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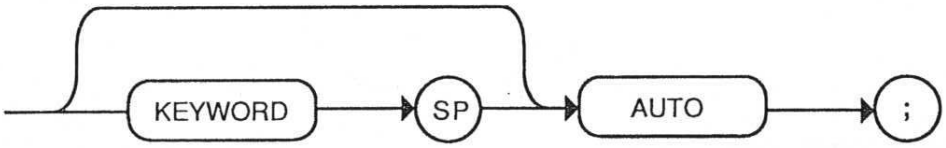
Find the *Keysight / Agilent 8592A* at our website: ***Click HERE***

AUTO

Auto Couple

Description: The AUTO command couples the attenuation (AT), step size (SS), sweep time (ST), resolution (RB) and video (VB) bandwidths to yield optimum amplitude accuracy. In addition, AUTO deactivates the display line (DL), threshold (TH), video averaging (VAVG), and markers. Individual functions can couple by entering the keyword for the command before AUTO (for example, `"AT AUTO;"`). To recouple all functions, press HOLD, followed by ***AUTO COUPLE***.

Syntax:



Example:
```
OUTPUT 718;"AT AUTO;"
OUTPUT 718;"HD;AUTO;"
OUTPUT 718;"AUTO;"
```

The first line couples the attenuation. The second line couples all functions. The third line couples and deactivates a function if one was active, or couples all functions if none were active. It has no effect if the active function does not couple.

Note: Alternate commands allow you to couple individual functions: CR couples resolution bandwidth, CS couples step size, CT couples sweeptime, CV couples video bandwidth, CA and couples input attenuation. The AUTO command is also available for the AT, SS, RB, and VB commands. The functions of the AUTO command and the ***AUTO COUPLE*** key are identical.

AXB

Exchange Trace A and Trace B

Description: The AXB command exchanges trace A and trace B, point by point.

Syntax: See Figure 4-1

Example:
```
OUTPUT 718;"AXB;"
```

Note: The functions of the AXB and EX commands and the [A EXCH B] softkey are identical.

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BLANK

Blank Trace

Description: The BLANK command disconnects a trace from the input data source. The trace is not displayed.

Syntax: See Figure 4-5

Example: OUTPUT 718;"BLANK TRA;"

Note: The functions of the BLANK command and the [STORE BLANK A] and [STORE BLANK B] softkeys are identical.

BL

Trace B Minus Display Line

Description: The BL command subtracts the display line from trace B and sends the difference to trace B.

Syntax: See Figure 4-1

Example: `OUTPUT 718;"BL;"`

Note: The functions of the BL and BML commands and the [B — DL → B] softkey are identical.

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CAL

Calibration

Description: The CAL command controls calibration functions. CAL initiates action according to the CAL parameters. The various parameters correspond to analyzer softkeys as shown below.

ON turns correction factors on and corresponds to [CORRECT ON off].

OFF turns correction factors off and corresponds to [CORRECT on OFF].

STORE saves the calibration data in the non- volatile memory of the analyzer and corresponds to [CAL STORE]. It is a service function that should not be used without correct calibration data.

FETCH recalls the calibration data that was stored in the non-volatile memory of the analyzer and corresponds to [CAL FETCH].

FREQ initiates the frequency calibration routine and corresponds to [CAL FREQ].

AMP initiates the amplitude calibration routine and corresponds to [CAL AMPTD].

DLY initiates the tuning delay calibration routine and corresponds to [CAL YTO DELAY].

ALL initiates frequency, amplitude, and tuning delay calibration routines.

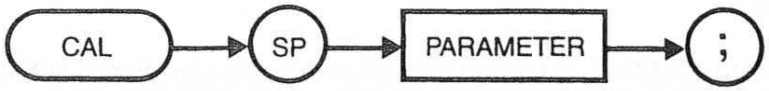
INIT resets stored calibration data from the non-volatile memory of the analyzer and corresponds to [EEPROM INIT].

Note: When INIT is selected, the CAL ALL routine must be run again.

DISP displays calibration data on the analyzer screen and corresponds to [DISPLAY CAL DATA].

DUMP returns calibration data to the controller.

Syntax:



Example: `OUTPUT 718;"CAL ON;"`

Note: See *CAL* under "Analyzer Functions" in the Operating Manual for more information including the correct instrument set-up for each routine. CAL DISP and CAL DUMP do not return all of the calibration data since screen size is limited and CAL DUMP only returns the data that would be displayed on the analyzer screen.

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CF

Center Frequency

Description: The CF command specifies the value of the center frequency. When queried with OA or ?, CF returns the center frequency value as a real number followed by a carriage-return/line-feed.

Since span is affected by frequency, change the frequency before changing span. (See HNLOCK.)

Syntax: See Figure 4-7. The AUTO parameter does not apply.

