
## Example

```
OUTPUT 718;"SQLCH 100;"
```

## Description

SQLCH mutes weak signals and passes strong signals.

## Query Response




QQ1

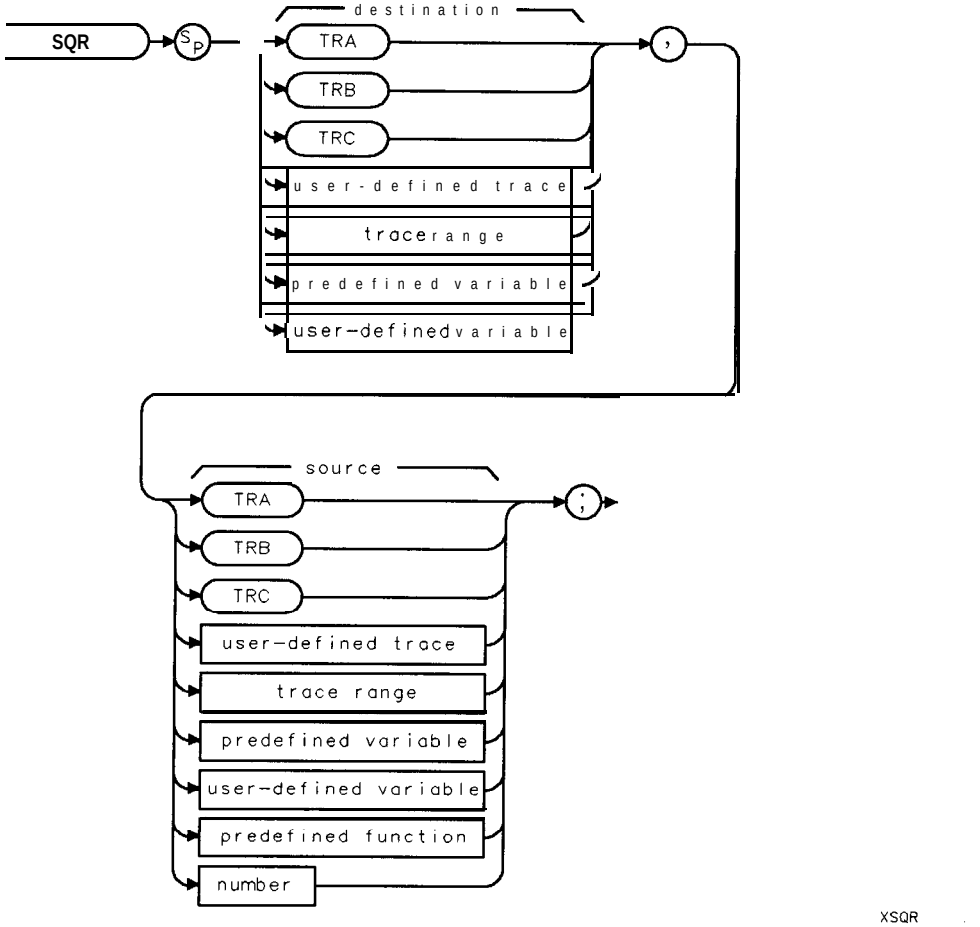


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# SQR
## Square Root

Places the square root of the source into the destination.

### Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-l. | |
| Predefined function | Function that returns a value. Refer to Table 5-l. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF for a user-defined variable. TS when using trace data.
Related Commands: PDA, PDF, STDEV.



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## Example

```
OUTPUT 718 ;"SQR SP,1E8;"
```
*Changes the span to 10 kHz.*

## Description

If the source is negative, the square root of the absolute value will be returned.

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

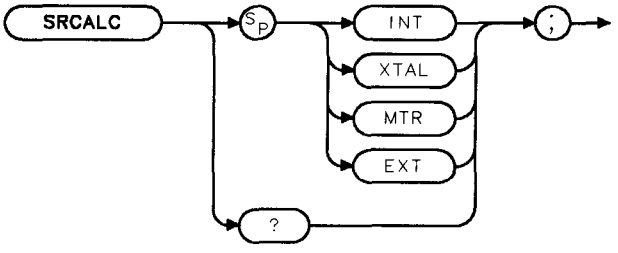


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# SRCALC
# Source Leveling Control

Selects internal or external leveling for use with the built-in tracking generator.

## Syntax




XSRCALC

Option Required: Option 010 or 011.
Preset State: SRCALC INT.
Related Commands: CF, FA, FB, FS, HNLOCK, SI?

## Example

```
OUTPUT 718;"SRCALC XTAL;"
```

## Description

**For the HP 8590L or** HP **85913:** Option 010 or 011 for the HP 8590L and HP 85913 provide internal (INT), crystal (XTAL), and meter (MTR) leveling.

- SRCALC INT activates internal leveling.
- SRCALC XTAL activates external leveling. The external leveling input (EXT ALC INPUT) is located on the rear panel of the spectrum analyzer. Positive- or negative-polarity detectors are supported. External leveling increases the amplitude accuracy by improving the effective source match.
- SRCALC MTR narrows loop bandwidth so Hewlett-Packard power meters can be used for external leveling.

*For the HP 859OL and HP 8591E* only: The functions of SRCALC and ALC MTR INT XTAL are identical.

**For the HP 85933,** HP **85943,** HP **85953, or** HP **85963:** Option 010 for the HP 85933, HP 85943, HP 85953, or HP 85963 provide internal (INT) and external (EXT) leveling.

- SRCALC INT activates internal leveling.
- SRCALC EXT is for external leveling. The external leveling input (EXT ALC INPUT) is located on the rear panel of the spectrum analyzer. Only negative-polarity detectors are supported. External leveling increases the amplitude accuracy by improving the effective source match.



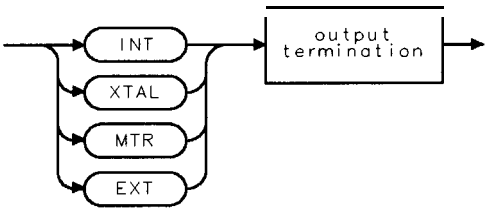
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*For the HP 85933, HP 8594E, HP 8595E, and HP 85963* only: The functions of SRCALC and ALC INT EXT are identical.

When used as a predefined variable, SRCALC returns a number from 0 to 2. The value that is returned by SRCALC depends on the SRCALC parameter, as shown in the following table.

| Parameter setting | Value returned |
|---|---|
| INT | 0 |
| XTAL or EXT | 1 |
| MTR | 2 |

## Query Response




QSRCALC

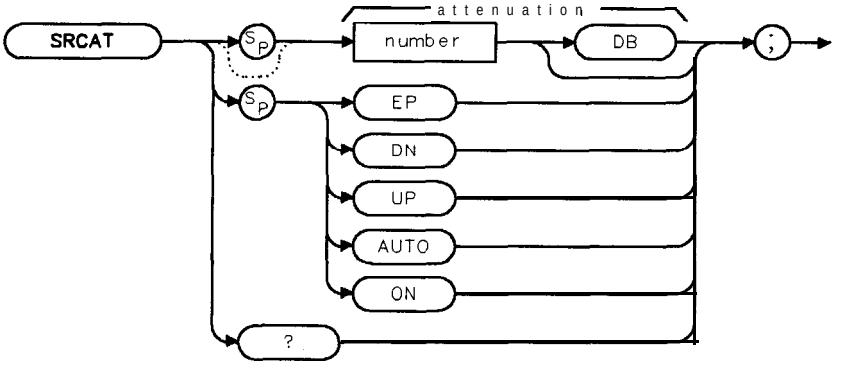


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# SRCAT
# Source Attenuator

Attenuates the source output level.

## Syntax




XSRCAT

| Item | Description/Default | Range |
|---|---|---|
| Number (HP 85913 only) | Any real or integer number, specified in multiples of 10 dB. | 0 to 60 dB. |
| Number (HP 8593E, HP 85943, HP 8595E, or HP 8596E only) | Any real or integer number, specified in multiples of 8 dB. | 0 to 56 dB. |

Equivalent Softkey: SRC ATN MAN AUTO .

Option Required: Option 010 or 011 installed in an HP 85913. Option 010 installed in an HP 85933, HP 85943, HP 85953, or HP 85963.

Coupling: Coupled to power level of the source output (SRCPWR) when set to auto (SRCAT AUTO).

Related Commands: SRCPSTP

Preset State: SRCAT AUTO.

## Example

The following example uses the SRCAT command to attenuate the source output. This value specified for SRCAT (20 dB) applies to an HP 85913 only.

```
OUTPUT 718;"SRCAT AUTO;"        Activates source-attenuation coupling.
OUTPUT 718;"SRCPWR -20DB;"      Activates source output.
OUTPUT 718;"SRCAT 20DB;"        Sets attenuator to 20 dB. This decouples the attenuator
                                from the source power-level setting.
```



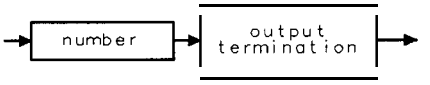
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## Description

The SRCAT command attenuates the output level of the source. Use SRCAT to attenuate the power level of the source manually, from 0 to 60 dB in 10 dB steps for an HP 85913, from 0 to 56 dB in 8 dB steps for an HP 85933, HP 85943, HP 85953, or HP 85963.

"SRCAT AUTO;" automatically adjusts the attenuator to yield the source amplitude level specified by the SRCPWR command.

## Query Response




QQ1

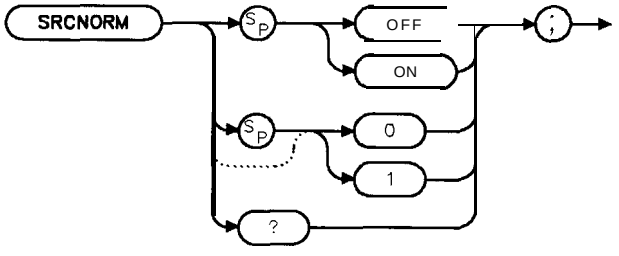


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## SRCNORM
## Source Normalization

Subtracts trace B from trace A, adds the display line value to the difference, and sends the result to trace A during every sweep of the spectrum analyzer.

### Syntax




XSRCNORM

Equivalent **Softkey: NORMLIZE ON** OFF .
Preset State: SRCNORM OFF.
Related Commands: AMB, CONTS, CLRW, DL, MXMH, SNGLS, TS, VAVG, VIEW.

### Example

```
10 OUTPUT 718;"IP;SNGLS;RL 20DB;"
20 OUTPUT 718;"MOV TRA,5000;"
30 OUTPUT 718;"VIEW TRA;"
40 OUTPUT 718;"MOV TRB,4000;"
50 OUTPUT 718;"VIEW TRB;"
60 OUTPUT 718;"DL 0DM;"
70 OUTPUT 718;"SRCNORM ON;"
80 OUTPUT 718;"BLANK TRB;VIEW TRA;"
90 END
```

*Initializes spectrum analyzer, activates single-sweep mode.*

*Sets trace A to 5000 measurement units, which is equal to -10 dBm.*

*Sets trace B to 4000 measurement* units, *which is equal to -20 dBm.*

*Sets display line to 0 dBm, which is at 6000 measurement* units.

*Performs trace A – trace B + display* line. *The result is 5000 – 4000 + 6000 = 7000 or 10 dBm. Note that this has resulted in a subtraction of amplitude in dBm, -10 dBm -(-20 dBm) = 10 dBm.*



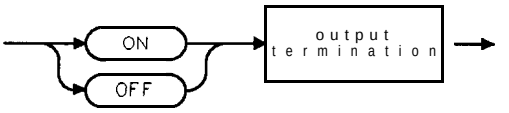
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## Description

The SRCNORM command subtracts trace B from trace A, point by point, adds the display line value to the difference, and sends the difference to trace A. The SRCNORM function remains in effect until it is turned off by executing "SRCNORM OFF; ".

A common use of trace subtraction is to normalize one trace with respect to another. For example, traces are frequently subtracted to normalize the spectrum analyzer response when a tracking generator is used. In such applications, amplitude units in dBm should be subtracted. To accomplish this, the display line should be set to 0 dBm using DL as shown in the example. Also see example 2 and 3 in "AMB" for comparison.

## Query Response




QQ2

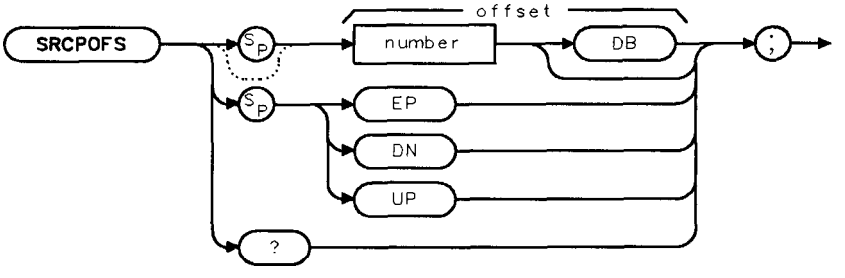


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# SRCPOFS
## Source Power Offset

Offsets the source power level readout.

### Syntax




XSRCPOFS

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | |

Option Required: Option 010 or 011.
Equivalent Softkey: SRC PWR OFFSET .
Related Commands: SRCPWR, SRCPSWP.
Step Increment: Determined by SRCPSTP
Preset State: 0 dB.

### Example

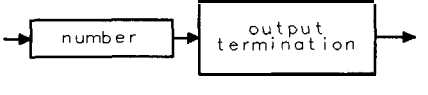
Use SRCPOFS to offset the power-level readout for the tracking-generator source.

```
OUTPUT 718;"MEASURE SR;"      Sets spectrum analyzer to stimulus-response mode.
OUTPUT 718;"SRCPWR -10DB;"    Turns on source output.
OUTPUT 718;"SRCPOFS 13DB;"    Offsets power-level readout for source by 13 dB.
```

### Description

The SRCPOFS command offsets the displayed power of the built-in tracking generator. This function may be used to take into account system losses (for example, cable loss) or gains (for example, preamplifier gain) reflecting the actual power delivered to the device under test.

### Query Response




QQ1

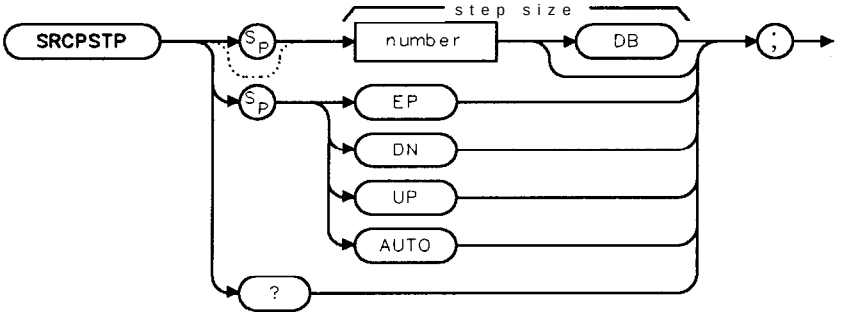


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# SRCPSTP
# Source Power-Level Step Size

Selects the source-power step size.

## Syntax




XSRCPSTP

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | |

Option Required: Option 010 or 011.
Equivalent Softkey: SRC PWR STP SIZE.
Step Increment: 0.1 dB.
Related Commands: SRCPWR, SRCPOFS, SRCPSWP
Preset State: SRCPSTP AUTO (one major vertical 'scale division).

## Example

Select incremental changes of power effected by "SRCPWR UP;", "SRCPWR DN;" commands, or the step keys.

```
OUTPUT 718;"MEASURE SR;"          Activates stimulus-response mode.
OUTPUT 718;"SRCPWR -10DB;"        Turns on the source output.
OUTPUT 718;"SRCPSTP .3DB;"        Sets power-level step size to 0.3 dB.
OUTPUT 718;"SRCPWR UP;"           Increases the power level.
```

## Description

The SRCPSTP command selects the step size for the following source commands:

- Power offset (SRCPOFS).
- Power sweep (SRCPSWP).
- Power (SRCPWR).

Use SRCPSTP to set the step size to a specific value.

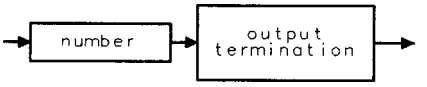
"SRCPSTP AUTO;" sets the step size to one vertical scale division.



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## SRCPSTP Source Power-Level Step Size

### Query Response




QQ1

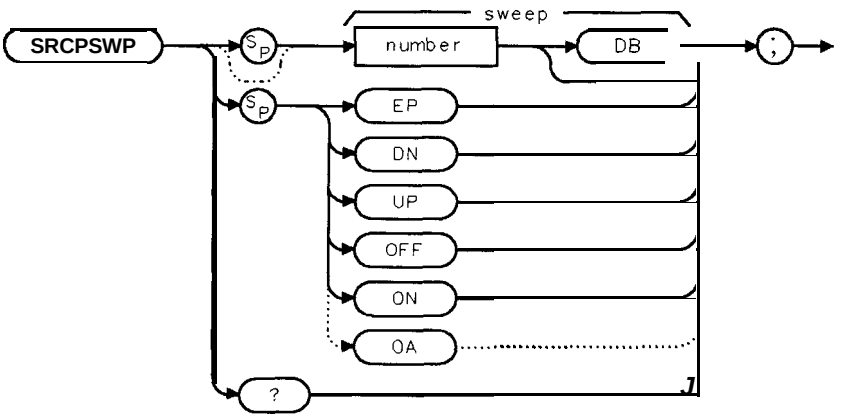


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# SRCPSWP
# Source Power Sweep

Selects the sweep range of the source output,

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | |

Option Required: Option 010 or 011.
Equivalent Softkey: PWR SWP ON OFF .
Step Increment: Determined by SRCPSTP.
Related Commands: SRCPSWP, SRCPOFS, SRCPSTP
Preset State: SRCPSWP OFF.

## Example

Use SRCPSWP to sweep the power level of the source output.

```
OUTPUT 718;"MEASURE SR;"        Activates stimulus-response mode.
OUTPUT 718;"SRCPWR -10DB;"      Sets power level of source output to -10 dBm.
OUTPUT 718;"SP 0;"              Sets span to 0 Hz.
OUTPUT 718;"SRCPSWP 10DB;"      Sweeps source output from -10 dBm to 0 dBm.
```

## Description

The SRCPSWP command works in conjunction with the SRCPWR (source power) command to sweep the amplitude level of the source output. The SRCPWR setting determines the amplitude level at the beginning of the sweep. The SRCPSWP command determines the change in amplitude level of the sweep.

For example, if SRCPWR and SRCPSWP are set to -15 dBm and 4 dB respectively, the source sweeps from – 15 dBm to – 11 dBm.

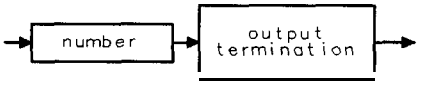


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Note Power is swept from low to high.

The minimum sweep time is limited to 20 ms when performing a source power sweep, even if the spectrum analyzer has an Option 101 installed in it.

## Query Response




QQ1

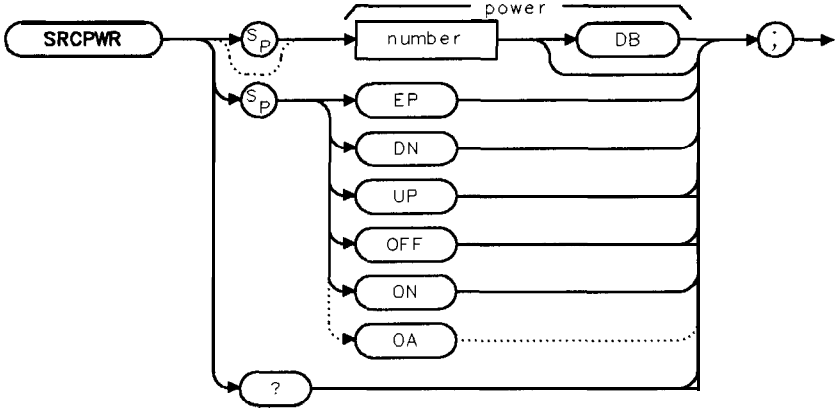


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# SRCPWR
# Source Power

Selects the source power level.

## Syntax




XSRCPWR

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is the current amplitude unit. | Actual range is hardware dependent. |

Option Required: Option 010 or 011.
Equivalent Softkey: SRC PWR ON OFF .
Step Increment: Set by SRCPSTP.
Related Commands: SRCAT, SRCPSTP, SRCPSWP.
Preset State: -10 dBm.

## Example

Use SRCPWR to turn on the source and adjust its power level.

```
OUTPUT 718;"SRCPWR -20DB;"      Changes power level to -20 dBm.
OUTPUT 718;"AUNITS DBMV;"       Changes the current amplitude unit.
OUTPUT 718;"SRCPWR 37;"         The source power is now 37 dBmV.
```

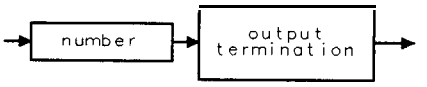
## Description

The SRCPWR command turns the source off or on and sets the power level of the source. The source is turned on automatically whenever its value is specified with SRCPWR. Also see "SRCPSTP."



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## Query Response




QQ1

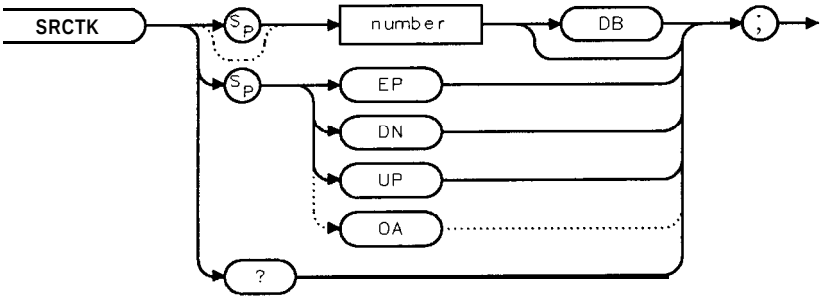


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# SRCTK
# Source Tracking

Adjusts the tracking of the source output with the spectrum analyzer sweep.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. | 0 to 16,383. |

Option Required: Option 010 or 011.
Equivalent Softkey: MAN TRK ADJUST .
Step Increment: 1.
Related Commands: Commands that change bandwidth, such as RB, VB, ST, and commands that change frequency, such as SP, CF, FA, FB, SP, FS, SRCTKPK.

## Example

```
OUTPUT 718;"MEASURE SR;"        Activates the stimulus-response mode.
OUTPUT 718;"SRCPWR -20DB;"      Turns on the power at the source output.
OUTPUT 718;"SP 1MHZ;"           Sets measurement range.
OUTPUT 718;"RB 1KHZ;"
OUTPUT 718;"TS;"                Takes sweep.
OUTPUT 718;"SRCTK EP;"          Allows entry of from front-panel keys to adjust tracking.
```

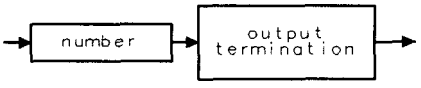
## Description

The SRCTK command adjusts the tracking of the tracking-generator output relative to the center frequency of the spectrum-analyzer. SRCTK is used typically for bandwidths less than 300 kHz. Bandwidths greater than 300 kHz do not require tracking adjustment. Use SRCTK to improve amplitude accuracy and maximize signal response. Use SRCTKPK to adjust tracking automatically. See "SRCTKPK. "



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## Query Response




QQ1



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# SRCTKPK
# Source Tracking Peak

Automatically adjusts the tracking of source output with spectrum-analyzer sweep.

## Syntax




XSRCTKPK

Option Required: Option 010 or 011.
Equivalent Softkey: TRACKING PEAK .
Related Commands: Commands that change bandwidth, such as RB, VB, ST, and commands that change frequency, such as SP, CF, FA, FB, SP, FS, SRCTK.
Restrictions: Not available with Analog+ display mode. See "ANLGPLUS" for more information.

## Example

```
OUTPUT 718;"MEASURE SR;"        Activates the stimulus-response mode.
OUTPUT 718;"SRCPWR -10DB;"      Turns on the power at the source output to its current
                                setting.
OUTPUT 718;"SP 1MHZ;"           Sets measurement range.
OUTPUT 718;"RB 1KHZ;"
OUTPUT 718;"TS;"                Takes sweep.
OUTPUT718;"SRCTKPK;"            Automatically adjusts the tracking.'
```

## Description

The SRCTKPK command adjusts the tracking of the tracking-generator source output automatically to maximize responses for measurements made with resolution bandwidths less than 300 kHz.

SRCTKPK maximizes the amplitude of the displayed active trace.

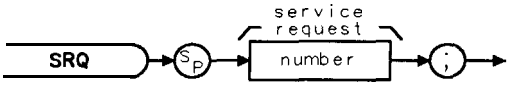


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# SRQ
## Force Service Request

The SRQ command is used by an external controller to simulate interrupts from the spectrum analyzer.

### Syntax




XSRQ

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | 2 to 126. |

Related Commands: CLS, EE, RQS, STB.

### Example

```
OUTPUT 718;"RQS 8;SRQ 8;"
```

*Sets bit **mask** for a hardware broken **service** request, **generates** a hardware broken interrupt.*

**Note** A program can respond to the interrupt in the same way it would under a true service request condition.

### Description

The service request condition is also displayed on the spectrum analyzer screen with the annotation `SRQ XXX`, where XXX is a three-digit octal number.

The conditions that can generate a service request are as follows:

32 = Illegal command
16 = Command complete
8 = Hardware broken
4 = End of sweep
2 = Units key pressed

A service request is generated only if the proper request mask bit has been set (see "RQS"), and either the condition itself or the Force Service Request is sent. To set the request mask, choose the desired interrupt conditions and sum their assigned values. Executing the RQS command with this value sets the bit mask. After setting the bit mask, only the chosen conditions can produce an interrupt.

Each bit in the status byte is defined as shown in the following table.



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**Table 5-9. Spectrum Analyzer Status Byte**

| Bit Number | Decimal Equivalent | Spectrum Analyzer State | Description |
|---|---|---|---|
| 5 | 32 | Set when an illegal command is present. | SRQ 140 appears on the spectrum analyzer screen. |
| 4 | 16 | Set when any command is completed. | It is triggered by EOI at the end of a command string or the completion of a print or plot. |
| 3 | 8 | Indicates hardware broken condition. | SRQ 110 appears on the spectrum analyzer screen. |
| 2 | 4 | Indicates end of sweep. | SRQ 104 appears on the spectrum analyzer screen. If you send any RQS value that contains mask value 4, another sweep will be taken. |
| 1 | 2 | Indicates a units key was pressed. | SRQ 102 appears on the spectrum analyzer screen. If you activate the units key bit, it will remain active until you activate "EE" and press a units key. (See "EE.") |

Bit numbers 0 (LSB), 6, and 7 are not used.

The spectrum analyzer screen numbers 102, 104, and 110 are the octal values corresponding to the status register values; that is, SRQ 102 = bit 6 = octal 100 and bit 2 = octal 2 are both true.

Generally, you must set the bit mask using the RQS command. However, the "hardware broken" and "illegal remote command" conditions are automatically enabled after presetting or sending the IP command. Pressing PRESET or sending the IP command, then, produces the same interrupt bit mask as sending "RQS 40;" (decimal 40 is the sum of the assigned values of these two interrupt bits, 32 = bit 5 and 8 = bit 3).

For most conditions, the RQS mask bit stays set until the next instrument preset (IP), or RQS command is executed. The only condition to which this does not apply is the Units Key Pressed bit. When this bit (bit 1) is set in the RQS mask, a Units Key Pressed interrupt occurs if EE (enable entry mode) is executed and a front-panel units key such as Hz, kHz, MHz, or GHz is pressed.

When a units key is pressed, the interrupt occurs and the Units Key Pressed bit in the RQS mask is reset. lb reenable the Units Key Pressed interrupt, you must send a new RQS mask. See "RQS" for detailed information.

As mentioned, you can simulate a service request condition. Choose the desired interrupt conditions from the RQS command table (see "RQS"), and sum their assigned values. Use the RQS command with this value to set the bit mask. By setting the corresponding bits in the SRQ command and sending the SRQ command to the spectrum analyzer, the desired interrupt occurs. This allows the user to verify proper operation of software routines designed to handle infrequent or unlikely interrupts.



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## Interface Differences

As implemented on the HP-IB interface, an spectrum analyzer service request asserts the SRQ control line on the HP-IB.

On the RS-232 interface, the spectrum analyzer does not have a way of signaling the interrupt condition to a controller. In this case, the controller must operate in a polled mode if it requires interrupt information (see "Polled Mode of Operation" below for a discussion of the polled mode).

**Interrupt-Related Commands Common to All Interfaces:**

- CLS Clear status byte, without read.
- RQS Request mask.
- SRQ Force service request.
- STB Read then clear status byte.

The HP-IB interface supports interface commands to read the status byte.

On HP-IB in HP 9000 Series 200 or 300 BASIC, the statement SPOLL (Device-address) can be used to read the status byte.

## Polled Mode of Operation

The polled mode of operation is probably most applicable to an RS-232 interface user. Because there is no interrupt signal to the RS-232 controller, the user must periodically ask the spectrum analyzer, via the "STB?" command, for the contents of its status register. For example, the RS-232 controller could periodically check for the hardware-broken condition by executing the "STB?" command and reading the results.

## Status Byte Definition

The status byte sent by the spectrum analyzer determines the nature of the service request. The meaning of each bit of the status byte is explained in Table B-l.

**Table 5-10. Status Byte Definition**

| Bit | Message | Display Message |
|---|---|---|
| 0 (LSB) | Unused | |
| 1 | Unit Key Pressed | SRQ 102 |
| 2 | End of sweep | SRQ 104 |
| 3 | Hardware broken | SRQ 110 |
| 4 | Command complete | SRQ 120 |
| 5 | Illegal spectrum analyzer command | SRQ 140 |
| 6 | Universal HP-IB service request HP-IB RQS bit | |
| 7 | Unused | |

The display message is an octal number based on the binary value of the status byte. This octal number always begins with a "1" since this is translated from bit 6, the universal service request bit. The status byte for an illegal spectrum analyzer command (SRQ 140) is as follows:

| bit number | 7 6 | 5 4 3 | 2 1 0 |
|---|---|---|---|
| status byte | 0 1 | 1 0 0 | 0 0 0 |



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This displays the octal equivalent of the status byte binary number: **SRQ** 140

The octal equivalent is based on the whole binary number:

01100000 (binary) = 140 (octal) One simple way to determine the octal equivalent of the binary number is to partition the binary number three bits at a time from the least significant bit, and treat each part as a single binary number:

| **binary** | **0 1** | **1 0 0** | **0 0 0** |
|---|---|---|---|
| **octal** | 1 | 4 | 0 |

The decimal equivalent of the octal number is determined as follows:

140 (octal) = 1 x (8) + 4 x (8) + 0 x (8) = 96 (decimal)

More than one service request can be sent at the same time. For example, if an illegal spectrum analyzer command (SRQ 140) and the end of a sweep (SRQ 104) occurred at the same time, **SRQ** 144 appears on the spectrum analyzer display, because both bit 5 and bit 2 are set as shown below:

| **bit number** | **7 6** | 5 4 3 | 2 **10** | |
|---|---|---|---|---|
| status byte | 0 1 | 1 0 0 | 1 0 0 | |
| octal value | 1 | 4 | 4 | = SRQ 144 |

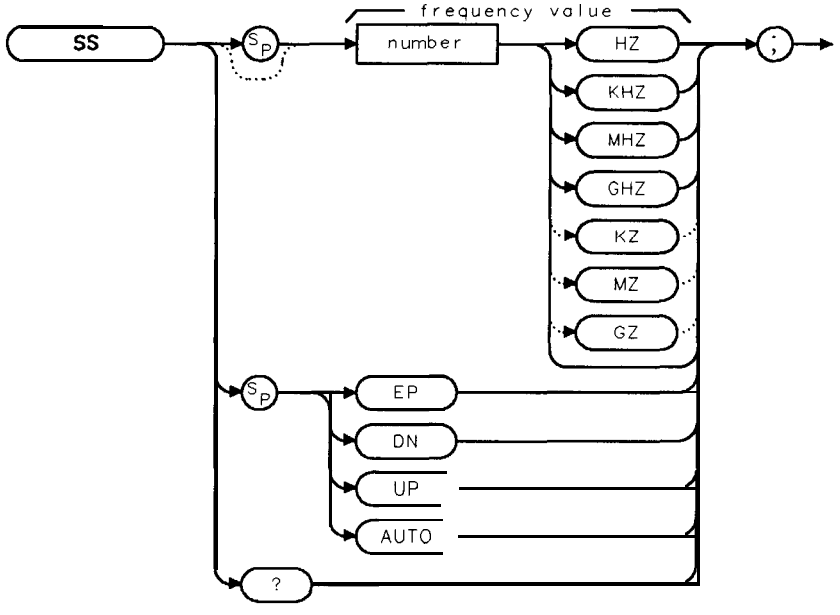


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# SS
## Center Frequency Step Size

Specifies center frequency step size.

### Syntax




xss

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | Frequency range of the spectrum analyzer. |

Equivalent **Softkey:** CF **STEP** AUTO NAN .

Preset State: 100 MHz.
Step Increment: 1, 2, 5, 10 sequence.
Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: AUTO, CF, FOFFSET, **SP.**



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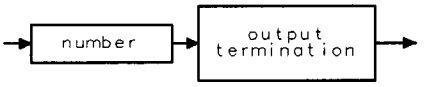
## Example

```
10 CLEAR 718                                  Clears the HP-IB.
20 OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;TS;"   Initializes the spectrum analyzer,
                                              activatessingle-sweep mode, changes
                                              the center frequency, span, takes
                                              sweep.
30 OUTPUT 718;"MKPK HI;MKRL;TS;MKF?;"         Finds the highest peak, changes
                                              the reference level to the marker,
                                              takes sweep, returns the frequency
                                              of the marker.
40 ENTER 718 USING "K";Mk_freq                Puts the spectrum analyzer re-
                                              sponse in the computer variable,
                                              Mk_freq.
50 OUTPUT 718;"MKA?;"                         Returns the amplitude of the marker.
60 ENTER 718 USING "K";Mk_amp                 Puts the spectrum analyzer re-
                                              sponse in the computer variable,
                                              Mk_amp.
70 OUTPUT 718;"SS ";Mk_freq;"HZ"              Changes the step size to the marker
                                              frequency.
80 OUTPUT 718;"CF UP;TS;MKPK HI;MKA?;"        Increases the center frequency, takes
                                              sweep, puts the marker on the
                                              highest peak and returns the am-
                                              plitude of the marker
90 ENTER 718;Mk_ampl                          Puts the spectrum analyzer re-
                                              sponse in the computer variable,
                                              Mk-ampl.
100 PRINT "THE FUNDAMENTAL IS ";Mk_amp-Mk_ampl   Outputs the result.
110 PRINT "dB ABOVE THE SECOND HARMONIC"
120 END
```

## Description

The AUTO parameter removes SS as an active function but does not have an effect on its value.

## Query Response




QQ1

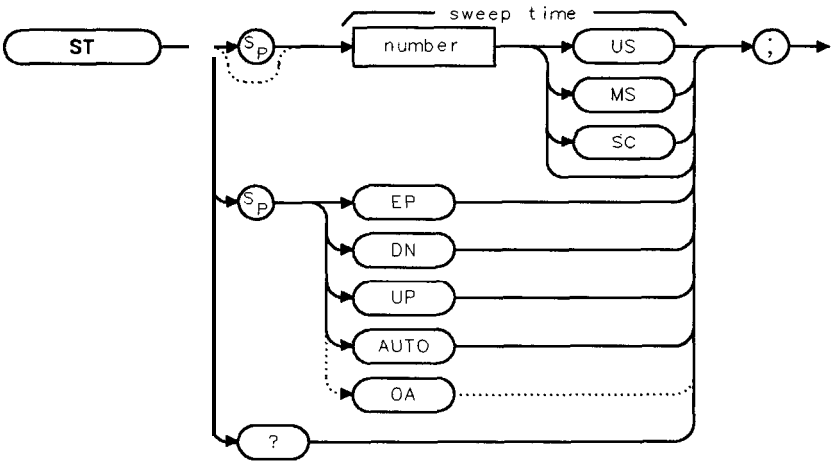


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# ST
# Sweep Time

Specifies the time in which the spectrum analyzer sweeps the displayed frequency range.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is seconds. | Within the sweep time range of the spectrum analyzer. |

Equivalent **Softkey: SWP TIME** AUTO MAN .
Sweep Time Range in Zero Span: 15 ms to 100s.
Sweep Time Range in Zero Span, Option 101 only: 20 μs to 100s.
Sweep Time Range in Non-zero Span: 20 ms to 100 s.
Step Increment: 2, 3, 5, 7.5, 10, 15 sequence.
Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: AUTO, CONTS, HNLOCK, HNUNLK, RB, SNGLS, SP, SRCPSWP, TS.

## Example

```
OUTPUT 718;"ST 100MS;"
```
*Sets the sweep time to 100 milliseconds.*

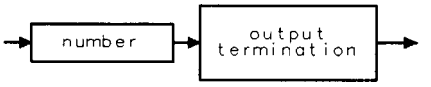
## Description

When used as a predefined variable, ST returns the sweep time as a **real** number in seconds.



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## Query Response




QQ1

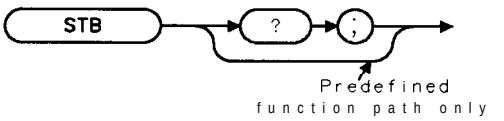


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# STB
# Status Byte Query

Returns to the controller the decimal equivalent of the status byte.

## Syntax




XSTB

Related Commands: RQS, SRQ,

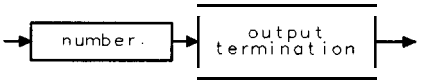
## Example

```
10 OUTPUT718;"IP;"          Initializes spectrum analyzer.
20 OUTPUT 718;"SNGLS;"      Activates single-sweep mode.
30 OUTPUT718:"CLS:",,       Clears the status bits.
40 OUTPUT 718;"TS;:"        Takes sweep.
50 OUTPUT 718;"STB?;"       Returns the status bits.
60 ENTER718;Status_Byte     Puts the spectrum analyzer response in the computer variable,
                            Status-Byte.
70 PRINT  Status-byte       Displays the result.
80 END
```

## Description

The STB command is equivalent to a serial poll command. The RQS and associated bits are cleared in the same way that a serial poll command would clear them. The bits in the status byte are explained under the RQS command.

## Query Response




QQ1

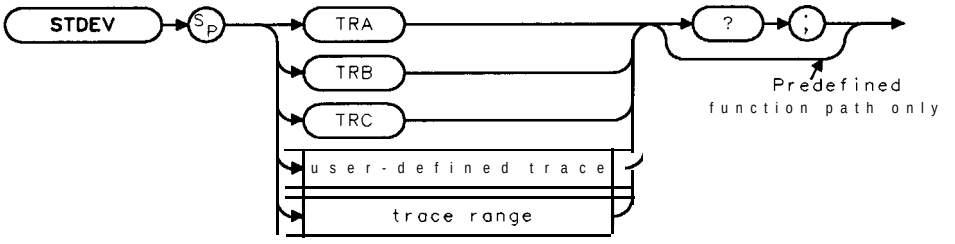


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# STDEV
# Standard Deviation of Trace Amplitudes

Returns the standard deviation of the trace amplitude in measurement units.

## Syntax




XSTDEV

| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.
Related Commands: MEAN, PDA, PDF, VARIANCE.

## Example

The following program segment finds the standard deviation of the amplitude of trace A.

```
OUTPUT 718;"IP;"                                  Initializes spectrum analyzer.
OUTPUT 718;"SNGLS;"                               Activates single-sweep mode.
OUTPUT 718;"CF 300MHZ;SP 2MHZ;RB 100KHZ;"         Changes the center frequency, span, and resolution bandwidth.

OUTPUT 718;"TS;"                                  Takes sweep.
OUTPUT 718;"STDEVTRA?;"                           Finds the standard deviation of trace A.

ENTER 718;Number                                  Get the response from the spectrum analyzer:

PRINT "THE STANDARD DEVIATION OF TRACE A";Number/100;"DB"
```



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## STDEV Standard Deviation of Trace Amplitudes

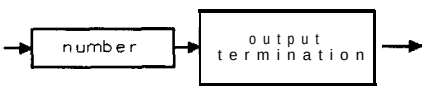
### Description

The formula to calculate the standard deviation is as follows:

$$\sqrt{\frac{\sum_{i=1}^{n}(\bar{x} - x_i)^2}{n - 1}}$$

$n$ represents the number of data points.
$x_i$ represents a data point.
$\bar{x}$ represents the mean of data.

### Query Response




QQ1

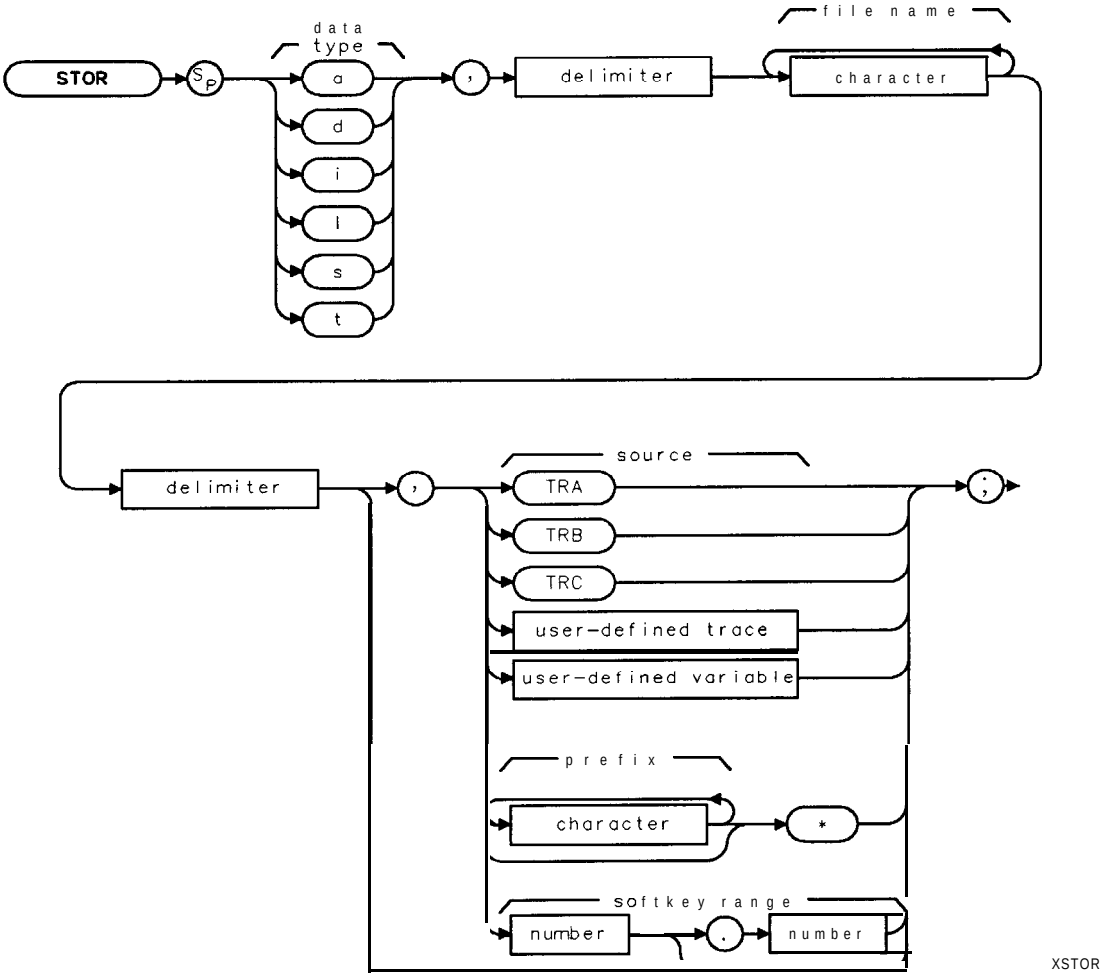


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# STOR
# Store

Stores data on a RAM card.

## Syntax






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| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Character (file name) | Any valid character. Characters form the Ele type and file name. | File type (lowercase a, c, d, i, 1, s, or t) should precede the file name. File name is 0 to 6 characters long, A through Z and the underscore (the underscore should be used as the second character of the label). |
| Character (prefix) | Any valid character. | |
| Number | A valid softkey number range. Use a decimal point to separate the softkey numbers when specifying a softkey range. | 1 to 6, 601 to 1200. |
| Delimiter | Matching characters marking the beginning and end of the list of spectrum analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |

Option Required: An HP 8590L or HP 8592L spectrum analyzer needs Option 003 installed in it to use STOR.
Related Commands: CAT, LOAD, PREFX.

## Example

```
OUTPUT 718;"TRDEF N_EW,400;"
OUTPUT 718;"MOV N_EW,TRA;"
OUTPUT 718;"STOR t,%tF_UNCX%,N_EW;"
OUTPUT 718;"STOR d,%dP_ROG_1%,*;"
OUTPUT 718;"STOR a,%aA_MPDATA_7%;"
OUTPUT 718;"STOR l,%lL_IMITS_1%;"
OUTPUT 718;"STOR s,%sS_TATE_1%;"
OUTPUT 718;"STOR d,%dK_EYS_15%,601.606;"
OUTPUT 718;"STOR d,%dK_EY_1%,601;"
OUTPUT 718;"STOR d,%dF_ILES_1%,KEN*;"
```

*Defines a trace.*
*Moves the contents of trace A into N_EW.*
*Stores N_EW under the file name of tFUNCX as trace data.*
*Stores all downloadable programs in the spectrum analyzer memory on the RAM card.*
*Stores the current amplitude correction factors.*
*Stores the current limit-line tables.*
*Stores the spectrum analyzer state.*
*Stores softkey functions 601 through 606 in the file dKEYS_1.*
*Stores softkey function 601 in the file dKEY_1.*
*Stores all downloadable programs with the prefix "KEN" on the RAM card.*



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## Description

The STOR command stores the source data on the RAM card under the specified file name and data type.

**Data type:** Use the data type as the first character of the file name in order to catalog the file by the file type. For example, use tFUNCX instead of FUNCX to catalog it by traces. If the file type is not specified as the first character of the file name, the file is stored as an ASCII file. It is necessary to use the correct data type (a, d, i, 1, s, or t) to load the file into spectrum analyzer memory correctly. The letters correspond to the data type as shown in the following table.

| Data Type | Description |
|---|---|
| a | Amplitude correction factor table. |
| d | Downloadable program. |
| i | Displays image. |
| 1 | Limit-line table. |
| s | Instrument state. |
| t | Trace and instrument state. |

**Note** The STOR saves data on a RAM card. See "SAVET," "SAVES," or "SAVRCLN" to save data in spectrum analyzer memory.

With the memory card reader, the spectrum analyzer can read from either a RAM (random-access memory) card or a ROM (read-only memory card). lb write to a memory card, the card must be a RAM card. The spectrum analyzer cannot write to a ROM card.

## Specifying the source

When storing trace data, enter the location of the trace data (trace A, trace B, trace C, or user-defined trace) as the source.

Downloadable programs can be stored as follows:

- For storing all downloadable programs in spectrum analyzer memory on a RAM card, use an asterisk as the source.
- For storing all downloadable programs with a certain prefix, use a prefix followed by an asterisk as the source.
- For storing a range of softkey functions, specify the softkey numbers separated with a decimal. Use the downloadable program file type when storing user-defined variables.

**Space required:** To store a file on a memory card, there must be enough space on the memory card for the file. See "Determining the Amount of Space on a RAM Card" in Chapter 4 for more information about space requirements.

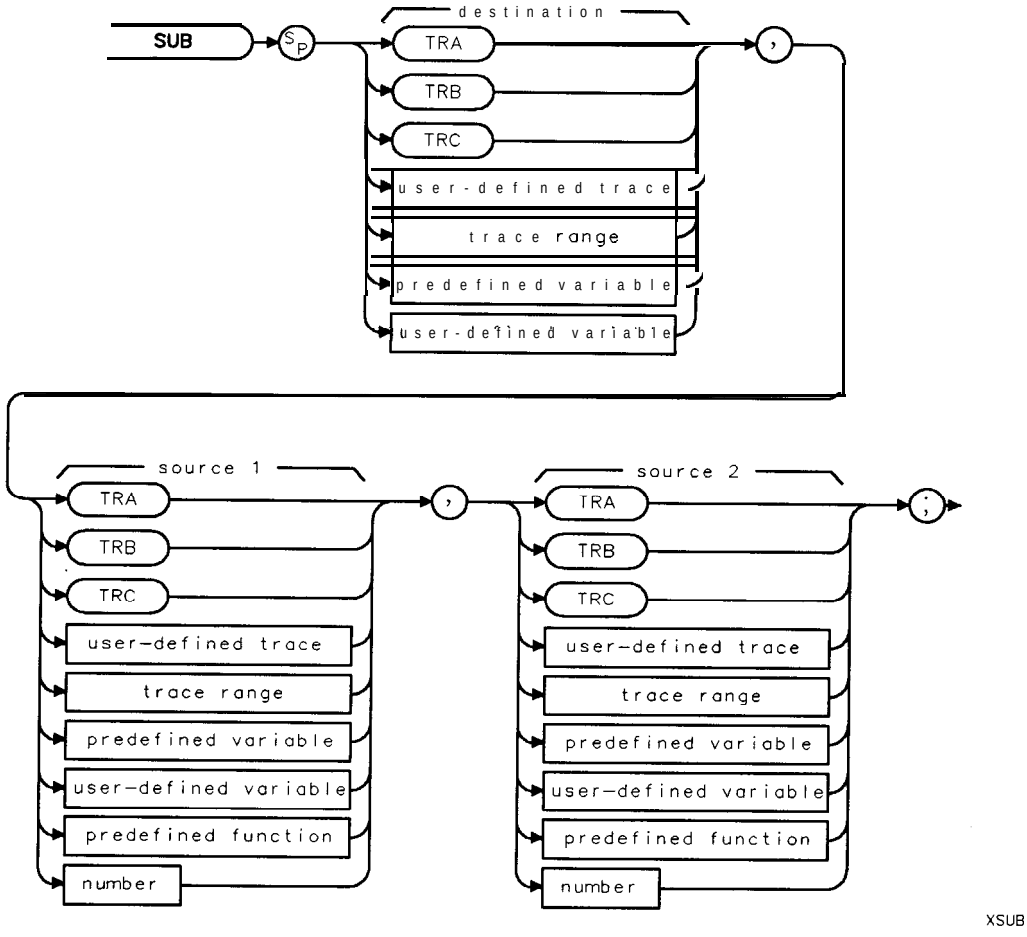


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# SUB
# Subtract

Subtracts source 2 from source 1, point by point, and sends the difference to the destination.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| **User-defined** trace | A trace **defined** by the TRDEF command. | Any valid trace name. |
| **User-defined** variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| **Predefined** variable | A command that acts as a variable. Refer to Table 5-l. | |
| Predefined function | Function that returns a value. Refer to Table 5-1. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | Real number range. |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF for a user-defined variable. TS when using trace data.
Related Commands: AMB, AMBPL, BML, LIMITEST, SUM.



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## Example

`OUTPUT 718;"SUB TRA,TRB,TRC;"` *Subtracts trace C from trace B and places the result in trace A.*

## Description

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

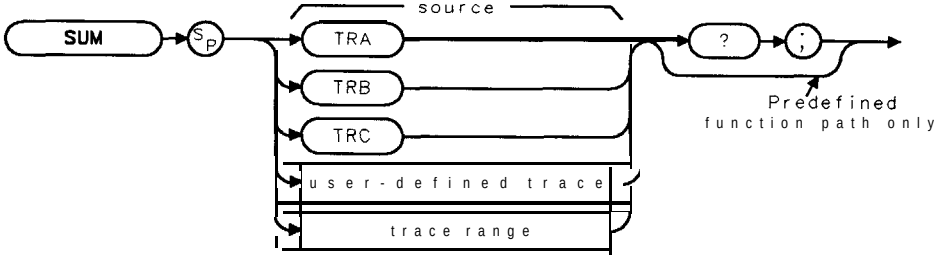


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# SUM
# Sum of Trace Amplitudes

Returns the sum of the amplitudes of the trace elements in measurement units.

## Syntax




XSUM

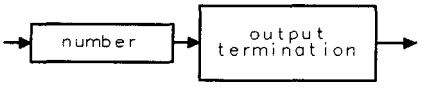
| Item | Description/Default | Range |
|---|---|---|
| **User-defined** trace | A trace defined by the TRDEF command. | Any valid trace name. |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.
Related Commands: ADD, DIV, MEAN, MPY, SUB, TS, VARIANCE.

## Example

```
10 OUTPUT 718;"IP;"                          Initializes spectrum analyzer:
20 OUTPUT 718;"SNGLS;TS;"                    Activates single-sweep mode, takes sweep.
30 OUTPUT 718;"SUM TRA?;"                    Gets the result.
40 ENTER 718;Trace_sum                       Puts the spectrum analyzer response in the
                                             computer variable, Trace-sum.
50 DISP Trace_sum;"MEASUREMENT UNITS"        Displays the result.
60 END
```

## Query Response




QQ1

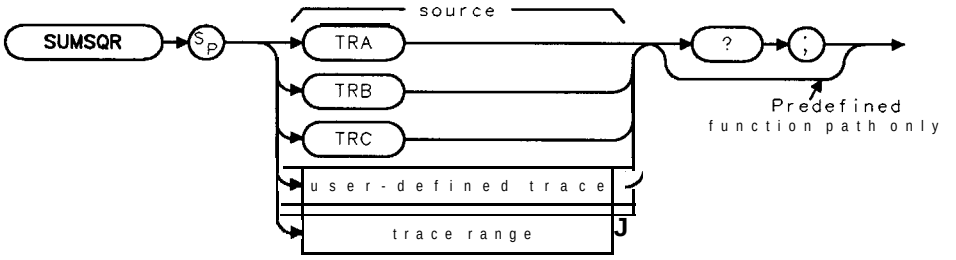


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# SUMSQR
# Sum of Squared Trace Amplitudes

Returns the sum of the squares of the amplitude of each trace element in measurement units.

## Syntax




XSUMSQR

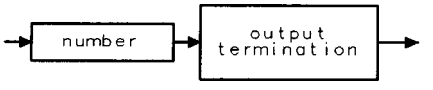
| Item | Description/Default | Range |
|---|---|---|
| **User-defined** trace | A trace defined by the TRDEF command. | Any valid trace name. |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.

## Example

```
OUTPUT 718;"IP;"                    Initializes spectrum analyzer.
OUTPUT 718;"SNGLS;TS;"              Activates single-sweep mode, takes sweep.
OUTPUT 718; "SUMSQR TRA?;"          Gets the result.
ENTER718;Trace_sqrsum               Puts the spectrum analyzer response in the
                                    computer variable, Trace-sqrsum.
DISP  Trace,sqrsum; "MEASUREMENT UNITS" D&plays the result.
```

## Query Response




QQ1

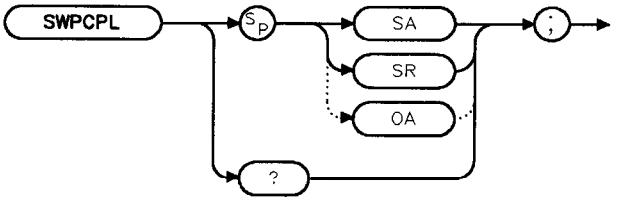


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# SWPCPL
# Sweep Couple

Selects either a stimulus-response (SR) or spectrum-analyzer (SA) auto-coupled sweep time.

## Syntax




Equivalent **Softkey:** SWP GPLG SR SA .
Option Required: Option 010 or 011.
Preset State: SWPCPL SA.
Related Commands: SRCPWR.

## Example

```
10  OUTPUT718;"IP;SNGLS;"
20  OUTPUT 718;"FA 300KHZ;FB 1GHZ;"
30  OUTPUT 718;"SRCPWR -10DB;"
40  OUTPUT 718;"SWPCPL SR;"
50  OUTPUT718;"SRCTKPK;DONE?;"
60  ENTER 718;Done
70  LOCAL 718
80  END
```

## Description

In stimulus-response mode, auto-coupled sweep times are usually much faster for swept-response measurements. Stimulus-response auto-coupled sweep times are typically valid in stimulus-response measurements when the system's frequency span is less than 20 times the bandwidth of the device under test.

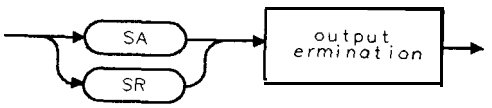
When used as a predefined variable, SWPCPL returns either a "0" or a "1," depending on the setting of the SWPCPL parameters. Refer to the following table.

| sParameteri n g | Value returned |
|---|---|
| | 0 |
| | 1 |



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## Query Response



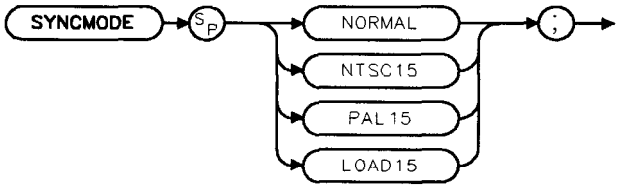

QSWPCPL

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# SYNCMODE
## Synchronize Mode

Selects the horizontal and vertical synchronizing constants, (the synchronization) rate for both the internal monitor of the spectrum analyzer and the video signal that is output to the MONITOR OUTPUT connector.

### Syntax




XSYNCMODE

Equivalent Softkey: SYNC NRM NTSC , DEFAULT SYNC , SYNC NRM PAL.
Related Commands: CRTHPOS, CRTVPOS, IP.

### Example

| | |
|---|---|
| `OUTPUT 718;"SYNCMODE NTSC15;"` | *Selects the NTSC format for the spectrum analyzer monitor and monitor output.* |
| `OUTPUT 718;"IP;"` | *An instrument preset activates the new synchronizing constants.* |

### Description

Whenever you use SYNCMODE to change the synchronizing constants, you must press PRESET or execute IP to activate the new synchronizing constants. Changing the vertical scanning rate may change the location of the time and date display on the spectrum analyzer display.

The SYNCMODE parameters NORMAL and LOAD15 allow you to change the horizontal and vertical synchronizing constants for both the spectrum analyzer's internal monitor and the video signal to the MONITOR OUTPUT connector.

The SYNCMODE parameters NTSC15 and PAL15 allow you to change the vertical scanning rate for both the spectrum analyzer's internal monitor and the video signal that is output to the MONITOR OUTPUT connector. The regular vertical scanning rate for the spectrum analyzer's monitor is 57 Hz; the NTSC15 changes the vertical scanning rate to 60 Hz, and the PAL15 changes the vertical scanning rate to 50 Hz. If you want to record the spectrum analyzer display on a video cassette recorder (VCR) that uses the NTSC format, you must use the NTSC15 parameter to change the vertical scanning rate of the spectrum analyzer monitor to 60 Hz. If you want to record the spectrum analyzer display on a VCR that uses the PAL format, you must use the PAL15 parameter to change the vertical scanning rate of the spectrum analyzer monitor to 50 Hz.



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The following parameters for SYNCMODE are described:

NORMAL — Restores the previous values for the horizontal and vertical synchronizing constants of the spectrum analyzer display if SYNCMODE NTSC15 or SYNCMODE PAL15 was previously executed. The previous values for the horizontal and vertical position are the positions that were set by CRTHPOS and CRTVPOS. SYNCMODE NORMAL is equivalent to SYNC NRM NTSC (with NRM underlined).

NTSC15 — Selects the NTSC format for a spectrum analyzer that has an internal monitor with a horizontal scanning rate of 15.75 kHz (the monitors for the HP 8590L, HP 85913, HP 8592L, HP 85933, HP 85943, HP 85953, and HP 85963 all have horizontal scanning rates of 15.75 kHz). SYNCMODE NTSC15 is equivalent to SYNC NRM NTSC (with NTSC underlined).

PAL15 — Selects the PAL format for a spectrum analyzer that has an internal monitor with a horizontal scanning rate of 15.75 kHz (the monitors for the HP 8590L, HP 85913, HP 8592L, HP 85933, HP 85943, HP 85953, and HP 85963 all have horizontal scanning rates of 15.75 kHz). SYNCMODE PAL15 is equivalent to SYNC NRM PAL (with PAL underlined).

LOAD15 — Loads the default constants horizontal and vertical position for the display of a spectrum analyzer with an internal monitor with 15.75 kHz horizontal scanning (the HP 8590L, HP 85913, HP 8592L, HP 85933, HP 85943, HP 85953, and HP 85963 all have horizontal scanning rates of 15.75 kHz). The default constants are the constants that are stored into the spectrum analyzer's read-only memory (ROM). SYNCMODE LOAD15 is equivalent to DEFAULT SYNC.

When used as a predefined variable, SYNCMODE returns a number from 0 to 5. The value that is returned by SYNCMODE depends on the SYNCMODE parameter, as shown in the following table.

| Parameter setting | Value returned |
|---|---|
| NORMAL | 0 |
| NTSC15 | 1 |
| PAL15 | 3 |
| LOAD15 | 5 |

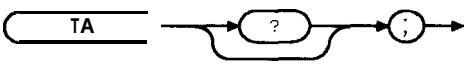


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# TA
# Transfer A

Returns trace A amplitude values from the spectrum analyzer to the controller.

## Syntax




XTA

Related Commands: MDS, TB, TDF.

## Example

This example stores the TA results in array A.

```
DIM A(401)                                  Reserves memory area for array.
OUTPUT 718;"IP;"                            Initializes analyzer
OUTPUT 718;"SNGLS;CF 300MHZ;SP 2MHZ;TS;"    Activates single-sweep mode, changes center frequency and span, takes sweep.

OUTPUT 718;"TDF P;TA;"                      Changes trace data format, outputs trace A.

FOR N = 1 TO 401                            FOR NEXT loop moves each element of trace A to the computer:

  ENTER 718;A(N)
NEXT N
FOR N = 1 TO 401                            FOR NEXT loop moves the trace values from the computer to the printer

  PRINT A(N)                                Prints out the results.
NEXT N
```

## Description

The display unit values are transferred in sequential order (from left to right) as seen on the screen.

Transfer of trace amplitude data should be done only as follows:

1. Select single sweep mode (SNGLS).
2. Select desired spectrum analyzer settings.
3. lake one complete sweep (TS).
4. Transfer data (TA).

This procedure ensures that the current settings of the spectrum analyzer are reflected in the transferred data.

See Chapter 3, “Different Formats for Trace Data Transfers,” for more information about transferring trace data. Items are separated by a comma when in TDF P format.



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# TB
# Transfer B

Transfers trace B amplitude values from the spectrum analyzer to the controller.

## Syntax




XTB

Related Commands: MDS, TA, TDF.

## Example

```
DIM A(401)                                  Reserves memory area for array.
OUTPUT 718;"IP;"                            Initializes analyzer.
OUTPUT 718;"SNGLS;CF 300MHZ;SP 2MHZ;TS;"    Activates single-sweep mode, changes center
                                            frequency and span, takes sweep.
OUTPUT 718;"TDF P;TB;"                      Changes trace data format, outputs trace
                                            B.
FOR N = 1 TO 401                            FOR NEXT loop moves each element of
                                            trace A to the computer:
  ENTER 718;A(N)
NEXT N
FOR N = 1 TO 401                            FOR NEXT loop moves the trace values
                                            from the computer to the printer:
  PRINT A(N)                                Prints out the results.
NEXT N
```

## Description

The operation of TB is similar to the operation of TA.

See Chapter 3, "Different Formats for Trace Data Transfers," for more information about transferring trace data.

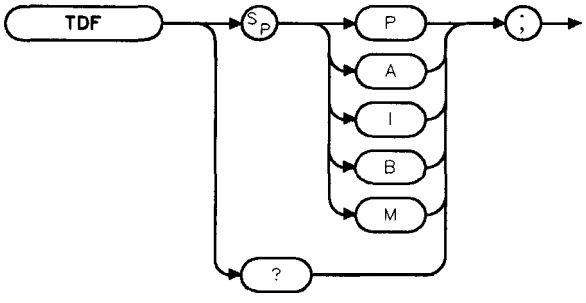


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# TDF
# Trace Data Format

Formats trace information for return to the controller.

## Syntax




XTDF

Related Commands: MDS, MKA, TA, TB, TRA.

## Example

```
DIM A(401)                                  Holds trace data.
OUTPUT 718;"IP;"                            Initializes analyzer.
OUTPUT 718;"BLANK TRA;CLRW TRB;"            Views trace B.
OUTPUT 718;"SNGLS;CF 300MHZ;SP 2MHZ;TS;"    Activates single-sweep mode, changes center
                                            frequency and span.
OUTPUT 718:"TDF P;TB;"                      Formats trace data.
FOR N = 1 lo 401                            Transfers trace data to array A, one
                                            element at a time.
  ENTER 718;A(N)
  NEXT N
FOR N = 1 TO 401                            Loop prints out trace B data.
  PRINT A(N)                                Prints out the results.
NEXT N
```

## Description

The different trace data formats are as follows:

### TDF P

**Description:** TDF P is the real number format. An example of a trace element returned with the real number format is 10.00 dB. When querying the trace or marker value, the value is returned using the amplitude unit set by AUNITS (for example, watts or dBm).

**Restrictions:** The spectrum analyzer must be in log scale to use TDF l? To send the trace data back to the spectrum analyzer, the data must be converted to measurement units.

**How data is returned:** The following table describes what is transferred when the trace data format is set to P, but the AUNITS are changed. In every case, the trace data transfer is ended by a carriage return, and a line feed with an EOI.



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**Trace Data Transfers with TDF P**

| AUNITS Setting | Example | Description |
|---|---|---|
| Watts | TDF P;AUNITS W;TA; | Transfers 401 real values, in watts, with each value separated by a carriage return and a line feed. |
| dBm | TDF P;AUNITS DBM;TA; | Transfers 401 real values, in dBm, with each value separated by a carriage return and a line feed. |
| dBmV | TDF P;AUNITS DBMV;TA; | Transfers 401 real values, in dBmV, with each value separated by a carriage return and a line feed. |
| dBμV | TDF P;AUNITS DBUV;TA; | Transfers 401 real values, in dBμV, with each value separated by a carriage return and a line feed. |
| Volts | TDF P;AUNITS V;TA; | Transfers 401 real values, in volts, with each value separated by a carriage return and a line feed. |

**Example of how data is returned:** For example, if the reference level of the spectrum analyzer is set to -10 dBm, the amplitude scale is set to 10 dB per division, and trace A contains the following data:

TRA[1] contains 8000 (in measurement units). The value 8000 indicates trace element 1 is at the reference level.
TRA[2] = 7000 measurement units (trace element 2 is -10 dB below the reference level).
TRA[3] through TRA[401] each contain 6000 (in measurement units). The value 6000 indicates that the trace elements 3 through 401 are all at -20 dB below the reference level.

Querying trace A with the TDF P format and AUNITS set to DBM returns ASCII character codes for the following:

−10.00,−20.00,−30.00,(−30.00 is repeated 398 times),<CR><LF><EOI>

## TDF A

**Description:** TDF A is the A-block data format. With the A-block data format, trace data is preceded by "#," "A," and a two-byte number (the two byte number indicates the number of trace data bytes). The setting of the MDS command determines whether the trace data is transferred as one or two 8-bit bytes.

**Restrictions:** To use the A-block format for sending data, you must provide the number of data bytes.

**How data is returned:** The following table describes what is transferred when the trace data format is set to A, but the MDS setting is changed.

**Trace Data Transfers with TDF A**

| MDS setting | Example | Description |
|---|---|---|
| Binary | TDF A;MDS B;TA; | Transfers "#A," the number of bytes of trace data, then the 401 bytes of trace data. Using MDS B "reduces" each trace value into one byte by dividing (DIV) the trace value by 32. The trace data transfer is ended with an EOI. |
| Word | TDF A;MDS W;TA; | Transfers "#A," the number of bytes of trace data, then 802 bytes of trace data. MDS W uses two bytes per trace element to transfer trace data. The first byte contains the trace value divided by (DIV) 256, the second byte contains the remainder (MOD) of that division. The trace data transfer is ended with an EOI. |



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**Example of how data is returned:** For the same trace A data that is used in the TDF P description, querying trace A with the TDF A format and MDS set to binary (MDS B) would return the ASCII character codes for the following:

#A(401 div 256)(401 mod 256)(8000 div 32)(7000 div 32)(6000 div 32)(the number for 6000 div 32 is repeated 398 times)<EOI>

Notice that #A is followed by the two bytes that contain the number of trace elements. Because MDS is set to binary, the number of trace elements is 401.

If MDS is set to W, querying trace A with the TDF A format would return the ASCII character codes for the following:

#A(802 div 256)(802 mod 256)(8000 div 256)(8000 mod 256)(7000 div 32)(7000 mod 256)(6000 div 256)(6000 mod 256)(the number for 6000 div 256, then the number for 6000 mod 256 is repeated 398 times)

Notice that #A is followed by the two bytes that contain the number of trace elements. Because MDS is set to W (word), the number of trace elements is 802.

## TDF I

**Description:** TDF I is the I-block data format. With the I-block data format, trace data must be preceded by "#," and "I." The setting of the MDS command determines whether the trace data is transferred as one or two 8-bit bytes. Unlike using the A-block format, you do not provide the number of data bytes when sending trace data back to the spectrum analyzer.

**Restrictions:** This format is not recommended for use with an RS-232 interface.

**How data is returned:** The following table describes what is transferred when the trace data format is set to I, but the MDS setting is changed.

**Trace Data Transfers with TDF I**

| MDS setting | Example | Description |
|---|---|---|
| Binary | TDF I;MDS B;TA; | Transfers "#I," then the 401 bytes of trace data. Using MDS B "reduces" the trace value into 1 byte by dividing (DIV) the trace value by 32. The trace data transfer is ended with an EOI. |
| Word | TDF I;MDS W;TA; | Transfers "#A," then 802 bytes of trace data. MDS W uses two bytes per trace element to transfer trace data. The first byte contains the trace value divided by (DIV) 256, the second byte contains the remainder (MOD) of that division. The trace data transfer is ended with an EOI. |

**Example of how data is returned:** For the same trace A data that is used in the TDF P description, querying trace A with the TDF I format and MDS set to binary (MDS B) would return the ASCII character codes for the following:

#I(8000 div 32)(7000 div 32)(6000 div 32)(the number for 6000 div 32 is repeated 398 times)

If MDS is set to W, querying trace A with the TDF I format would return the ASCII character codes for the following:

#I(8000 div 256)(8000 mod 256)(7000 div 32)(7000 mod 256)(6000 div 256)(6000 mod 256)(the number for 6000 div 256, then the number for 6000 mod 256 is repeated 398 times)



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**Example of how data is returned:** For the same trace A data that is used in the TDF P description, querying trace A with the TDF A format and MDS set to binary (MDS B) would return the ASCII character codes for the following:

#A(401 div 256)(401 mod 256)(8000 div 32)(7000 div 32)(6000 div 32)(the number for 6000 div 32 is repeated 398 times)<EOI>

Notice that #A is followed by the two bytes that contain the number of trace elements. Because MDS is set to binary, the number of trace elements is 401.

If MDS is set to W, querying trace A with the TDF A format would return the ASCII character codes for the following:

#A(802 div 256)(802 mod 256)(8000 div 256)(8000 mod 256)(7000 div 32)(7000 mod 256)(6000 div 256)(6000 mod 256)(the number for 6000 div 256, then the number for 6000 mod 256 is repeated 398 times)

Notice that #A is followed by the two bytes that contain the number of trace elements. Because MDS is set to W (word), the number of trace elements is 802.

## TDFI

**Description:** TDF I is the I-block data format. With the I-block data format, trace data must be preceded by "#," and "I." The setting of the MDS command determines whether the trace data is transferred as one or two 8-bit bytes. Unlike using the A-block format, you do not provide the number of data bytes when sending trace data back to the spectrum analyzer.

**Restrictions:** This format is not recommended for use with an RS-232 interface.

**How data is returned:** The following table describes what is transferred when the trace data format is set to I, but the MDS setting is changed.

**Trace Data Transfers with TDF I**

| MDS Setting | Example | Description |
|---|---|---|
| Binary | TDF I;MDS B;TA; | Transfers "#I," then the 461 bytes of trace data. Using MDS B "reduces" the trace value into 1 byte by dividing (DIV) the trace value by 32. The trace data transfer is ended with an EOI. |
| Word | TDF I;MDS W;TA; | Transfers "#A," then 802 bytes of trace data. MDS W uses two bytes per trace element to transfer trace data. The first byte contains the trace value divided by (DIV) 256, the second byte contains the remainder (MOD) of that division. The trace data transfer is ended with an EOI. |

**Example of how data is returned:** For the same trace A data that is used in the TDF P description, querying trace A with the TDF I format and MDS set to binary (MDS B) would return the ASCII character codes for the following:

#I(8000 div 32)(7000 div 32)(6000 div 32)(the number for 6000 div 32 is repeated 398 times)

If MDS is set to W, querying trace A with the TDF I format would return the ASCII character codes for the following:

#I(8000 div 256)(8000 mod 256)(7000 div 32)(7000 mod 256)(6000 div 256)(6000 mod 256)(the number for 6000 div 256, then the number for 6000 mod 256 is repeated 398 times)



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## TDF B

**Description:** TDF B enables the binary format. With the binary format, the marker or trace data is transferred as bytes. Of all the trace data formats, TDF B transfers trace data the fastest. The setting of the MDS command determines whether the trace data is transferred as one or two 8-bit bytes.

**Restrictions:** The TDF B format cannot be used to send data back to the spectrum analyzer (you must use the A-block format to send data back to the spectrum analyzer).

**How data is returned:** The following table describes what is transferred when the trace data format is set to B, but the MDS setting is changed.

**Trace Data Transfers with TDF B**

| MDS Setting | Example | Description |
|---|---|---|
| Binary | TDF B;MDS B;TA; | Transfers the 401 bytes of trace data. Using MDS B "reduces" the trace value into 1 byte by dividing (DIV) the trace value by 32. The trace data transfer is ended with an EOI. |
| Word | TDF B;MDS W;TA; | Transfers the 802 bytes of trace data. MDS W uses two bytes per trace element to transfer trace data. The first byte contains the trace value divided by (DIV) 256, the second byte contains the remainder (MOD) of that division. The trace data transfer is ended with an EOI. |

**Example of how data is returned:** For the same trace A data that is used in the TDF P description, querying trace A with the TDF B format and MDS set to binary (MDS B) would return the ASCII character codes for the following:

(8000 div 32)(7000 div 32)(6000 div 32)(the number for 6000 div 32 is repeated 398 times)

If MDS is set to W, querying trace A with the TDF B format would return the ASCII character codes for following:

(8000 div 256)(8000 mod 256)(7000 div 32)(7000 mod 256)(6000 div 256)(6000 mod 256)(the number for 6000 div 256, then the number for 6000 mod 256 is repeated 398 times)

T D F M

**Description:** TDF M is the measurement data format. The measurement data format transfers trace data in measurement units, and the measurement data can range from -32768 to + 32767.

**Restrictions:** TDF M cannot be used to send trace data back to the spectrum analyzer.

**How trace data is returned:** The following table describes what is transferred when the trace data format is set to M.

**Trace Data Transfers with TDF M**

| Example | Description |
|---|---|
| TDF M;TA; | Transfers 401 bytes, with each trace value in measurement units. The trace data transfer is ended with a carriage return, a line feed with an EOI. |

**Example of how data is returned:** For the same trace A data that is used in the TDF P description, querying trace A with the TDF M would return the ASCII character codes for the following:

8000,7000,6000,(6000 repeated 398 times),<CR><LF>

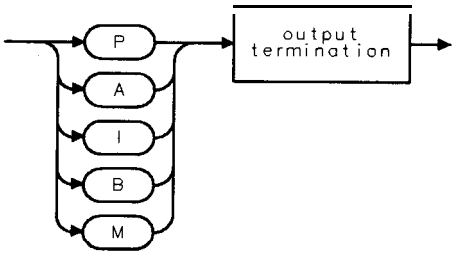


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**TDF Trace Data Format**

Refer to Chapter 3, “Different Formats for Trace Data Transfers,” for more information about transferring trace data.

## Query Response




QTDF

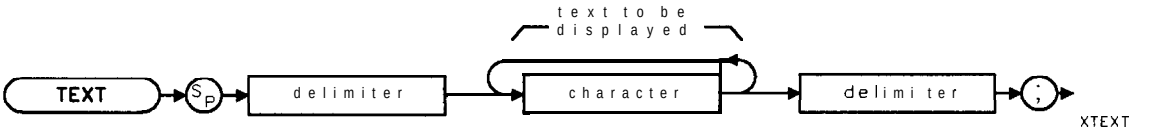


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# TEXT
# Text

Writes text on the spectrum analyzer screen at the current pen position.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Delimiter | Matching characters marking the beginning and end of the list of analyzer commands. | ~ \| \ @ = / ^ 8 % ; ! ' : " & |
| Character | Any valid character. See "LB" for additional characters available. | |

Related Commands: DSPLY, LB, PA, PD, PU, PR.

## Example

```
OUTPUT 718;"PU;PA80,80;TEXT%CONNECT ANTENNA%;"
```
*Displays CONNECTANTENNA on the analyzer screen.*

```
OUTPUT 718;"PU;PA100,100;TEXT%50";CHR$(250);"%;"
```
*Displays 50Ω on the analyzer screen.*

## Description

The TEXT origin is at the lower-left corner of the first character. The pen is placed to the right of and behind the last character position after the text characters. Line feeds are not automatically generated for lines that extend past the edge of the screen.

See "LB" for the additional characters available by specifying the ASCII character code. (See second line of the example for an example of using the ASCII character code.)

The TEXT command also enters the text into the display list. See "DA" for more information about the display list.

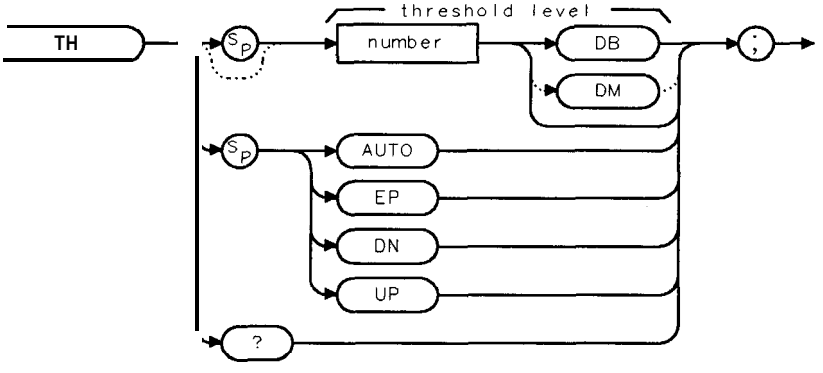


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# TH
# Threshold

Clips signal responses below the threshold level.

## Syntax




XTH

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is dBm. | Range dependent on RL setting. |

Equivalent Softkey: THRESHLD ON OFF .
Preset State: Clip off, positioned one division above bottom graticule line.
Step Increment: One division.
Related Commands: AUTO, DL, MEANTH, MKPK, PEAKS, RL.
Restrictions: Not available with Analog+ display mode. See "ANLGPLUS" for more information.

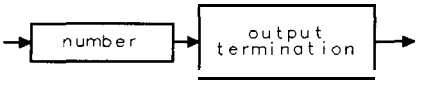
## Example

```
OUTPUT 718;"TH UP;"
```
*Increases the threshold level.*

## Description

The threshold level is eight graticule divisions below the top of the screen unless otherwise specified. The threshold level is annotated in reference level units at the lower-left corner of the spectrum analyzer screen. AUTO deactivates clipping. The TH level is used for next peak marker movements (see "MKPK") and the PEAKS command even if the display clipping is off.

## Query Response




QQ1

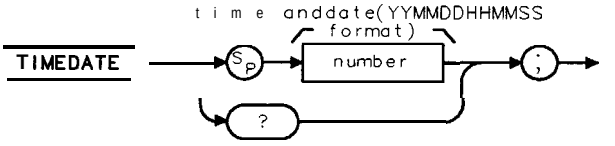


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# TIMEDATE
## Time Date

Allows you to set the time and date for the spectrum analyzer real-time clock in the YYMMDDHHMMSS format.

### Syntax




XTIMEDATE

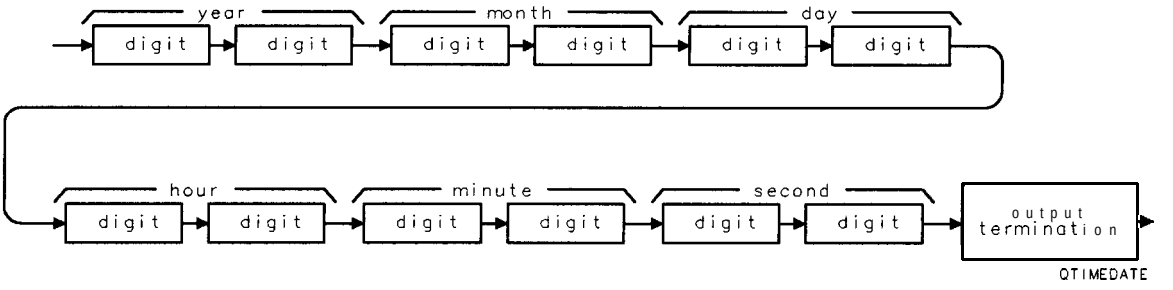
| Item | Description/Default | Range |
|---|---|---|
| Number | **A** number representing the date and time in the YYMMDDHHMMSS (24 hour) format. | A valid date and time. |

Related Commands: **SETDATE, SETTIME,** TIMEDSP.

### Example

`OUTPUT 718;"TIMEDATE 881231135501;"` *Sets the analyzer time and date to 1:55:01 PM on 31 December 1988.*

### Query Response




QTIMEDATE

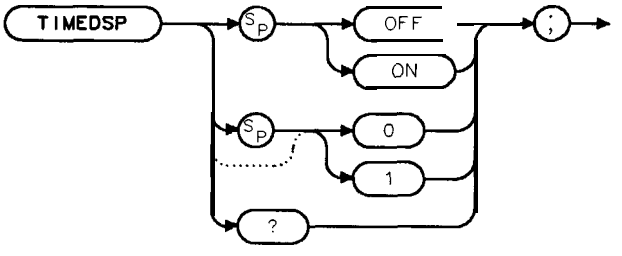


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# TIMEDSP
## Time Display

Enables the display of the time and date on the spectrum analyzer screen.

### Syntax



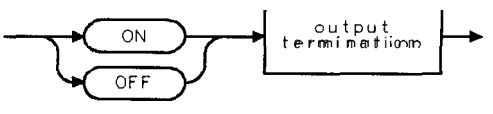

XTIMEDSP

Equivalent **Softkey: TIMEDATE ON OFF** .
Related Commands: **ANNOT, SETDATE, SETTIME,** TIMEDATE.

### Example

```
OUTPUT 718;"TIMEDSP OFF;"
```

### Query Response




QQ2

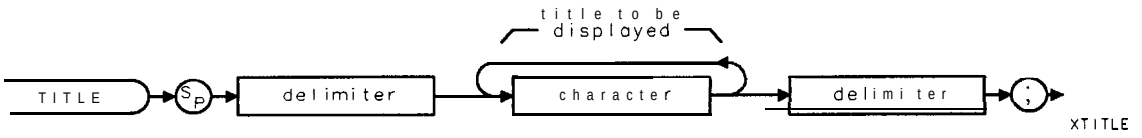


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# TITLE
# Title

Activates the screen title mode. The title is displayed above the top graticule and is left justified.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Delimiter | Matching characters marking the beginning and end of the list of analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Character | Any valid character. See "LB" for additional characters available. | Up to 53 characters. |

Equivalent Softkey: Change Title.

Related Commands: IP, LB, SAVES, TEXT.

## Example

```
OUTPUT 718;"TITLE %ADJUST ANTENNA%;"
```

Displays *"'ADJUST ANTENNA" on the analyzer screen.*

## Description

This function writes a message at the top of the spectrum analyzer

screen. The full width of the display is available for writing a maximum of 53 characters. However, the marker readout may interfere with the last 26 characters. IP removes the message.

The SAVET command saves the screen title is along with the trace in the trace register.

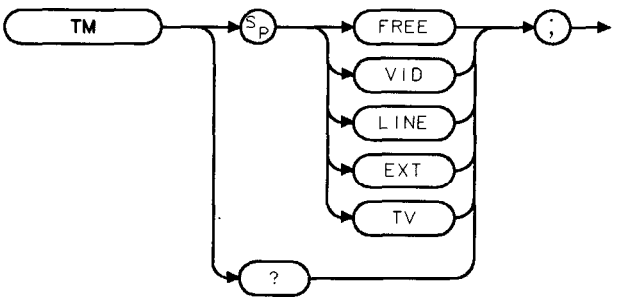


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# TM
# Trigger Mode

Selects a trigger mode: free, line, video, TV, or external.

## Syntax




XTM

Equivalent Softkeys: The keys accessed by TRIG.
Related Commands: DL.

## Example

```
OUTPUT 718;"TM EXT;"
```
*Activates the external trigger mode.*

## Description

The conditions of the four trigger modes are as follows:

**FREE** allows the next sweep to start as soon as possible after the last sweep. The functions of TM FREE and **FREE RUN** are identical.

**VID** allows the next sweep to start if the trace data rises across a level set by the display line. The functions of TM VID and **VIDEO** are identical.

**LINE** allows the next sweep to start when the line voltage passes through zero, going positive. The functions of TM LINE and **LINE** are identical.

**EXT** allows the next sweep to start when an external voltage level passes through approximately 1.5 V, going positive. The external trigger signal level must be between 0 V and + 5 V. Connect the external trigger to the EXT TRIG INPUT. The functions of TM EXT and **EXTERNAL** are identical.

**TV** allows TV triggering if Options 101 and 102, or Option 301 is installed. The functions of TM TV and **TV TRIG** are similar. TM TV does not select the TV line number, set up the amplitude level, change the span, change the bandwidth, or change the sweep time.

---

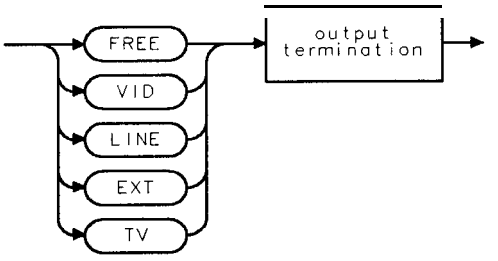
Note Some spectrum analyzer functions are not performed until the spectrum analyzer is triggered.

---



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## Query Response




QTM

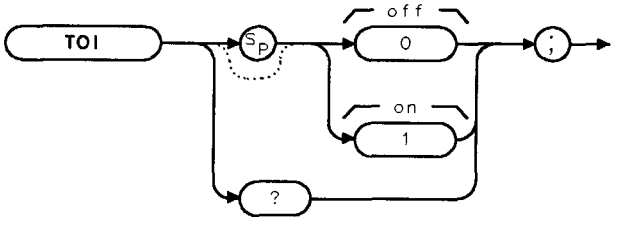


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# TO1
# Third-Order Intermodulation Measurement

Turns on or off the third-order inter-modulation (TOI) measurement.

## Syntax




XTOI

Equivalent **Softkey: TOI ON** OFF .
Related Commands: **AUNITS**, MKPX, TH, TOIR.

## Example

```
OUTPUT 718;"MOV TO1,1;"
```
*Turns on the third-order intermodulation measurement.*

```
OUTPUT 718;"TOIR?;"
```
*Queries TOIR. TOIR contains the results of the third-order intermodulation measurement.*

```
ENTER 718;Toi
```
*Stores the value of TOIR in the variable Toi.*

```
PRINT 'Third-order intermodulation is ",Toi
```
*Prints the results.*

```
OUTPUT 718;"MOV TOI,0;"
```
*Turns off the third-order intermodulation measurement.*

## Description

Setting TO1 to 1 turns on the third-order intermodulation measurement. Setting TO1 to 0 turns off the third-order intermodulation measurement. When the third-order intermodulation measurement is turned on, the spectrum analyzer first determines that there are four signals on the spectrum analyzer display; the four signals must be the two fundamental signals and two distortion products. All of the signals must be greater than the peak excursion above the threshold. If four valid signals could not be found for the third-order intermodulation measurement, the value of TOIR is -100. If four valid signals could be found, the spectrum analyzer does the following:

1. Finds the four highest on-screen signals. (If the four highest on-screen signals are not the two signals and two distortion products, the TOI measurement cannot be performed.)
2. Determines the spacing between the highest two signals. The highest two signals are tone A and tone B.
3. Verifies that the third and fourth highest signals (distortion A and distortion B) fall above and below tone A and tone B by the frequency difference between tone A and tone B.



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4. Measures the levels of the four signals (tone A, tone B, distortion A, and distortion B) and calculates the third-order intermodulation intercept.

The third-order intermodulation intercept is calculated as follows:

$$TOI = \frac{(2 \times Level_{Tone\ A} - Level_{Distortion\ A} + Level_{Tone\ B})}{2}$$

The frequency of the distortion product (Distortion A) is equal to the following:

$$Frequency_{Distortion\ A} = 2 \times Frequency_{Tone\ A} - Frequency_{Tone\ B}$$

You must query TOIR to determine the value of the higher third-order intermodulation product.

The third-order intermodulation measurement is repeated at the end of every sweep (TOI uses the ONEOS command to update the measurement data) until you turn off the third-order intermodulation measurement.

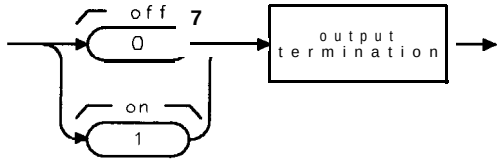
**Restrictions**

Turning the TO1 measurement on turns off the following functions: windows display mode (WINON), N dB point measurement (NDBPNT), the FFT menu measurements (FF'IAUTO, FFTCONTS, FFTSNGLS), gate utility functions (GDRVUTIL), marker table (MKTBL), peak table (PKTBL), percent AM (PCTAM), peak zoom (PKZOOM), and power menu measurements (ACP, ACPE, CHP, and OBW).

You can execute the TOI command two different ways. You can either execute the TOI command directly (for example, "TOI 1;") or use the MOV command to move the 1 or 0 into the TO1 command (for example, "MOV TOI, 1;"). If you use the MOV command, no text is displayed in the active function area during command execution.

Because TOI is performed at the end of every measurement sweep, you should turn off the third-order intermodulation measurement (set TOI to 0) when you are done with the third-order intermodulation measurement.

## Query Response




QTOI

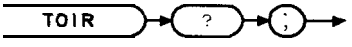


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# TOIR
# Third-Order Intermodulation Response

Returns the intercept point for the highest third-order intermodulation product measured by the third-order intermodulation measurement (TOI).

## Syntax




XTOIR

Related Commands: AUNITS, MKPX, TH, TOI.

## Example

```
OUTPUT 718;"MOV TOI,1;"
```
*Turns on the third-order intermodulation measurement.*

```
OUTPUT 718;"TOIR?;"
```
*Queries TOIR. TOIR contains the results of the third-order intermodulation measurement.*

```
ENTER 718;Toi
```
*Stores the value of TOIR in the variable Toi.*

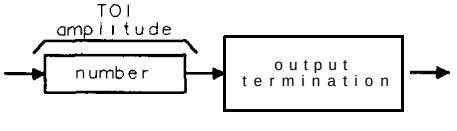
```
PRINT "Third-order intermodulation is ",Toi
```
*Prints the results.*

```
OUTPUT 718;"MOV TOI,0;"
```
*Turns off the third-order intermodulation measurement.*

## Description

TOIR returns a -100 if the TOI function has not been turned on, or if four on-screen signals are not valid or are not present. For TOI to perform a third-order intermodulation measurement, there needs to be four signals on the spectrum analyzer display, and all four signals must be greater than the peak excursion above the threshold.

## Query Response




QTOIR

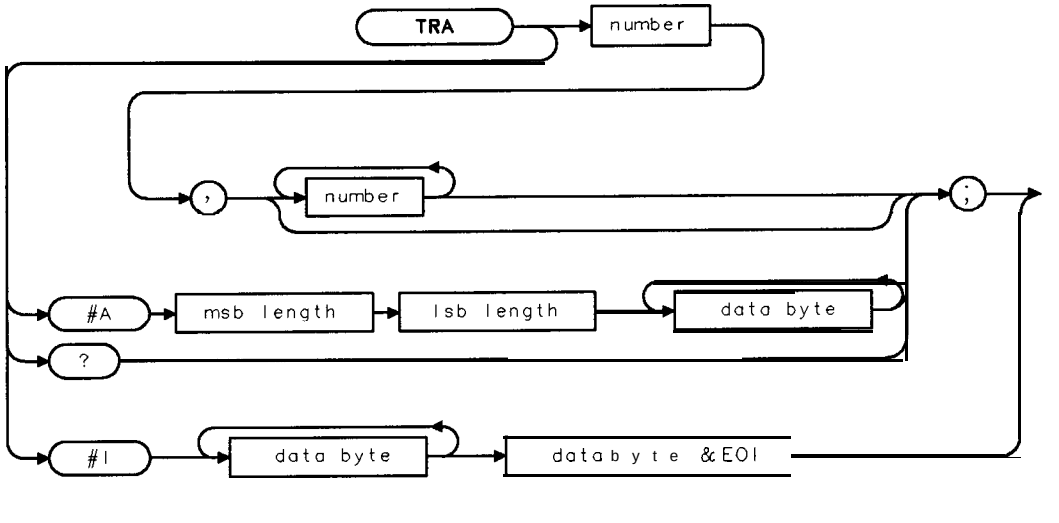


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# TRA/TRB/TRC
# Trace Data Input and Output

The TRA/TRB/TRC commands provide a method for returning or storing 16-bit trace values.

## Syntax




XTRA

Use the same syntax for TRB and TRC as shown for TRA, just substitute TRB or TRC for TRA.

| Item | Description/Default | Range |
|---|---|---|
| Number | **Any** real or integer number. | nteger number range |
| Msb length | Most signiflcant byte of a two-byte word that describes the number of bytes transmitted. | |
| Lsb length | Least signiflcant byte of a two-byte word that describes the number of bytes transmitted. | |
| Data byte | S-bit byte containing numeric or character data. | |
| Data byte & EOI | 8-bit byte containing numeric or character data followed by END. | |

Related Commands: LOAD, ONEOS, RCLT, SAVET, STOR, TDF.

## Example

```
10 REAL Trace_a(1:401)          Creates a 401-point trace array.
20 OUTPUT 718;"IP;"             Initializes analyzer.
30 OUTPUT 718;"TDF P;"          Changes the format for real numbers.
40 OUTPUT 718;"SNGLS;"
50 OUTPUT 718;"CF 300MHZ;"      Changes the center frequency.
60 OUTPUT 718;"SP 200MHZ;"      Changes the span.
70 OUTPUT 718;"TS;"
80 OUTPUT 718;"MKPK HI;"
90 OUTPUT 718;"MKCF;"           Mioves peak to center of analyzer screen.
100 OUTPUT 718;"TS;"            Updates measurement trace.
110 OUTPUT 718;"TRA?;"          Gets the trace data.
```



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```
120 ENTER 718;Trace_a(*)      Sends the trace data to the computer:
130 OUTPUT 718;"CONTS;"       Activates continuous sweep mode.
140 END
```

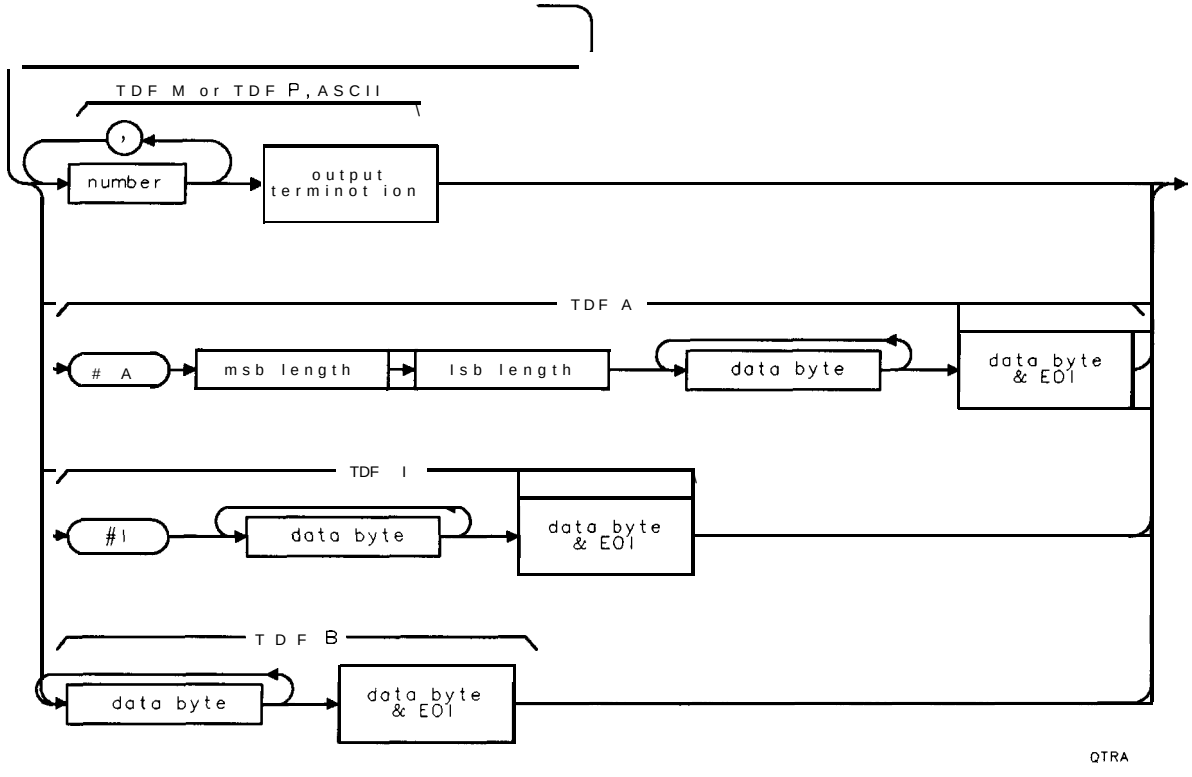
## Description

Trace data that is input in the A-block or the I-block format is treated as measurement units independent of trace data format (TDF). Enter words in measurement units only. The output format is specified according to TDF and MDS.

The command may be used to input integer data to traces. See “Saving Trace Data” in Chapter 3. Because the lengths of trace A, trace B, and trace C are fixed, there are always 401 or 802 bytes transferred during binary input or binary output mode, respectively.

## Query Response

The form of the query response is dependent upon the previously used TDF and MDS commands as follows:




If Analog+ display mode is turned on, only the 401 or 802 bytes of trace data are returned; the dot display is not returned.

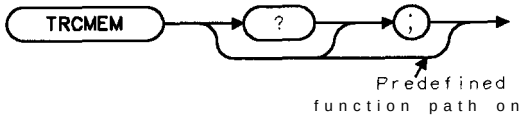


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# TRCMEM
# Trace Memory

Returns a nonnegative integer that indicates the total number of trace registers available for SAVET and RCLT.

## Syntax




XTRCMEM

Related Commands: ACTDEF, DISPOSE, FUNCDEF, RCLT, SAVET, TRDEF

### Example

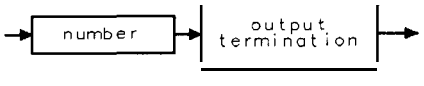
```
OUTPUT718;"TRCMEM?;"
ENTER 718;Number
DISP Number
```

*Gets the total number of trace registers.*

### Description

The value of TRCMEM is displayed on the spectrum analyzer display when you save a trace, limit-line table, or table of amplitude correction factors in spectrum analyzer memory with Trace **-> Internl** .

### Query Response




QQ1

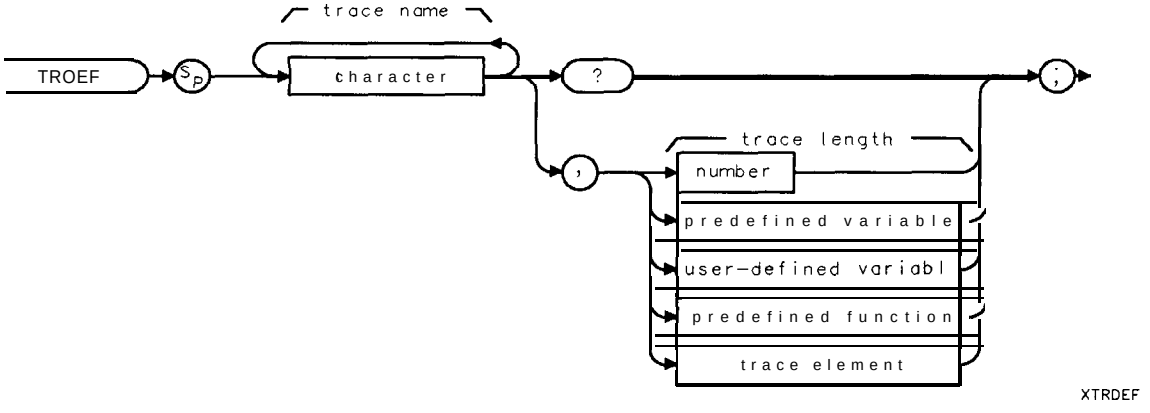


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# TRDEF
# Trace Define

Creates a user-defined trace.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Character | Any valid character. | 2 to 11 characters long, A through Z and the underscore (the underscore should be used as the second character of the label). |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-1. | |
| Predefined function | Function that returns a value. Refer to Table 5-l. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |
| Number | Any real or integer number. | 2 to 2047. |

Parameter Value: 2 to 2047.
Prerequisite Commands: ACTDEF or VARDEF when using a user-defined variable.
Related Commands: DISPOSE.

## Example

```
OUTPUT 718;"TRDEF NEW,100;"
```

*Defines a trace called NEW*



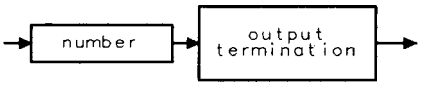
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## Description

The TRDEF command defines a trace and the number of points the trace will contain. Each trace element consists of 16 bits and stores the trace amplitude in measurement units. See the description for the TDF M format that is described in “Different Formats for Trace Data Transfers” in Chapter 3 for more information about measurement units.

## Query Response

The query response returns the number of trace elements in the trace.




QQ1

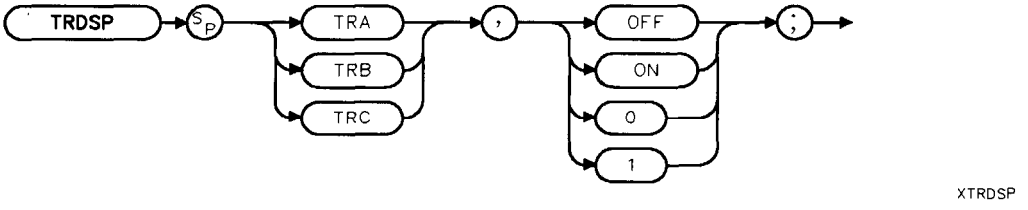


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# TRDSP
## Trace Display

Turns on or off the display of trace A, B, or C without clearing the trace (measurements can still be taken).

### Syntax




Related Commands: TRPRST, TRSTAT.
Restrictions: Not available with Analog+ display mode. See “ANLGPLUS” for more information.

### Example

```
OUTPUT 718;"TRDSP TRA,OFF;"
```

### Description

TRDSP OFF reduces the time duration between sweeps.

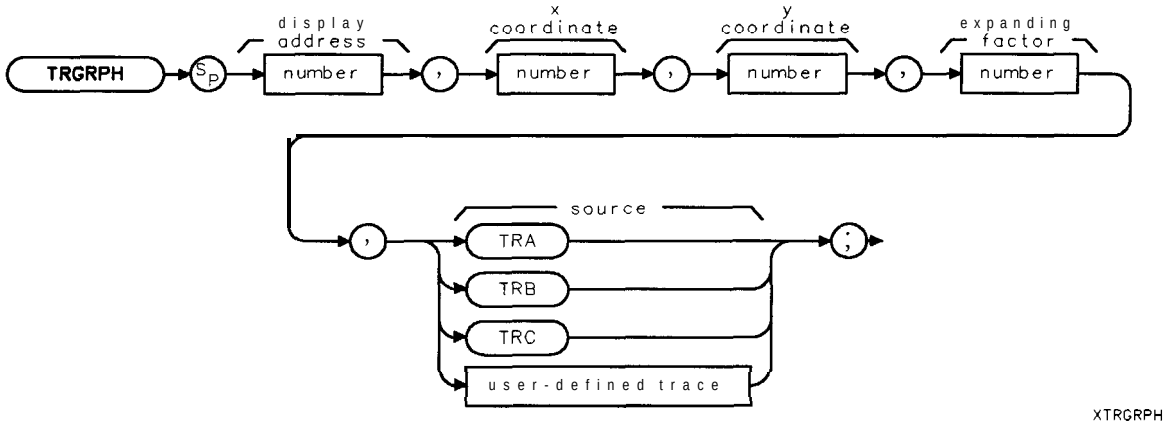


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# TRGRPH
# Trace Graph

Displays a compressed trace on the spectrum analyzer display.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. | 0 to 4000 for the *x* coordinate, 0 to 8000 for the y coordinate. |
| Number (expanding factor) | Any valid integer. | 0 to 100. |
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |

Prerequisite Commands: TRDEF when using a user-defined trace.
Related Commands: COMPRESS, DSPLY.

## Example

```
OUTPUT 718;"IP;"                          Initializes analyzer
OUTPUT 718;"TRDEF NEW,100;"               Defines a trace called NEW with 100 trace
                                          elements.
OUTPUT 718;"CF 300MHZ;SNGLS;"             Changes the center frequency, activates single-
                                          sweep mode.
OUTPUT 718;"TS;"                          Takes sweep.
OUTPUT 718;"COMPRESS NEW,TRA,POS;"        Compresses the contents of trace A into trace
                                          NEW
OUTPUT 718;"BLANK TRA;"
OUTPUT 718;"TRGRPH 0,0,400,4,NEW;"        Redraws trace NEW 400 measurement units
                                          above the baseline, expanded by a factor of 4.
```



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## Description

The x and *y* coordinates specify the position of the first trace element. Each horizontal division represents 40 x coordinates. Each vertical division represents 1000 *y* coordinates. The display address is inoperative; it is specified for backward compatibility only. The trace can be expanded according to the scale determined by the expanding factor.

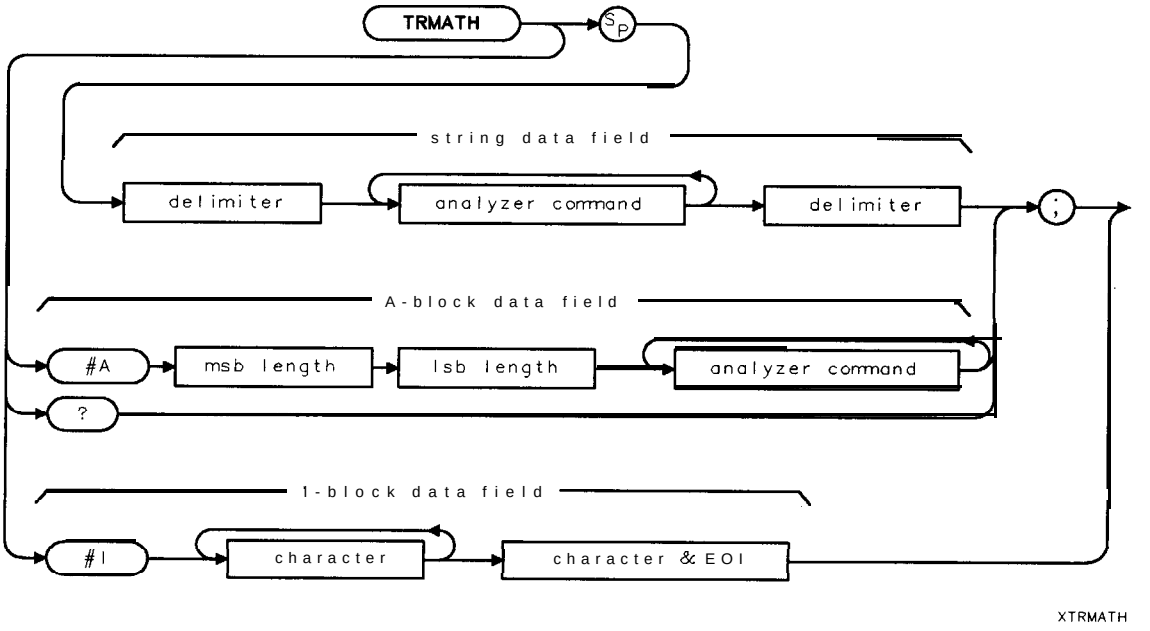


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# TRMATH
# Trace Math

Executes a list of spectrum analyzer commands at the end of each sweep.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Delimiter | Matching characters marking the beginning and end of the list of analyzer commands. | ~ \| \ @ = / ^ $ % ; ! ' : " & |
| Analyzer Command | Any spectrum analyzer command except TS. | |
| Msb length | Most significant byte of a two-byte word that describes the number of bytes transmitted. | |
| Lsb length | Least significant byte of a two-byte word that describes the number of bytes transmitted. | |
| Character | Any valid character. | |
| Character & EOI | Any valid character and END. | |

Related Commands: LIMITEST, ONDELAY, ONEOS, ONMKR, ONSRQ, ONSWP, ONTIME.



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## Example

The program below halves the amplitude of trace A and moves it to trace B.

```
OUTPUT 718;"CLRW TRA;VIEW TRB;"          Displays trace B.
OUTPUT 718;"DISPOSE TRMATH;"             Disposes of existing TRMATH commands.
OUTPUT 718;"TRMATH! DIV TRB,TRA,2!;"     Divides trace A by 2 and moves it into trace
                                         B.
```

## Description

The TRMATH command executes the list of spectrum analyzer commands at the end of each sweep. Any spectrum analyzer command except TS is allowed within the list of commands.

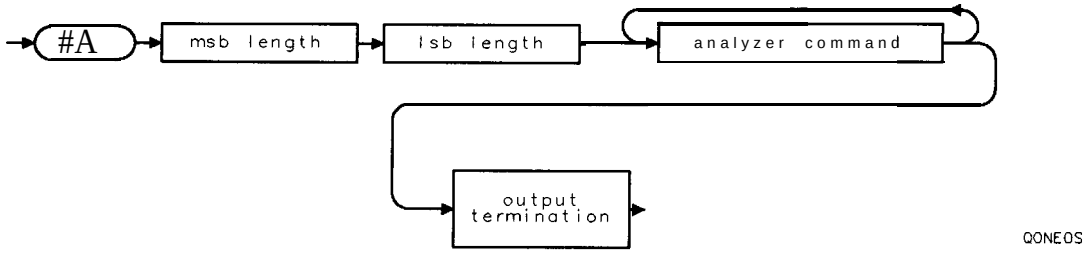
The operands and results of trace math are truncated if they are not within certain limits. If operating on traces A, B, or C, trace lengths must be less than or equal to 401. If operating on user-defined traces, results must be less than or equal to 2047.

After the TRMATH command is executed, any current ONEOS definitions are executed, and then any current limit-line testing (LIMITEST).

Limit the number of characters (between the delimiters) in the list of spectrum analyzer commands to a maximum of 2047 characters.

**Clearing the TRMATH definition:** IP clears the TRMATH definition. You can use the DISPOSE command to clear the TRMATH definition also.

## Query Response






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# TRPRST
# Trace Preset

Sets the trace operations to their preset values.

## Syntax




XTRPRST

Related Commands: AMB, BLANK, CLRDSP, CLRW, DISPOSE, DL, IP, TH.

## Example

```
OUTPUT 718;"TRPRST;"
```

## Description

TRPRST executes these commands:

AMB OFF
AMBPL OFF
ANLGPLUS OFF
BLANK TRB
BLANK TRC
CLRW TRA
DISPOSE ONEOS
DISPOSE ONSWP
DISPOSE TRMATH
DL OFF
EM
TH OFF

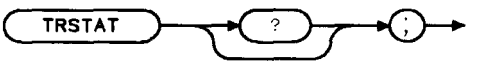


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# TRSTAT
# Trace Status

Returns the status of traces A, B, and C: clear write, blank, view, minimum hold, or maximum hold.

## Syntax




XTRSTAT

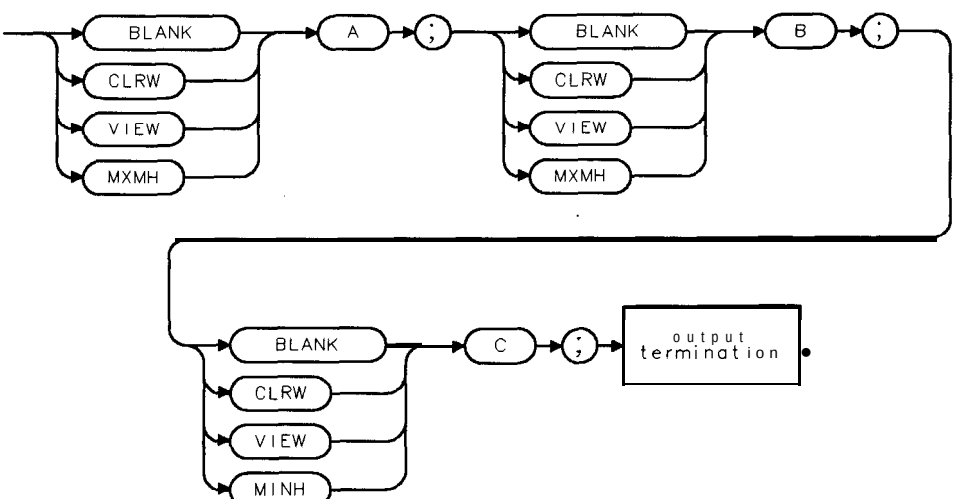
Related Commands: BLANK, CLRW, DET, MINH, TRDSP, VIEW.

## Example

This example returns the measurement state of traces A, B, and C.

```
DIM States$[40]                 Declares array for results.
OUTPUT718;"TRSTAT?;"            Returns the status results to the computer:
ENTER 718 USING "-K";States$
PRINT States$                   Prints out status of traces.
```

## Query Response




QTRSTAT



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# TS
# Take Sweep

Starts and completes one full sweep before the next command is executed.

## Syntax




XTS

Related Commands: SNGLS, TM.

## Example

```
OUTPUT 718;"SNGLS;TS;"
```

*Activates the single-sweep mode, and performs a take sweep.*

## Description

A take sweep is required for each sweep in the single-sweep mode. TS prevents further input from the interface bus until the sweep is completed to allow synchronization with other instruments.

In the example below, the command sequence does not allow sufficient time for a full sweep of the specified span before VIEW is executed. Therefore, only the span set by the instrument is displayed in trace A.

```
OUTPUT 718;"IP;SNGLS;CF 400MHZ;SP 20KHZ;VIEW TRA;"
```

A TS command inserted before VIEW makes the spectrum analyzer take one complete sweep before displaying trace A. This allows the spectrum analyzer sufficient time to respond to each command in the

sequence.

```
OUTPUT 718;"IP;CF 400MHZ;SP 20MHZ;TS;VIEW TRA;"
```

TS is recommended before transmission of marker data and before executing marker operations such as peak search. This is because the active marker is repositioned at the end of each sweep. When the spectrum analyzer receives a TS command, it is not ready to receive any more data until one full sweep has been completed. However, when slow sweep speeds are being used, the controller can be programmed to perform computations or address other instruments while the spectrum analyzer completes its sweep.

On-event commands (ONCYCLE, ONDELAY, ONEOS, ONMKR, ONSRQ, ONSWP, ONTIME, and TRMATH) do not interrupt a take sweep.

**Note** When MKPAUSE or MKSTOP are activated, TS considers the sweep complete when it reaches the active marker.

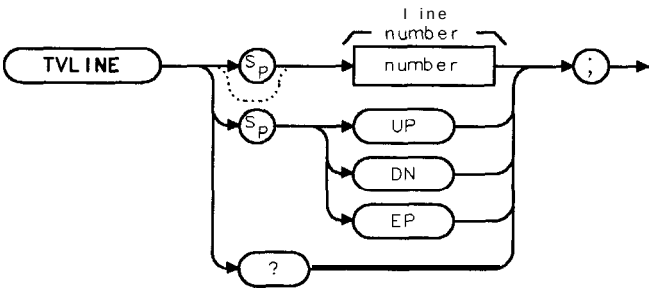


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# TVLINE
# TV Line

Selects which horizontal line of video to trigger on.

## Syntax




XTVLINE

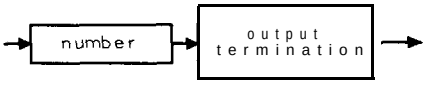
| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer number. Default value is 17. | 1 to 1012. |

Equivalent **Softkey:** TV **LINE #** .
Options Required: Options 101 and 102, or Option 301.
Preset Value: 17.
Related Commands: HAVE, TVSFRM, TVSTND.

## Example

```
OUTPUT 718;"TVLINE 20;"
```

## Query Response



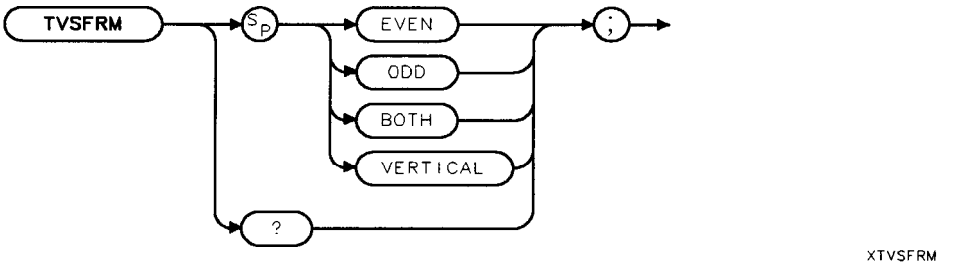



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# TVSFRM
# TV Frame

Selects the type of video frame to trigger on.

## Syntax




Options Required: Options 101 and 102, or Option 301.
Related Commands: HAVE, TVLINE, TVSYNC.

## Example

```
OUTPUT 718;"TVSFRM BOTH;"
```

## Description

The ODD and EVEN trigger are for interlaced formats, and VERTICAL is for noninterlaced display formats.

The functions of TVSFRM ODD, TVSFRM EVEN, and TVSFRM BOTH are identical to TV TRIG ODD FLD , TV TRIG EVEN FLD , and TV TRIG VERT INT , respectively. TVSFRM BOTH is the same as TVSFRM VERTICAL.

When used as a predefined variable, TVSFRM returns a number. The number that is returned depends upon the setting of the TVSFRM parameter, as shown in the following table.

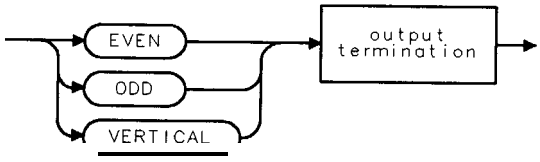
| TVSFRM Parameter Setting | Value Returned |
|---|---|
| VERTICAL or BOTH | 0 |
| EVEN | 1 |
| ODD | 2 |



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**TVSFRM TV Frame**

## Query Response




QTVSFRM

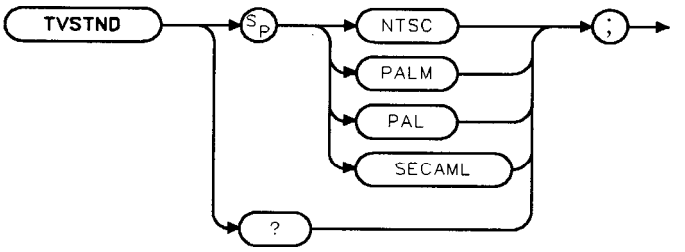


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# TVSTND
# TV Standard

Selects the triggering for NTSC, PAL, PAL-M, and SECAM-L formats.

## Syntax




XTVSTND

Equivalent Softkey: TV Standard.
Options Required: Options 101 and 102, or Option 301.
Related Commands: TM, TVLINE, TVSYNC.

## Example

```
OUTPUT 718;"TVSTND PAL;"
```

## Description

TVSTND sets corrections for TVLINE for each standard format. TVSTND sets the polarity to trigger on (positive or negative) automatically; it is necessary to use TVSYNC after using TVSTND only if you require a non-standard format.

When used as a predefined variable, TVSTND returns a number. The number that is returned depends upon the setting of the TVSTND parameter, as shown in the following table.

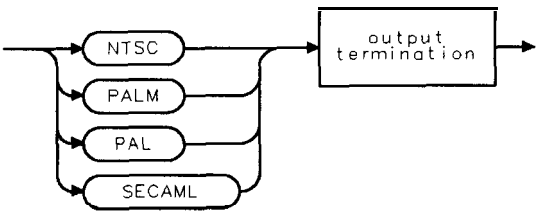
| TVSTND Parameter setting | Value Returned |
|---|---|
| NTSC | 0 |
| PALM | 1 |
| PAL | 2 |
| SECAML | 3 |



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**TVSTND TV Standard**

Query Response




QTVSTND

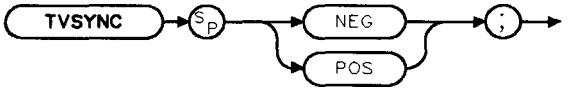


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# TVSYNC
# TV Sync

Selects the polarity of video modulation to trigger on.

## Syntax




XTVSYNC

Equivalent **Softkey:** TV SYNC NEG POS .

Options Required: Options 101 and 102, or Option 301.
Preset Value: TVSYNC NEG.
Related Commands: HAVE, TVLINE, TVSFRM, TVSTND.

### Example

OUTPUT 718; "TVSYNC POS;"

### Description

TVSYNC allows you to trigger on the negative or positive modulation video format. TVSTND changes the triggering polarity for the selected video format.

When used as a predefined variable, TVSYNC returns a "0" when TVSYNC is set to POS, a " 1" if TVSYNC is set to NEG.

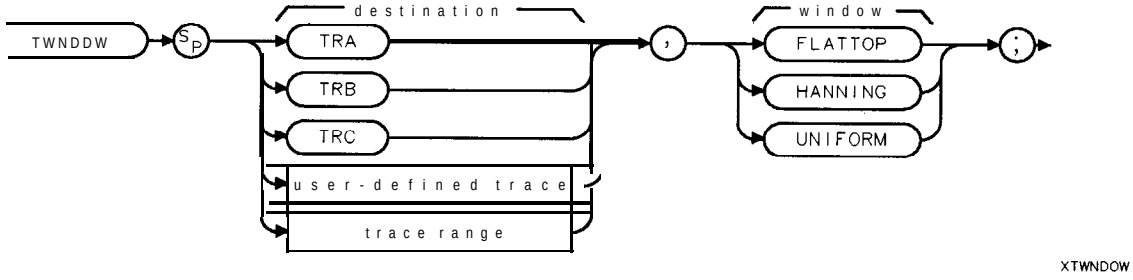


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# TWNDOW
# Trace Window

Creates a window trace array for the fast Fourier transform (FFT) function.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| Trace Range | A segment of trace A, trace B, trace C, or a user-defined trace | |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.
Related Commands: FFT.

## Example

Connect calibrator signal to the spectrum analyzer input.

```
OUTPUT 718;"IP;"                        Initializes analyzer:
OUTPUT 718;"CF 300MHZ;"                 Changes the center frequency.
OUTPUT 718;"SP 0HZ;ST 800MS;"           Changes span, sweep time.
OUTPUT 718;"TRDEF NEW,401;"             Defines a trace called NEW
OUTPUT 718;"TWNDOW NEW,UNIFORM;"        Trace NEW stores the window algorithm, UNIFORM.
OUTPUT 718;"CLRW TRB;"
OUTPUT718;"SNGLS;TS;TS;"                Activates single-sweep mode and updates trace.
OUTPUT 718;"FFT TRA,TRB,NEW;"           Performs fast Fourier transform on trace B and
                                        stores the results in trace A.
OUTPUT 718;"BLANK TRB;"
OUTPUT 718;"VIEW TRA;"                  Displays the result.
```

## Description

The trace window function creates a trace array according to three built-in algorithms: UNIFORM, HANNING, or FLATTOP. When used with the FFT command, the three algorithms give resultant passband shapes that represent a give-and-take between amplitude uncertainty, sensitivity, and frequency resolution. See “FFT” for more information about these algorithms and the FFT function.



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# UP
# Up

Increases the value of the active function by the applicable step size.

## Syntax




XUP

Related Commands: See the list of active functions listed in the description for UP

## Example

```
OUTPUT 718;"IP;MKN;RB 10KHZ;MKPK NH;UP;"
```

*Increases the resolution bandwidth to 30 kHz because MKPK NH does not change the active function.*

## Description

Before executing UP, be sure that the function to be decreased is the active function. For example, the programming example increases the resolution bandwidth, because marker peak (MKPK) is not an active function.

The active functions are ACPBW, ACPSP, AT, CF, CRTHPOS, CRTVPOS, DL, DOTDENS, FA, FB, FMGAIN, GD, GL, LG, MKA, MKD, MKFCR, MKN, MKPAUSE, MKPX, ML, NDB, NRL, RB, RCLS, ROFFSET, RL, RLPOS, SAVES, SAVRCLN, SETDATE, SETTIME, SP, SQLCH, SRCALC, SRCAT, SRCPOFS, SRCPSWP, SRCPWR, SRCTK, SS, ST, TH, TVLINE, VB, VBR, and user-defined active function specified by the ACTDEF command.

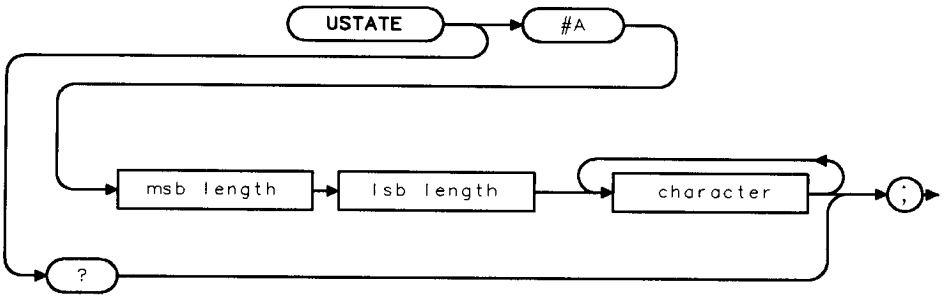


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# USTATE
# User State

Transmits information that has been stored in the spectrum analyzer by the user.

## Syntax




XUSTATE

| Item | Description/Default | Range |
|---|---|---|
| Msb length | Most significant byte of a two-byte word that describes the number of bytes transmitted. | |
| Lsb length | Least significant byte of a two-byte word that describes the number of bytes transmitted. | |
| Character | Any valid character. | |

Related Commands: FUNCDEF, KEYDEF, ONEOS, SAVES, TRDEF, VARDEF.

## Example

```
DIM User$[20000]                 Dimensions a string to store the user state data.
OUTPUT 718;"USTATE?;"            Sends contents of user state memory to the computer.
ENTER 718 USING "#,-K";User$     Stores contents in string. "-K" allows control codes to
                                 be treated as characters.
```

## Description

The user state information contains the contents of user memory, which contains:

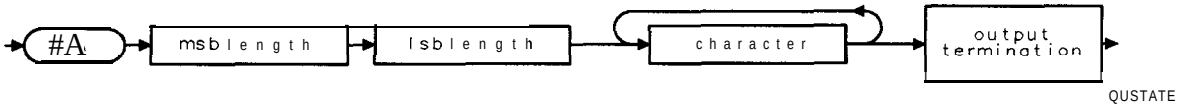
- User-defined functions (FUNCDEF).
- User-defined variables (VARDEF).
- On-cycle algorithm (ONCYCLE).
- On-delay algorithm (ONDELAY).
- On-end-of-sweep algorithm (ONEOS).
- On-marker algorithm (ONMKR).
- On-SRQ algorithm (ONSRQ).
- On-time algorithm (ONTIME).
- User-defined keys (KEYDEF).
- User-defined trace arrays (TRDEF).
- Values stored in user-defined variables and user-defined traces.



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## Query Response

USTATE? returns the user state to the computer. Also returned are instructions required by the spectrum analyzer when the user state information is transmitted to the spectrum analyzer. The contents of user memory can be restored by executing USTATE followed by the A-block data retrieved by a previous "USTATE?;" command.




QUSTATE

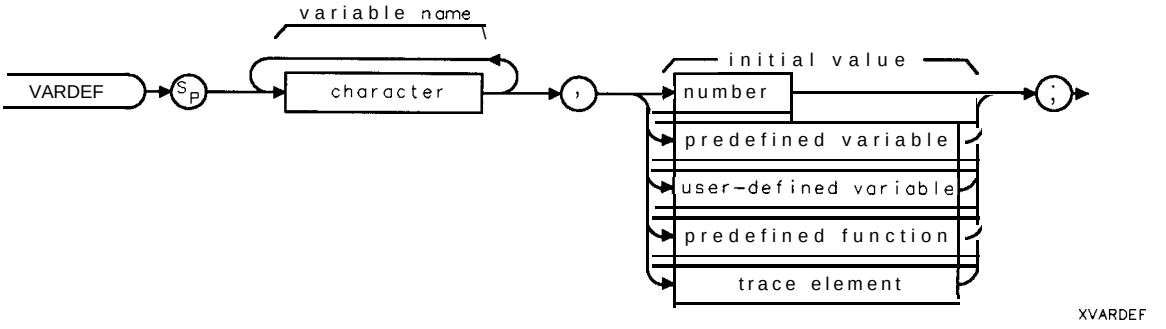


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# VARDEF
# Variable Definition

Creates a user-defined variable and assigns it a value.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Character | Any valid character. | 2 to 11 characters long, A through Z and the underscore (the underscore should be used as the second character of the label). |
| Number | Any real or integer number. | Real number range. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-l. | |
| Predefined function | Function that returns a value. Refer to Table 5-1. | |
| Trace element | An element of trace A, trace B, trace C, or a user-defined trace. | |

Related Commands: DISPOSE, TRDEF'.



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## Example

```
OUTPUT 718;"VARDEF V_AR,0;"

DISP "ENTER THE VALUE OF THE VARIABLE USING
THE ANALYZER KEYS"
OUTPUT 718;"V_AR EP;"

OUTPUT 718;"V_AR?;"
ENTER 718;N

PRINT N
OUTPUT 718;"IP;"
OUTPUT 718;"V_AR?;"

ENTER 718;N
PRINT N
```

*Defines variable called V-AR and assigns it a value of 0.*

*The value of VAR is changed by using the front-panel controls.*

*Returns entered value of V_AR to the computer:*
*Displays value on the computer screen.*
*Initializes analyzer.*
*The value of V-AR changes to its initial value after an I.*

*Displays "0."*

## Description

The VARDEF command creates a user-defined variable and assigns it a value. User-defined variables can be used in many of the spectrum-analyzer remote-control processes. Use user-defined variables wherever "user-defined variable" appears in the syntax diagrams. An instrument preset (IP) sets user-defined variables to their initial value (see example).

An error results if a variable name is the same as any reserved word. Table 5-2 lists reserved words.

User-defined variables occupy spectrum analyzer memory. Use the DISPOSE command to clear user-defined variables from memory.

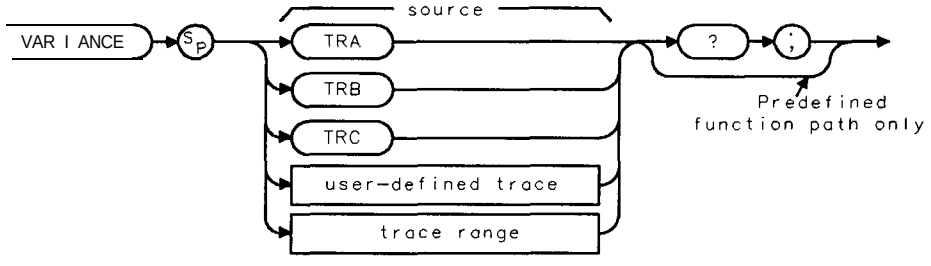


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# VARIANCE
## Variance of Trace Amplitudes

Returns the amplitude variance of the specified trace, in measurement units.

### Syntax




XVAR I ANCE

| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | **A** trace **defined** by the TRDEF command. | Any valid trace name. |
| Trace range | **A** segment of trace **A,** trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. TS when using trace data.
Related Commands: MEAN, RMS, STDEV.

### Example

```
OUTPUT 718;"IP;"                    Initializes analyzer.
OUTPUT 718;"SNGLS;TS;"              Activates single-sweep mode.
OUTPUT 718;"VARIANCE TRA?;"         I&turns variance of trace A to computer:
ENTER 718;Number                    Stores value in computer variable.
DISP Number;"MEASUREMENT UNITS"     Displays the results on computer screen.
```

### Description

Taking the square root of a variance yields the standard deviation value.

The formula to calculate the variance is as follows:

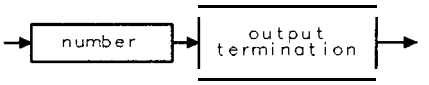
$$\frac{\sum_{i=1}^{n}(\overline{x} - x_i)^2}{n - 1}$$

$n$ represents the number of data points.
$x_i$ represents a data point.
$\overline{x}$ represents the mean of data.



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## Query Response




QQ1

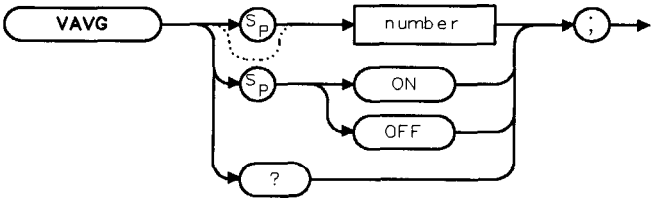


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# VAVG
# Video Average

Enables the video-averaging function, which averages trace points to smooth the displayed trace.

## Syntax




XVAVG

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid integer. Default is 100. | 1 to 16384. |

Equivalent **Softkey**: VID **AVG ON** OFF .
Related Commands: AUTO, CLRAVG, IP, SMOOTH.
Restrictions: Not available with Analog+ display mode. See "ANLGPLUS" for more information.

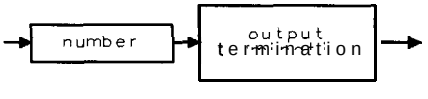
## Example

```
OUTPUT 718;"VAVG 150;"
```
*Video averages the trace.*

## Description

Use VAVG to view low-level signals without slowing the sweep time. Video averaging can lower the noise floor by more than a 30 Hz video bandwidth if a large number of sweeps has been specified for averaging. VAVG may also be used to monitor instrument state changes (for example, changing bandwidths, center frequencies) while maintaining a low noise floor. The active function readout indicates the number of sweeps to be averaged; the default for the number of sweeps is 100 unless otherwise specified. Executing "VAVG OFF;" turns off video averaging. Executing "VAVG ON;" turns on video averaging.

## Query Response




QQ1

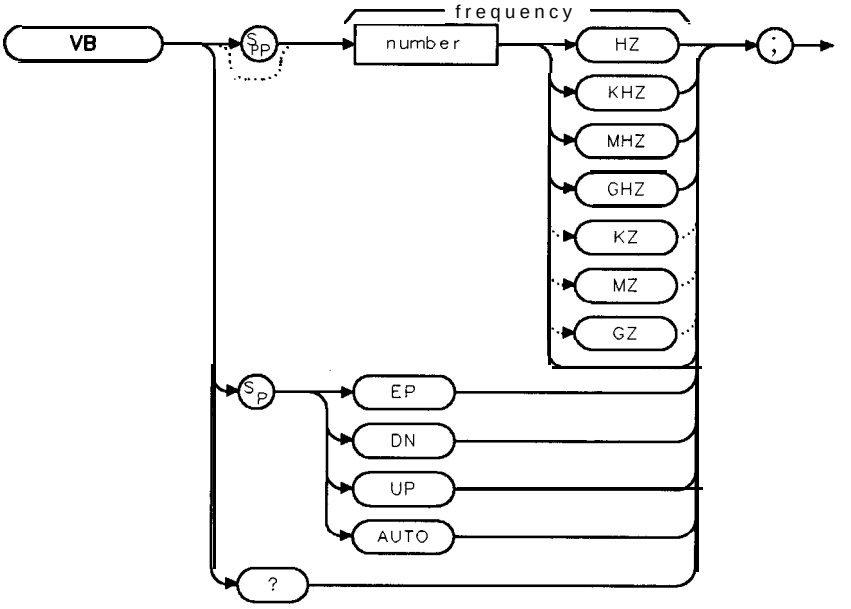


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# VB
# Video Bandwidth

Specifies the video bandwidth, which is a post-detection, low-pass filter.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | 30 Hz to 3 MHz. |

Equivalent Softkey: VID BW AUTO MAN.
Preset State: 1 MHz.
Step Increment: In a 1, 3, 10 sequence.
Related Commands: AUTO, RB, SP, ST, VBR.

## Example

```
OUTPUT 718;"VB 10KHZ;"
```
*Changes the video bandwidth to 10 kHz.*

## Description

The resolution bandwidth, video bandwidth, and sweep time are normally coupled to the span. Executing VB uncouples video bandwidth from resolution bandwidth (it does nothing to the sweep-time, resolution-bandwidth, and span coupling). Executing AUTO recouples video bandwidth to the resolution bandwidth.

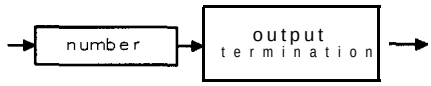
Frequency values other than the values in the 1, 3, 10 sequence are rounded to the nearest permissible value.



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**VB Video Bandwidth**

Query Response




QQ1

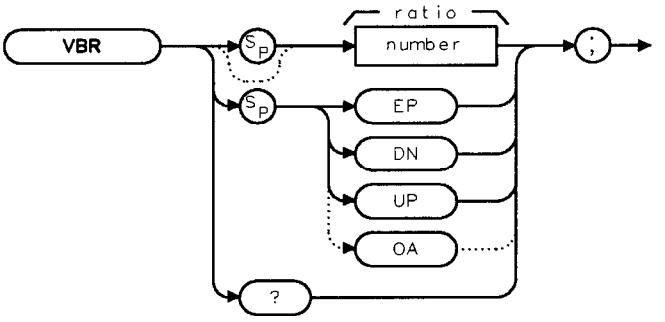


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# VBR
# Video Bandwidth Ratio

The VBR parameter is multiplied by the resolution bandwidth to determine the automatic setting of video bandwidth.

## Syntax




XVBR

| Item | Description/Default | Range |
|---|---|---|
| Number | Any valid real number. | 0 to 3000000 |

Equivalent Softkey: VBW/RBW RATIO .
Preset State: 0.300.
Step Increment: 1, 3, 10 sequence.
Related Commands: AUTO, RB, SP, VB.

## Example

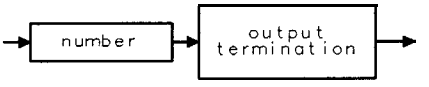
```
OUTPUT 718;"VBR 1;"
```

## Description

Ratio values other than the values in the 1, 3, 10 sequence are rounded to the nearest permissible value.

VBR returns a real number when used as a predefined variable.

## Query Response




QQ1

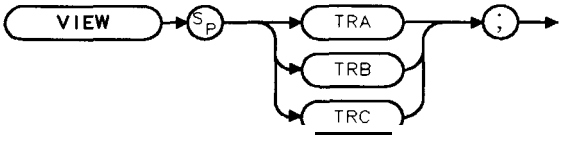


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# VIEW
## View Trace

Displays trace A, trace B, or trace C, and stops taking new data into the viewed trace.

### Syntax




XVIEW

Equivalent **Softkey:** VIEW A , VIEW B , and VIEW C .
Related Commands: BLANK, CLRW, MINH, MXMH.
Restrictions: Not available with Analog+ display mode. See "ANLGPLUS" for more information.

### Example

```
OUTPUT 718;"VIEW TRA;"
```

### Description

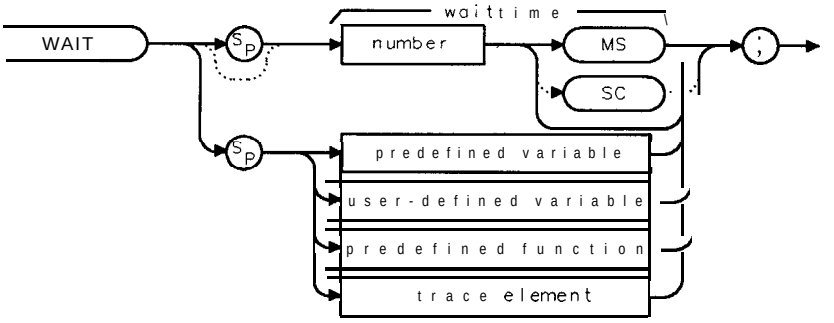
In the VIEW mode the trace is not updated. When VIEW is executed, the contents of the trace are stored in display memory.



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# WAIT
# Wait

Suspends all spectrum analyzer operation for the specified time duration.




XWAIT

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is seconds. | 1 ms to 1000 s. |

## Example

Use WAIT to suspend spectrum analyzer operation.

```
130 OUTPUT 718;"TRDSP TRA,OFF;TS;"
140 OUTPUT 718;"WAIT 2SC;"
150 OUTPUT 718;"TRDSP TRA,ON;"
```

*Blanks trace A.*
*Suspends analyzer operation for 2 seconds.*
*Displays trace A.*

## Description

The WAIT command suspends *all* spectrum analyzer operation for the specified time. Use the ONDELAY command if you want the spectrum analyzer to keep taking data during the elapsed time period.



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# WINNEXT
## Window Next

When using the windows display mode, you can use **WINNEXT** to select the upper or lower window as the active window.

### Syntax




XWINNEXT

Equivalent Front-Panel Key (HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963 only): NEXT.
Related Commands: **WINON**, **WINOFF**.

### Example

| | |
|---|---|
| `OUTPUT 718;"WINON;"` | *Turns on the windows display mode.* |
| `OUTPUT 718;"WINNEXT;"` | *Selects the window that is currently not active to be the active window.* |

### Description

When the windows display mode is activated, there will be two windows displayed on the spectrum analyzer display. Only one of the windows is active (the currently active window will have a solid line around the graticule rather than a broken line.) You can use the **WINNEXT** command to select the active window.



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# WINOFF
# Window Off

Turns off the windows display mode.

## Syntax




XWINOFF

Equivalent **Softkey** (HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963 only): **WINDOWS OFF**.
Related Commands: **WINON**.

## Example

| | |
|---|---|
| `OUTPUT 718;"WINON;"` | ***Turns on** the windows display **mode**.* |
| OUTPUT 718; "WINNEXT; " | *Selects the window that is currently not active to be the active window.* |
| OUTPUT 718; `"WINOFF;"` | *Turns **off** the windows display **mode**.* |

## Description

When you execute **WINON**, there will be two windows displayed on the spectrum analyzer screen. You must execute **WINOFF** to turn the windows off and return to a single display, and the display will have the settings of the last active window. In contrast, **WINZOOM** also changes from two windows to one full screen display but does not exit the windows display mode; you can still access the second window by executing **WINZOOM** again.



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# WINON
# Window ON

Displays the two windows on the spectrum analyzer display.

## Syntax




XWINON

Equivalent Front-Panel Key (HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963 only): ON.
Related Commands: **WINOFF, WINNEXT, WINZOOM.**

## Example

```
OUTPUT 718;"WINON;"
```

## Description

**WINON** activates the windows display mode and the zone marker.

**Windows display mode:** When the windows display mode is first activated, there will be two windows displayed on the spectrum analyzer display. Only one of the windows is active (the active window will have a solid line around the graticule rather than a broken line.) You can use the **WINNEXT** command to select the active window. The instrument state of the active window can be changed without affecting the state of the inactive window.

**Zone marker:** The zone marker is shown in the upper window by two vertical lines. The frequency span between the two edges of the zone marker is the frequency range of the lower window. The zone marker can be moved and changed by using the ZMKCNTR, ZMKSPAN, ZMKPKNR, or ZMKPKNL programming commands. Changing the span or center frequency of the lower window will change the span or location of the zone marker on the upper window correspondingly.

Most programming commands can be executed when the windows display mode is used. Some functions cannot be used with the windows display mode, however. Table 5-11 lists the programming commands that, when executed, exit the windows display mode.



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**Table 5-11.**
**Programming Commands That Exit The Windows Display Mode**

| Command | Description |
|---|---|
| ACP | Measures adjacent channel power. |
| CAL | Performs the calibration routines. |
| CHP | Measures channel power. |
| CNF | Performs the confidence test. |
| DISPOSE ALL or ERASE | Disposes of the contents of user memory. |
| FFTAUTO, FFTCONTS, FFTSNGL! | Initiates a FFT measurement. |
| GDVRUTIL | Accesses the time-Sate functions. |
| IP | Performs an instrument preset. |
| LF | Performs an instrument preset into base band |
| NDBPNT | Measures NdB bandwidth. |
| OBW | Measures occupied bandwidth. |
| PCTAM | Measures the percent AM. |
| PKZOOM | Performs the peak zoom routine. |
| TOI | Makes a third order intercept measurement. |

When in the windows display mode, saving the trace or state saves the state of the currently active window only. The recall state function recalls the stored state into the currently active window.

You must execute WINOFF to turn the windows off.



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# WINZOOM
# Window Zoom

When using the windows display mode, you can use **WINZOOM** to either expand the size of the active window so that it fills the entire spectrum analyzer display, or display both the upper and lower windows on the spectrum analyzer display.

## Syntax




XWINZOOM

Equivalent Front-Panel Key (HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963 only): (ZOOM).
Related Commands: **WINNEXT**, **WINON**.

## Example

```
OUTPUT 718;"WINON;"        Turns on the windows display mode.
OUTPUT 718;"WINZOOM;"      Expands the size of the active window.
```

## Description

The first time **WINZOOM** is executed, it expands the active window. Executing **WINZOOM** again restores the windows display mode so that both of the windows are displayed on the spectrum analyzer display.

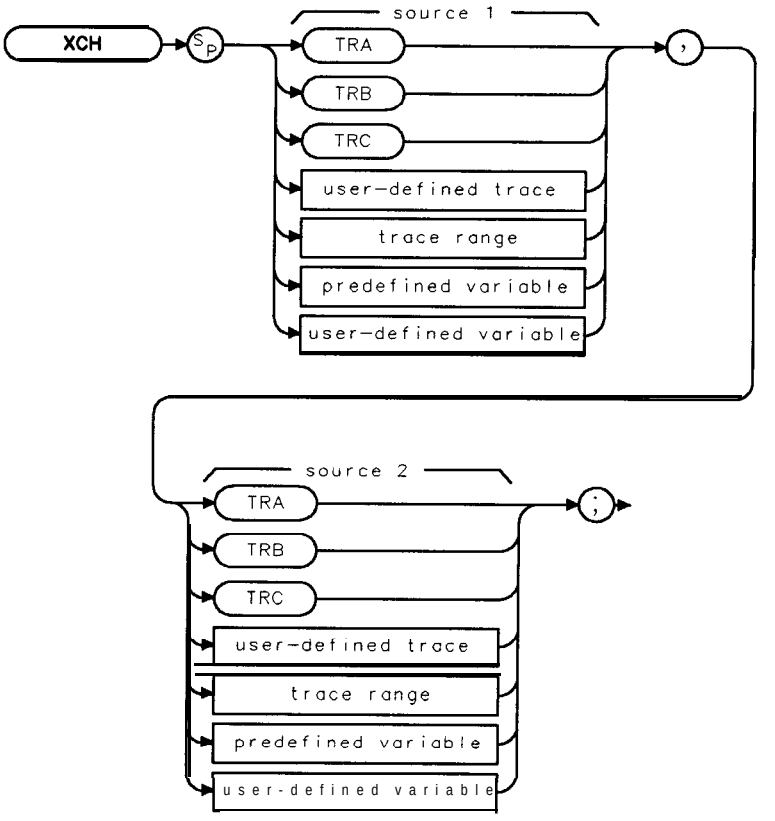


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# XCH
# Exchange

Exchanges the contents of sources 1 and 2.

## Syntax




XXCH

| Item | Description/Default | Range |
|---|---|---|
| User-defined trace | A trace defined by the TRDEF command. | Any valid trace name. |
| User-defined variable | A variable defined by VARDEF or ACTDEF commands. | Any valid variable name. |
| Predefined variable | A command that acts as a variable. Refer to Table 5-l. | |
| Trace range | A segment of trace A, trace B, trace C, or a user-defined trace. | |

Prerequisite Commands: TRDEF when using a user-defined trace. ACTDEF or VARDEF for a user-defined variable. TS when using trace data.
Related Commands: AXB, BXC.



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## Example

```
OUTPUT 718;"XCH TRA,TRB;"
```
*Exchanges the contents of trace A with trace B.*

## Description

When the source is longer than the destination, the source is truncated to fit. When the source is shorter than the destination, the last element is repeated to fill the destination.

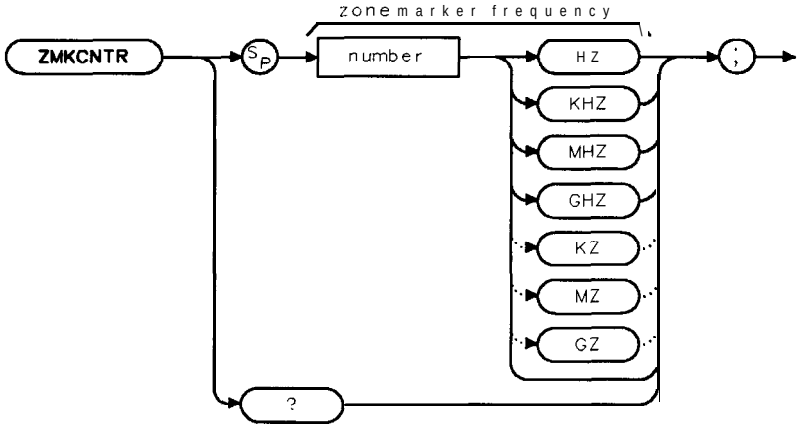


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# ZMKCNTR
# Zone Marker at Center Frequency

Positions the zone marker at the specified frequency.

## Syntax




XZMKCNTR

| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | Frequency range of the spectrum analyzer. |

Equivalent **Softkey** (HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963 only):
ZONE CENTER .
Default value: If a marker is on-screen, the frequency value of the marker. If a marker is not on-screen, the spectrum analyzer center frequency.
Related Commands: CF, SP, **WINON**, ZMKSPAN.

## Example

```
OUTPUT 718;"WINON;"              Turns on the windows display mode.
OUTPUT 718;"ZMKCNTR 300MHZ;"     Places the zone marker at 300 MHz.
```

## Description

ZMKCNTR allows you to move the zone marker within the frequency range displayed in the upper window. When the lower window is the active window, changing the center frequency (CF) or frequency span (SP) of the lower window changes the position of zone marker in the upper window.

**Restrictions:** Use ZMKCNTR only if the window is in non-zero span; ZMKCNTR does not apply if the window is in the time domain. The zone marker can be moved beyond the frequency range displayed by the upper window (the zone marker cannot exceed the frequency range of the spectrum analyzer, however.) ZMKCNTR should only be used when the windows display mode is turned on.

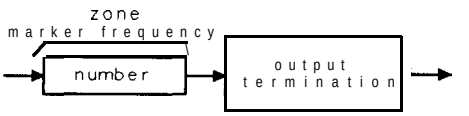
You can use ZMKSPAN to change the span of the zone marker.



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## ZMKCNTR Zone Marker at Center Frequency

Query Response




QZMKCNTR



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# ZMKPKNL
# Zone Marker for Next Left Peak

Places the zone marker at the next signal peak that is left of the zone marker's current position.

## Syntax




XZMKPKNL

Equivalent **Softkey** (HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963 only):
ZONE PK LEFT,
Related Commands: MKPX, **WINON**, ZMKCNTR, ZMKSPAN, ZMKPKNR.

## Example

```
OUTPUT 718;"WINON;"
OUTPUT 718;"ZMKPKNL;"
```

*Turns on the windows display mode.*
*Places the zone marker at the next peak to the left of the current position of the zone marker.*

## Description

ZMKPKNL does the following:

1. Searches for the next signal peak outside and to the left of the zone marker. ZMKPKNL only applies if the window is in a non-zero span; ZMKPKNL does not apply if the window is in the time domain.
2. If a peak is found, ZMKPKNL moves the zone marker so that it is centered around the peak. If a signal peak cannot be found, or the window is in zero span, the zone marker is not moved.
3. Changes the center frequency of the lower window to the frequency of the signal peak.

'Ib be considered a signal peak, the signal must be greater than the peak excursion (see "MKPX" for more information about the peak excursion).

ZMKPKNL should only be used when the windows display mode is turned on.



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# ZMKPKNR
# Zone Marker for Next Right Peak

Places the zone marker at the next peak to the right of the zone marker's current position.

## Syntax




XZMKPKNR

Equivalent **Softkey** (HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963 only): **ZONE PK RIGHT** .

Related Commands: MKPX, **WINON**, ZMKCNTR, ZMKSPAN, ZMKPKNL.

## Example

```
OUTPUT 718;"WINON;"
OUTPUT 718;"ZMKPKNR;"
```

*Turns on the windows display mode.*

*Places the zone marker at the next peak to the right of the current position of the zone marker.*

## Description

ZMKPKNR does the following:

1. Searches for the next signal peak outside and to the right of the zone marker. ZMKPKNR only applies if the window is in a non-zero span; ZMKPKNR does not apply if the window is in the time domain.
2. If a peak is found, moves the zone marker so that it is centered around the peak. If a signal peak cannot be found, or the window is in zero span, the zone marker is not moved.
3. Changes the center frequency of the lower window to the frequency of the signal peak.

To be considered a signal peak, the signal must be greater than the peak excursion (see "MKPX" for more information about the peak excursion).

ZMKPKNR should only be used when the windows display mode is turned on.

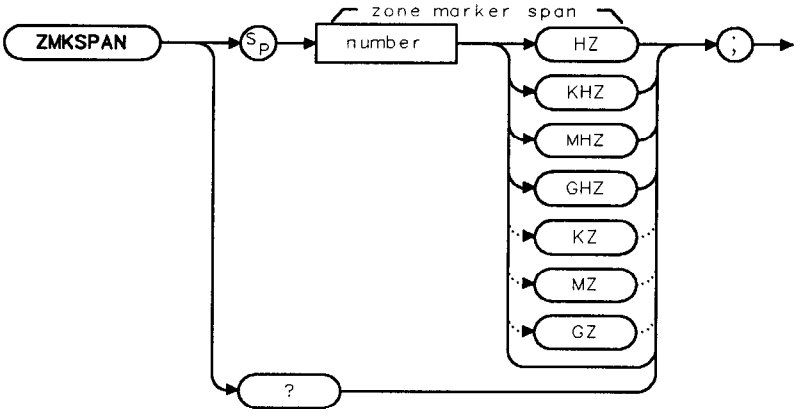


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# ZMKSPAN
# Zone Marker Span

Changes the width of the zone marker.

## Syntax




| Item | Description/Default | Range |
|---|---|---|
| Number | Any real or integer number. Default unit is Hz. | 0 to maximum frequency span of the spectrum analyzer. |

Equivalent Softkey (HP 85913, HP 85933, HP 85943, HP 85953, or HP 85963 only): ZONE SPAN.

Default value: 1/10 of the spectrum analyzer's frequency span.

Related Commands: SP, WINON, ZMKCNTR.

## Example

```
OUTPUT 718;"WINON;"              Turns on the windows display mode.
OUTPUT 718;"ZMKSPAN 100MHZ;"     Sets the span of the zone marker to 100 MHz.
```

## Description

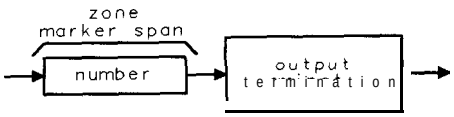
ZMKSPAN allows you to change the frequency span of the zone marker that is displayed in the upper window. When the lower window is the active window, frequency span (SP) of the lower window changes the frequency span of zone marker in the upper window.

**Restrictions:** Use ZMKSPAN only if the window is in non-zero span; ZMKSPAN does not apply if the window is in the time domain. ZMKSPAN should only be used when the windows display mode is turned on.



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## Query Response




QZMKSPAN



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# A

# Spectrum Analyzer Error Messages

## Error Messages

The spectrum analyzer can generate various messages that appear on its screen during operation to indicate a problem.

There are three types of messages: hardware error messages (H), user-created error messages (U), and informational messages (M).

- Hardware error messages indicate the spectrum analyzer hardware is probably broken. Refer to Chapter *8* in the *HP 8590 E-Series and L-Series Spectrum Analyzers User's Guide* for more information.
- User-created error messages appear when the spectrum analyzer is used incorrectly. They are usually generated during remote operation (entering programming commands using either a controller or the external keyboard).
- Informational messages provide information indicating the spectrum analyzer's progress within a specific procedure.

The messages are listed in alphabetical order on the following pages; each message is defined, and its type is indicated by an (H), (U), or (M).

**$\phi$ LOCK OFF**
Indicates slow YTO tuning. This message may appear if the spectrum analyzer is using default correction factors. If this message appears constantly, perform the CAL FREQ routine to try to eliminate this message. $\phi$ LOCK OFF appears briefly during the CAL FREQ routine, during instrument preset, or when the frequency value is changed; this is normal and does not indicate a problem. (U) and (H)

**ADC-2V FAIL**
Indicates a hardware failure. (H)

**ADC-GND FAIL**
Indicates a hardware failure. (H)

**ADGTIME FAIL**
Indicates a hardware failure. (H) and (U)

**CAL:- _ _**
During the self-calibration routine, messages may appear on the display to indicate how the calibration routines are progressing. For example, sweep, freq, span, MC delay, FM coil, and atten can appear on the spectrum analyzer display. $\phi$ LOCK OFF appears briefly during the CAL FREQ self-calibration routine; this is normal and does not indicate a problem. (M)

**CAL:- _ _ : done Press CAL STORE to save**
Indicates that the self-calibration routine is finished and that you should press CAL STORE. (M)

**CAL: cannot execute CALAMP enter: 0 dB PREAMP GAIN**
The preamplifier gain should be set to 0 dB before the CAL AMPTD routine is performed.



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The preamplifier gain is set by using EXTERNAL PREAMPG . This message also sets SRQ 110. (U)

**CAL: DATA NOT STORED CAL AMP NEEDED**
The correction factors are corrupt and cannot be stored. You need to perform the CAL FREQ & AMPTD routine before trying to store the correction factors. This message also sets SRQ 110. (U)

**CAL: FM SPAN SENS FAIL**
The spectrum analyzer could not set up span sensitivity of the FM coil. (H)

**CAL: GAIN FAIL**
Indicates the signal amplitude is too low during the CAL AMPTD routine. This message also sets SRQ 110. (H)

**Cal harmonic > = 5.7 GHz NOT found**
Indicates that the CAL YTF routine for an HP 85953 cannot find a harmonic of the 300 MHz calibration signal. If this happens, ensure that the CAL OUT connector is connected to the spectrum analyzer input, perform the CAL FREQ & AMPTD routine, and then perform the CAL YTF routine again. (U) and (H)

**CAL: MAIN COIL SENSE FAIL**
The spectrum analyzer could not set up span sensitivity of the main coil. If this message appears, press (FREQUENCY), -37, (Hz), (CAL), More 1 of 4, More 2 of 4, DEFAULT CAL DATA , and perform the CAL FREQ routine again. (H)

**CAL: NBW 200 Hz notch amp failed**
Indicates that the 200 Hz resolution bandwidth is not the correct shape for the calibration routine. (H)

**CAL: NBW 200 Hz notch failed**
Indicates that the 200 Hz resolution bandwidth is not the correct shape for the calibration routine. (H)

**CAL: NBW 200 Hz width failed**
Indicates that the 200 Hz resolution bandwidth is not the correct bandwidth for the calibration routine. (H)

**CAL: NBW gain failed**
Indicates that one of the resolution bandwidths is not the correct amplitude for the calibration routine. (H)

**CAL: NBW width failed**
Indicates that one of the resolution bandwidths is not the correct width for the calibration routine. (H)

**CAL: PASSCODE NEEDED**
Indicates that the function cannot be accessed without the pass code. For the DEFAULT CAL DATA function, the pass code is setting the center frequency of the spectrum analyzer to -37 Hz. (M)

**CAL: RES BW AMPL FAIL**
The relative insertion loss of the resolution bandwidth is incorrect. This message also sets SRQ 110. (H)

**CAL SIGNAL NOT FOUND**
Indicates the calibration signal (CAL OUT) cannot be found. Check that the CAL OUT and the spectrum analyzer input connectors are connected with an appropriate cable. If the calibration signal is connected to the spectrum analyzer input but cannot be found, press (FREQUENCY), –37, (Hz), (CAL), ore 2 of 4 , More 2 of 4 , DEFAULT CAL DATA . If the



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calibration signal still cannot be found, press FREQUENCY, -37, (Hz) and perform the CAL FREQ or CAL FREQ & AMPTD self-calibration routines. This message also sets SRQ 110. (U) and (H)

**CAL: SPAN SENS FAIL**
The self-calibration span sensitivity routine failed. This message also sets SRQ 110. (H)

**CAL: USING DEFAULT DATA**
Indicates that the calibration data is corrupt and the default correction factors are being used. Interruption of the self-calibration routines or an error can cause this problem. (M)

**CAL YTF FAILED**
Indicates that the CAL YTF routine could not be successfully completed. If this message appears, ensure that the CAL OUT connector (for the HP 85953) or 100 MHz COMB OUT connector (for the HP 8592L, HP 85933, or HP 85963) is connected to the spectrum analyzer input, perform the CAL FREQ & AMPTD routine, and then perform the CAL YTF routine again. (U) and (H)

**CAL: ZERO FAIL**
The spectrum analyzer could not set up the tuning sensitivity of the main coil. If this message appears, press FREQUENCY, -37, Hz, (CAL, More 2 of 4, More 2 of 4, DEFAULT CAL DATA , and perform the CAL FREQ routine again. (H)

**Cannot engage phase lock with current CAL FREQ data**
Indicates that the CAL FREQ routine needs to be performed before phase locking can be turned on. (U)

**Cannot reach N dB points**
Indicates that the number of dB specified for the N dB PTS function is greater than the distance of the signal peak from the spectrum analyzer noise floor or peak threshold. (U)

**Check trigger input**
Indicates that the spectrum analyzer needs an external trigger signal to use the time-gating functions. Before using the time-gating functions, you should ensure there is a trigger pulse connected to the GATE TRIGGER INPUT connector on the rear panel of spectrum analyzer and that the GATE OUTPUT is connected the EXT TRIG INPUT connector. (U)

**Comb harmonic at _ _ _ GHz NOT found**
Indicates that the CAL YTF routine for the spectrum analyzer cannot find a harmonic of the comb generator at frequency displayed. If this happens, ensure that the 100 MHz COMB OUT connector (for an HP 8592L, HP 85933, or HP 85963) or the CAL OUT connector (for an HP 85953) is connected to the spectrum analyzer input with a low-loss, short cable before the CAL YTF routine is performed. (U) and (H)

**COMB SIGNAL NOT FOUND**
The comb signal cannot be found. Check that 100 MHz COMB OUT is connected to the spectrum analyzer input. The comb generator is available with the HP 8592L, HP 85933, or HP 85963 only. (U) and (H)

**CMD ERR:- _ _**
The specified programming command is not recognized by the spectrum analyzer. (U)

**CONF TEST FAIL**
Indicates that the confidence test failed. If this happens, ensure that the CAL OUT connector is connected to the spectrum analyzer input, perform the CAL FREQ & AMPTD routine, and then perform the confidence test again. This message also sets SRQ 110. (H) and (U)

**Factory dlp, not editable**
Indicates that the downloadable program or variable that you have selected is used by a "personality" and cannot be edited. A personality is a program that is manufactured by



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Hewlett-Packard and is available for use with the HP 8590 Series spectrum analyzer. An example of a personality is the HP 85716A CATV system monitor personality. (U)

**FAIL:- _ _**
An error was discovered during the power-up check. The 4-digit by lo-digit code indicates **the** type of error. Error codes are described in the spectrum analyzer's service guide. (H)

**File type incompatible**
Indicates that the selected file is not a display image file. The file **name** for a display image file is always preceded by an "i." (U)

**F R E Q U N C A L**
If the FREQ UNCAL message appears constantly, it indicates a YTO-tuning error. If this message appears constantly, perform **the** CAL FREQ routine. FREQ UNCAL appears briefly during the CAL FREQ routine; this is normal and does not indicate a problem. (U) and (H)
(U) and (H)

**Function not available in current Mode**
Indicates that the function that you have selected can only be used with the spectrum analyzer mode. You can use the (MODE) key to select the spectrum analyzer mode. (U)

**Function not available with analog display**
Indicates that the function that you have selected is not compatible with the Analog+ display mode. lb use **the** function, you must first turn off **the** Analog+ display mode **with** ANALOG* ON OFF. (U)

**Gate card not calibrated**
This message can indicate that either the CAL AMPTD routine need to be performed before the time-gating functions can be used, or that something was connected to the GATE TRIGGER INPUT connector during the CAL AMPTD or CAL FREQ & AMPTD routines. If your spectrum analyzer has **an** Option 105 installed in it, you should ensure that nothing is connected to the GATE TRIGGER INPUT connector when **the** CAL AMPTD or CAL FREQ & AMPTD routines are performed. (U) and (H)

**INTERNAL LOCKED**
The spectrum analyzer's internal trace and state registers have been locked. lb unlock the trace or state registers, press SAV LOCK ON OFF so that OFF is underlined. For remote operation, use PSTATE OFF. (U)

**INVALID ACTDEF: _ _ _**
The specified ACTDEF name is **not** valid. See the ACTDEF programming command. (U)

**INVALID AMPCOR: FREQ**
For the AMPCOR command, the frequency data must be entered in increasing order. See the description for the AMPCOR programming command for more information. (U)

**INVALID BLOCK FORMAT: IF STATEMENT**
An invalid block format appeared within the IF statement. See the description for the IF THEN ELSE **ENDIF** programming command for more information. (U)

**INVALID CARD**
Indicates one of the following conditions: a card reader is **not** installed, the memory card is write-protected (check the position of the switch on the memory card), the memory card is a read-only memory (ROM) card, or a memory card has not been inserted. This message can also occur if remote programming commands for the memory card capability are executed with an HP 859OL or HP 8592L that does **not** have an Option 003. (U)

**INVALID CARD: BAD MEDIA**
Indicates the formatting routine ( FORMAT CARD ) for the memory card could not be



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completed. See the description for INVALID CARD above for more information about the possible causes of this message. (U) and (H)

**INVALID CARD: DATA ERROR**
Indicates the data could not be retrieved from the memory card. (U) and (H)

**INVALID CARD: DIRECTORY**
Indicates the memory card has not been formatted. (U)

**INVALID CARD: NO CARD**
Indicates a memory card has not been inserted. (U)

**INVALID CARD: TYPE**
Indicates one of the following conditions: a card reader is not installed, the memory card is write-protected (check the position of the switch on the memory card), the memory card is a read-only memory (ROM) card, or a memory card has **not** been inserted. This message can also occur if remote programming commands for the memory card capability are executed with an HP 8590L or HP 8592L that does not have an Option 003. (U)

**INVALID CHECKSUM: USTATE**
The user-defined state does not follow the expected format. (U)

**INVALID COMPARE OPERATOR**
An IF/THEN or REPEAT/UNTIL routine is improperly constructed. Specifically, **the** IF or UNTIL operands are incorrect. (U)

**INVALID DET: FM or TV option only**
Indicates that the selected detector cannot be used until the appropriate option is installed in the spectrum analyzer. (U)

**INVALID ENTER FORMAT**
The enter format is not valid. See the appropriate programming command description to determine the correct format. (U)

**INVALID <file name> NOT FOUND**
Indicates that the specified file could not be loaded into spectrum analyzer memory or purged from memory because the file name cannot be found. (U)

**INVALID FILENAME _ _ _**
Indicates the specified file name is invalid. A file name is invalid if there is **no** file name specified, if **the** first letter of the file name is not alphabetic, or if the specified file type does not match the type of file. See the description SAVRCLW or STOR programming command for more information. (U)

**INVALID FILE: NO ROOM**
Indicates that there is insufficient space available on the memory card to store the data. (U)

**INVALID BP-IB ADRS/OPERATION**
An HP-IB operation was aborted due to an incorrect address or invalid operation. Check that there is only one controller (the spectrum analyzer) connected to the printer or plotter. (U)

**INVALID BP-IB OPERATION REN TRUE**
The HP-IB operation is not allowed. (This is usually caused by trying to print or plot when a controller is on the interface bus with the spectrum analyzer.) To use the spectrum analyzer print or plot functions, you must disconnect any other controllers on the HP-IB. If you are using programming commands to print or plot, you can use an HP BASIC command instead of disconnecting the controller. See the description for the PRINT command for more information. (U)

**INVALID ITEM:- _ _**
Indicates an invalid parameter has been used in a programming command. (U)



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**INVALID KEYLBL: _ _ _**
Indicates that the specified key label contains too many characters. A key label is limited to 8 printable characters per label line. (U)

**INVALID KEYNAME:- _ _**
The specified key name is not allowed. (The key name may have conflicted with a spectrum analyzer programming command.) To avoid this problem, use an underscore as the second character in the key name, or avoid beginning the key name with the following pairs of letters: LB, OA, OL, TA, TB, TR, MA, MF, TS, OT, and DR. (U)

**INVALID OUTPUT FORMAT**
The output format is not valid. See the appropriate programming command description to determine the correct format. (U)

**INVALID RANGE: Stop < Start**
Indicates that the first trace element specified for a range of trace elements is larger that ending trace element. When specifying a trace range the starting element must be less than the ending element. For example, TRA[2,300] is legal but TRA[300,2] is not. (U)

**INVALID REGISTER NUMBER**
The specified trace register number is invalid. (U)

**INVALID REPEAT MEM OVFL**
Memory overflow occurred due to a REPEAT routine. This can occur if there is not enough spectrum analyzer memory for the REPEAT UNTIL declaration, or if the REPEAT UNTIL declaration exceeds 2047 characters. (U)

**INVALID REPEAT NEST LEVEL**
The nesting level in the REPEAT routine is improperly constructed. This can occur if too many REPEAT routines are nested. When used within a downloadable program (DLP), the maximum number of REPEAT UNTIL statements that can be nested is 20. (U)

**INVALID RS-232 ADRS/OPERATION**
An RS-232 operation was aborted due to an invalid operation. (U)

**INVALID SAVE REG**
Data has not been saved in the specified state or trace register, or the data is corrupt. (U)

**INVALID SCRMOVE**
Indicates the spectrum analyzer may have a hardware failure. See the spectrum analyzer's Service Guide for more information. (H)

**INVALID START INDEX**
Indicates that the first trace element specified for a range of trace elements is not within the trace range of the specified trace. (U)

**INVALID STOP INDEX**
Indicates that the ending trace element specified for a range of trace elements is not within the trace range of the specified trace. (U)

**INVALID STORE DEST: _ _ _**
The specified destination field is invalid. (U)

**INVALID TRACE: _ _ _**
The specified trace is invalid. (U)

**INVALID TRACE NAME: _ _ _**
The specified trace name is not allowed. Use an underscore as the second character in the trace name, or avoid beginning the trace name with the following pairs of letters: LB, OA, OL, TA, TB, TR, MA, MF, TS, OT, and DR. (U)



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**INVALID TRACENAME: _ _ _**
Indicates the specified trace could not be saved because the trace name is not allowed. 'lb avoid this problem, use an underscore as the second character in the trace name, or avoid beginning the trace name with the following pairs of letters: LB, OA, OL, TA, TB, TR, MA, MF, TS, OT, and DR. (U)

**INVALID VALUE PARAMETER: _ _ _**
The specified value parameter is invalid. (U)

**INVALID VARDEF: _ _ _**
The specified variable name is not allowed. To avoid this problem, use an underscore as the second character in the variable label, or avoid beginning the variable label with the following pairs of letters: LB, OA, OL, TA, TB, TR, MA, MF, TS, OT, and DR. (U)

**INVALID WINDOW TYPE: _ _ _**
The specified window is invalid. See the description for the TWNDOW programming command. (U)

**LOST SIGNAL**
For the HP 8592L, HP 85933, or HP 85963, this message indicates that the cable from the 100 MHz COMB OUT connector to the spectrum analyzer input is defective or has become disconnected during the CAL YTF routine. For the HP 85953, this message indicates that the cable from the CAL OUT connector is defective or has been disconnected during the CAL YTF routine. Be sure to use a short, low-loss cable to connect the signal to the spectrum analyzer input when performing the CAL YTF routine. (U)

**LO UNLVL**
Indicates that the spectrum analyzer's local oscillator distribution amplifier is not functioning properly. (H)

**Marker Count Reduce SPAN**
Indicates the resolution bandwidth to span ratio is too small to use the marker count function. Check the span and resolution bandwidth settings. (U)

**Marker Count Widen RES BW**
Indicates that the current resolution bandwidth setting is too narrow to use with the marker counter function. The marker counter function can be in narrow resolution bandwidths (bandwidths that are less than 1 kHz) with the following procedure:

1. Place the marker on the desired signal.
2. Increase the resolution bandwidth to 1 kHz and verify the marker is on the signal peak.
3. If the marker in on the signal peak, the marker count function can be used in either the 1 kHz resolution bandwidth or the original narrow resolution bandwidth setting. If the marker is not on the signal peak, it should be moved to the signal peak and the marker counter function should not be used with a resolution bandwidth setting of less than 1 kHz.

(U)

**MEAS UNCAL**
The measurement is uncalibrated. Check the sweep time, span, and bandwidth settings, or press [AUTO COUPLE], AUTO ALL . (U)

**No card found**
Indicates that the memory card is not inserted. (U)

**No points defined**
Indicates the specified limit line or amplitude correction function cannot be performed because no limit line segments or amplitude correction factors have been defined. (U)



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**OVEN COLD**
Indicates that the spectrum analyzer has been powered up for less than 5 minutes. (The actual temperature of the precision frequency oven is not measured.) (Option 004 only.) (M)

**PARAMETER ERROR: _ _ _**
The specified parameter is not recognized by the spectrum analyzer. See the appropriate programming command description to determine the correct parameters. (U)

**PASSCODE NEEDED**
Indicates that the function cannot be accessed without the pass code. (U)

**POS-PK FAIL**
Indicates the positive-peak detector has failed. (H)

**REF UNLOCK**
Indicates that the frequency reference is not locked to the external reference input. Check that the 10 MHz REF OUT connector is connected to the EXT REF IN connector, or, when using an external reference, that an external 10 MHz reference source of sufficient amplitude is connect to the EXT REF IN connector. (U) and (H)

**Require 1 signal > PEAK EXCURSION above THRESHOLD**
Indicates that the N dB PTS routine cannot locate a signal that is high enough to measure. The signal must be greater than the peak excursion above the threshold level to measure. (U)

**Require 3 signals > PEAK EXCURSION above THRESHOLD**
Indicates that the % AM routine cannot locate three signals that are high enough to measure. The signals must be greater than the peak excursion above the threshold level to measure. (U)

**Require 4 signals > PEAK EXCURSION above THRESHOLD**
Indicates that the TOI routine cannot locate four signals that are high enough to measure. The signals must be greater than the peak excursion above the threshold level to measure. (U)

**Required option not installed** Some spectrum analyzer functions require that an option be installed in the spectrum analyzer. See the description for the function in the HP 8590 *E-Series and L-Series Spectrum Analyzers* User's *Guide* for more information about which option is required. (U)

**RES-BW NOISE FAIL**
Indicates the noise floor level is incorrect at the indicated bandwidth. (H)

**RES-BW SHAPE FAIL**
Indicates the 3 dB bandwidth is not within specifications. (H)

**RF PRESEL ERROR**
Indicates that the preselector peak routine cannot be performed. (H)

**RF PRESEL TIMEOUT**
Indicates that the preselector peak routine cannot be performed. (H)

**SAMPLE FAIL**
Indicates the sample detector has failed. (H)

**SETUP ERROR**
Indicates that the span, channel bandwidth, or channel spacing are not set correctly for the adjacent channel power or channel power measurement. (U)

**SIGNAL CLIPPED**
Indicates that the current FFT measurement sweep resulted in a trace that is above the top graticule line on the spectrum analyzer display. If this happens, the input trace (trace A) has been "clipped," and the FFT data is not valid. (U)



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**Signal not found**
Indicates the PEAK ZOOM routine did not find a valid signal. (U)

**Signals do not fit expected % AM pattern**
Indicates that the % AM routine cannot perform the percent AM measurement because the on-screen signals do not have the characteristics of a carrier with two sidebands. (U)

**Signals do not flt expected TO1 pattern**
Indicates that the TO1 routine cannot perform the third-order intermodulation measurement because the on-screen signals do not have the characteristics of two signals and two distortion products. (U)

**SMPLR UNLCK**
Indicates that the sampling oscillator circuitry is not functioning properly. If this message appears, check that the external frequency reference is correctly connected to the EXT REF INPUT. (U) and (H)

**SOFTKEY OVFL**
Softkey nesting exceeds the maximum number of levels. (U)

**SRQ _ _ _**
The specified service request is active. Service requests are a form of informational message and are explained in Appendix A of the *HP 8590 E-Series and L-Series Spectrum Analyzers* User's Guide. (M)

**STEP GAIN/ATTN FAIL**
Indicates the step gain has failed. (H)

**Stop at marker not available with negative detection**
Indicates that the marker counter cannot be used when negative peak detection is selected. To use the marker counter, turn off negative peak detection with DETECTOR PK SP NG . (U)

**EMPTY DLP MEM**
Indicates that the user-defined items (user-defined functions, user-defined variables, user-defined traces, user-defined softkeys) and any personalities (for example, the HP 85716A CATV System Monitor Personality) in the spectrum analyzer's memory have been deleted. If this message appears, use ERASE DLP MEM to clear spectrum analyzer memory. If the message is still displayed, it may indicate a hardware failure. See the spectrum analyzer's Service Guide for more information. (U)

**TABLE FULL**
Indicates the upper or lower table of limit lines contains the maximum number of entries allowed. Additional entries to the table are ignored. (U)

**TG SIGNAL NOT FOUND**
Indicates the tracking generator output signal cannot be found. Check that the tracking generator output (RF OUT 500 or RF OUT 75Ω) is connected to the spectrum analyzer input connector with an appropriate cable. (U)

**TG UNLVL**
This message can indicate the following: that the source power is set higher or lower than the spectrum analyzer can provide, that the frequency span extends beyond the specified frequency range of the tracking generator, or that the calibration data for the tracking generator is incorrect. See "Stimulus-Response Measurements" in Chapter 4 of the *HP 8590 E-Series and L-Series Spectrum Analyzers User's Guide* for more information. (U)

**Too many signal with valid N dB points**
Indicates the N dB PTS function has located two or more signals that have amplitudes within the specified dB from the signal peak. If this happens, you should decrease the span of the spectrum analyzer so that only the signal that you want to measure is displayed. (U)



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**Trace A is not available**
Indicates that trace A is in the store-blank mode and cannot be used for limit-line testing. Use CLEAR WRITE A or VIEW A to change trace A from the store-blank mode to the clear write mode, and then turn on limit-line testing. (U)

**UNDF KEY**
The softkey number is not recognized by the spectrum analyzer. (U)

**USING DEFAULTS self cal needed**
Indicates that the current correction factors are the default correction factors and that the CAL FREQ & AMPTD routine needs to be performed. For the HP 8592L, HP 85933, HP 85953, or HP 85963, CAL YTF routine needs to be performed also. (U)

**Verify gate trigger input is disconnected before CAL AMPTD**
This message is meant to remind you that nothing should be connected to the GATE TRIGGER INPUT connector on the spectrum analyzer's rear panel during the CAL AMPTD routine. (U)

**VID-BW FAIL**
Indicates the video bandwidths have failed. (H)

**Waiting for gate input . . .**
Indicates that the spectrum analyzer needs an external trigger signal to use the time-gating functions. Before using the time-gating functions, you should ensure there is a trigger pulse connected to the GATE TRIGGER INPUT connector on the rear panel of spectrum analyzer and that the GATE OUTPUT is connected the EXT TRIG INPUT connector. If you do not want to use the time-gating functions, press (PRESET). (U)

**YTF is not available**
The YTF is only available for the HP 8592L, HP 85933, HP 85953, and HP 85963. (U)



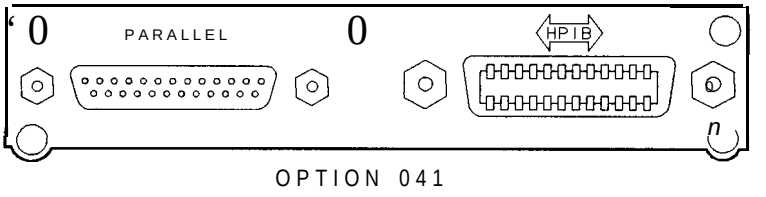
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# B

# HP-IB and Parallel Option 041

This appendix tells you how to connect a computer to your HP 8590 Series Option 041 spectrum analyzer with the Hewlett-Packard Interface Bus (HP-IB).

Your spectrum analyzer has an HP-IB connector on the rear panel, as shown in Figure B-l.




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**Figure B-l. HP-IB Connector**

The HP-IB system utilizes a party-line bus structure. Devices such as the spectrum analyzer are connected on the party line with HP-IB cables. A computer gives instructions and is the "controller." The spectrum analyzer takes orders and is the "listener." The spectrum analyzer is also capable of transmitting data over the party line. Devices that transmit data back to the computer are "talkers."

Each device on the party line has an address. Device addresses are used by the controller to specify who talks and who listens. A device's address is usually set at the factory.

The number 7 preceding the device's address (for example, **Analyzer=718),** signifies that the HP-IB interface is selected.

When you turn on the spectrum analyzer, the HP-IB address appears on the screen (for example, HP-IB ADRS : 18). If necessary, you can reset the address of the spectrum analyzer by pressing (CONFIG), **More** 2 of 3 , **ANALYZER** ADDRESS , entering in the address number using the front-panel number keys, then pressing (ENTER). You may use any address between 0 and 30. (Usually, 1 is reserved for printers and 5 for plotters.)



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C

# RS-232 and Parallel Option 043

## What You'll Learn in This Appendix

This appendix explains how to connect a computer to your HP 8590 Series Option 043 spectrum analyzer using the RS-232 interface. It contains information pertaining to RS-232 signals, cable connections, and baud rate.

### Introducing the RS-232 Interface

Your spectrum analyzer has an RS-232 connector on the rear panel, as shown in Figure C-l.

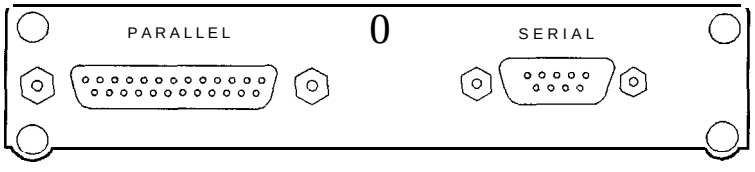



**Figure C-l. RS-232 Connector**

The RS-232 interface utilizes serial data transmission. Data is sent, one bit at a time, in groups of 10 to 12 data-bits.

Two devices, such as the spectrum analyzer and a computer, can exchange commands and data over the RS-232 connection. This interface uses two serial data lines and five handshaking lines. Handshaking signals are required for full hardware control of the information exchange. It is possible to use a three-wire connection, in some situations.

Another parameter for the RS-232 interface is the "baud," or data rate. This is the speed at which the computer and spectrum analyzer exchange data. The baud rate of each of the two RS-232 devices must be the same.

#### The RS-232 Data Lines

RS-232 uses serial data transmission, meaning that data is transmitted one bit at a time. There are two data lines carrying signals:

- Transmit data (TxD)-the serial data output. This line is connected to the RxD input line.
- Receive data (RxD)-the serial data input. This line is connected to the TxD output line.

#### The RS-232 Handshaking Lines

In addition to the data signals, there are five other signals lines (called handshaking lines), used to control the flow of data. Listed below are the handshake signal descriptions:

- Request to send (RTS)-Output signal indicates that the spectrum analyzer is ready to communicate. This line is true at power-up and stays true while power is on.



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- Clear to send (CTS)-Input signal indicates that the external controller is ready to receive data.
- Data terminal ready (DTR)-Output signal from the spectrum analyzer. When the input buffer is full, this line goes false.
- Data set ready (DSR)-Is not available.
- Data carrier detect (DCD)-Input to the spectrum analyzer. If DCD is true, the spectrum analyzer will receive data from the controller. If false, no data will be input. The data will be ignored.

The spectrum analyzer checks its CTS input before transmitting data to the computer. If the CTS line is false, the spectrum analyzer will not transmit data. The spectrum analyzer transmits data when the CTS line is true.

The spectrum analyzer sets the DTR line (PC CTS) false when its input buffer is full.

## Baud Rate

The speed at which data is exchanged is called the baud rate or data rate, This is usually expressed in baud or bits per second. Common baud rates are 1200 and 9600.

| Note | Some of the programs in this manual use 1200 baud for proper operation. If your system uses the RS-232 handshake lines, you can use 9600 baud for all of the programs. |
|---|---|

If you need to change the baud rate, refer to the "Setting the Spectrum Analyzer Baud Rate" in this appendix.

## Protocol

The RS-232 protocol is as follows:

Baud rate 300 to 57,000 baud.
8 bits per character.
1 stop bit.
No parity.
Software handshake-none.
**Xon/Xoff** and ENQ/ACK not supported by the spectrum analyzer.

When BREAK is issued to the spectrum analyzer, the following occurs:

1. The present command is aborted.
2. The input buffer is cleared.
3. The output buffer is cleared.
4. All trace output is stopped.
5. The command parser is reinitialized.

BREAK does not perform any of the following:

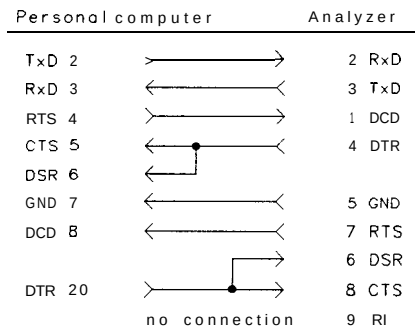
- Invoke instrument preset.
- Clear SRQ off screen.
- Clear illegal command off screen.

The RTS signal goes true on power-up and does not go false during any communication. It stays true while power is on.

Figure C-2 and Figure C-3 lists the signal connections between a personal computer and the spectrum analyzer.

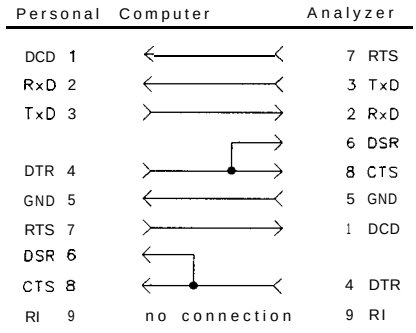


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**Figure C-2. HP 245426 25-pin to 9-pin Full Handshaking Connection**

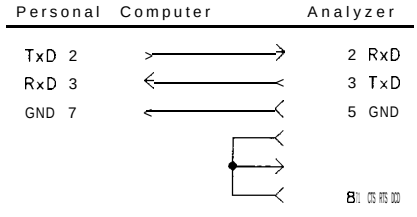



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**Figure C-3. HP 24542U 9-pin to 9-pin Full Handshaking Connection**

If your computer operates with only three wires, you can use the cable connections in Figure C-4.

Some computers require that the CTS, DSR, and DCD inputs be true before serial transmission can occur. lb solve this problem, you can wire these three signals to the personal computer RTS line.

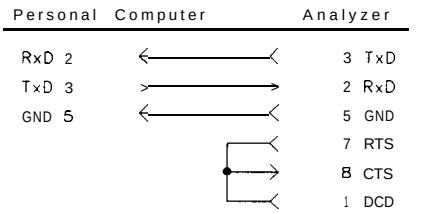



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**Figure C-4. 25-pin to O-pin 3-Wire Connection**



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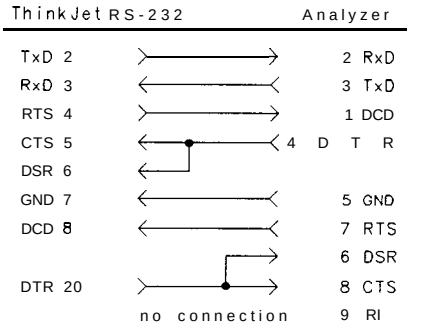



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**Figure C-5. O-pin to 9-pin 3-Wire Connection**

## Connecting a **ThinkJet** Printer

To connect an HP **ThinkJet** printer to the spectrum analyzer, use the information in Figure C-6, **Table** C-l, **Table** C-2, and **Table** C-3. Be sure to turn the printer off and then back on *after* changing the printer settings. See the **ThinkJet** Printer Manual for more information.




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**Figure C-6. 25-pin to 9-pin ThinkJet Printer Connection**

**ThinkJet Printer Mode Switches:**

**Table C-l. S :tting of Thinkjet Printer Mode Switches**

| Switch Number | Setting | Comments |
|---|---|---|
| 1 | down | Printer performs a carriage return only. |
| 2 | down | Printer performs a line feed only. |
| 3 | up | Sets the printer to skip paper perforations. |
| 4 | down | Sets the printer for a paper length of 11 inches. |
| 5 | down | Sets the printer to HP MODE. |
| 6 | up | Sets the printer to USASCII. |
| 7 | down | |
| 8 | down | |



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**Table C-2. Setting of RS-232 Switches**

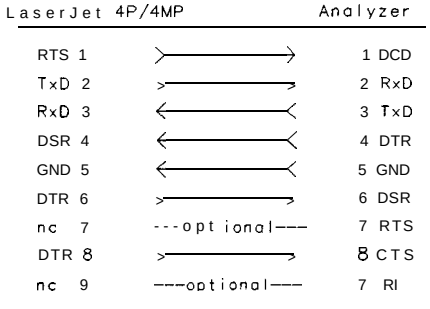
| Switch Number | Setting | Comments |
|---|---|---|
| 1 | IUD | DTR. |
| 2 | down | no parity, 8 bits. |
| 3 | down | |
| 4 | down | 9600 baud. |
| 5 | down | |

**Table C-3. Setting the Baud Rate**

| Baud Rate | Setting for Switch 4 | Setting for Switch 5 |
|---|---|---|
| 1200 | up | up |
| 2400 | up | down |
| 9600 | down | down |

## Connecting a LaserJet Printer

To connect an HP LaserJet printer to the spectrum analyzer, use the information in Figure C-7.




cu139e

**Figure G7. HP C2932A 9-pin to 9-pin LaserJet Printer Connection**



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## Connecting a Modem

To connect a modem to the spectrum analyzer, use the information in Figure C-8. The connection is for a Hayes 1200 Modem and the spectrum analyzer.

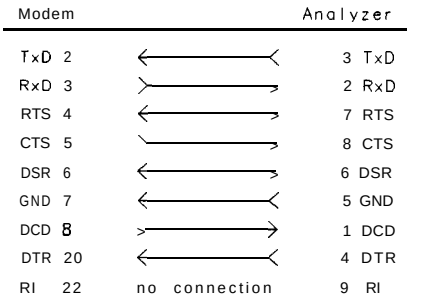



**Figure C-8. 25-pin to 9-pin Modem Connection**

### System Settings

Select 1200 baud for both the modem and the spectrum analyzer.

## Connecting an HP-GL Plotter

To connect an HP-GL plotter to the spectrum analyzer, use the information in Figure C-9.

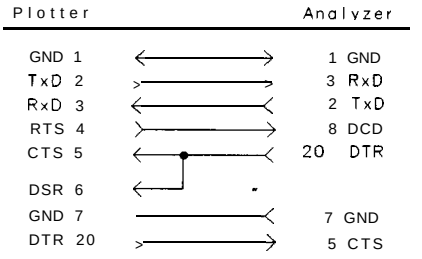



**Figure C-9. HP-GL Plotter Connection**

## Switch Settings

Set the switches on the HP-GL plotter to the following settings. Set the baud rate of the plotter and spectrum analyzer to the same value. After setting the switch positions, turn plotter off, then on again.

| Switch Position | Switch Position |
|---|---|
| Expand: ◀ | Parity: ▶ (Off) |
| Emulate: ◀ | Even/Odd: ▶ (Odd) |
| Stand-alone: ◀ | Duplex: ▶ (Full) |
| Monitor Mode: ▶ (normal) | Hardwire: ◀ |
| Local ▶ (normal) | DTR-Bypass: ▶ (normal) |



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## Setting the Spectrum Analyzer Baud Rate

The baud rates of the spectrum analyzer and the personal computer must be the same. For example, to set the spectrum analyzer to 9600 baud, use the following procedure:

1. Press the (CONFIG), **More** 1 of 3 .

2. Press the BAUD **RATE softkey**.

3. Press these keys: 9600, (Hz). lb set the baud rate to 1200 baud, press these keys: 1200, (Hz).

---

**Note** Some of the programs in this manual use 1200 baud for proper operation. If your system uses the RS-232 handshake lines, you can use 9600 baud for all of the programs.

---



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