Example: `OUTPUT 718;"CF 200MZ;"`

Note: The function of the CF command and the ***FREQUENCY*** key are identical, except CF does not call up the Frequency menu.

CLRW

Clear Write

Description: The CLRW command starts a sequence of events. First, each element in the indicated trace is set to the bottom of screen. Then, new data from the detector is put in the trace with each sweep. Traces in CLRW mode are displayed on the analyzer screen.

Syntax: See Figure 4-5

Example: `OUTPUT 718;"CLRW TRA;"`

Note: The functions of the CLRW command and the [CLEAR WRITE A] and [CLEAR WRITE B] softkeys are identical. Alternate command A1 is identical to [CLEAR WRITE A] and B1 is identical to [CLEAR WRITE B]

CLS

Clear Status Byte

Description: The Clear Status Byte CLS command clears all status bits See SRQ for more information on status bytes, status registers, and service requests.

Syntax: See Figure 4-1

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CNF

Confidence Test

Description: The CNF command initiates a confidence test of the resolution bandwidth, video bandwidth, and step gain.

Syntax: See Figure 4-1

Example: `OUTPUT 718; "CNF;"`

Note: The functions of the CNF command and the [CONF TEST] softkey are identical.

CONTS

Continuous Sweep

Description: The CONTS command sets the analyzer to continuous sweep mode. In the continuous sweep mode, the 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 interface bus.

Syntax: See Figure 4-1

Example: `OUTPUT 718;"CONTS;"`

Note: The functions of the CONTS and S1 commands and the [CONT SWEEP] softkey are identical.

Note: If the specified center frequency is in band 0 then 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.

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DET

Detection Mode

Description: The DET command selects the type of analyzer detection (positive peak or sample) and accesses service-diagnostic detection functions.

POS, the default detector mode, enables positive peak detection, which displays the maximum video signal excursions

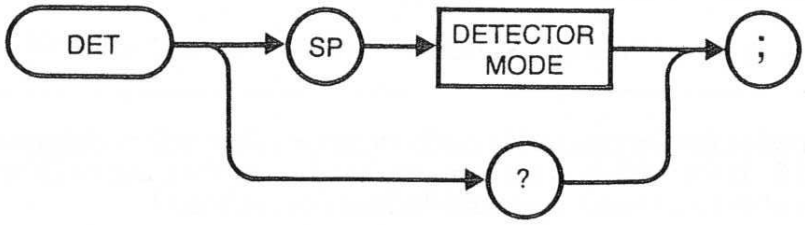
SMP enables sample detection, which uses the instantaneous signal value detected at the analyzer-to-digital converter output. Video averaging and noise-level markers, when activated, automatically activate sample detection.

Service Diagnostic Modes: The detector modes listed below are designed for troubleshooting and diagnostic tests of the HP 8592A. They are described in the HP 8592A Support Manual (HP Part Number 08592-90008), which is not supplied with the instrument. Contact your HP sales representative for more information.

AUXA, CDAC, DROOP, FDAC, FMD, FMSP, GND, MCD, MNSP, MTEN, MXRB, PTEN, REF, SDAC, SWPR, YFD, XFIN, YFL, YFN, YFSP, TEST.

When queried, DET returns the detection mode.

Syntax:



Example:
```
OUTPUT 718;"DET POS;"
OUTPUT 718;"DET SMP;"
```


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DL

Display Line

Description: The DL command defines the level of the display line in dBm and displays it on the analyzer screen. Activating video trigger mode activates the display line. The AUTO command and DL OFF turn off the display line.

Syntax: See Figure 4-6

Example:
```
OUTPUT 718;"DL OFF;"
OUTPUT 718;"DL 5DB;"
```

Note: Alternate command L0 turns off the display line. The functions of the DL command and the [DISPLAY LINE] softkey are identical.

DN

Down Command

Description: The DN command reduces the active function by the applicable step size.

Syntax: See Figure 4-1

Example:
```
OUTPUT 718;"SS 3GZ;CF 7GZ;DN;"
OUTPUT 718;"SP 40MZ;MKPK;DN;"
```

The first line sets center frequency to 4 GZ. The second line sets the span to 20 MHz since peak search is not an active function. The step size for span is one graticule.

DONE

Done

Description: The DONE command is a synchronizing function. When DONE follows a command list, it sends the controller a 1 after the command list is executed. (The command list is defined as any analyzer command from this chapter.)

Syntax: See Figure 4-1

Example:
```
05 REAL DONE_VAL
10 ! EXAMPLE TO SHOW WHEN ATTENUATOR HAS COMPLETED CHANGING
20 OUTPUT 718;"AT 30 DB;DONE;"
30 ENTER 718;DONE_VAL
40 ! WHEN ANANLYZER RECEIVES THE DONE VALUE. IT IS DONE EXECUTING THE COMMAND
50 END
```

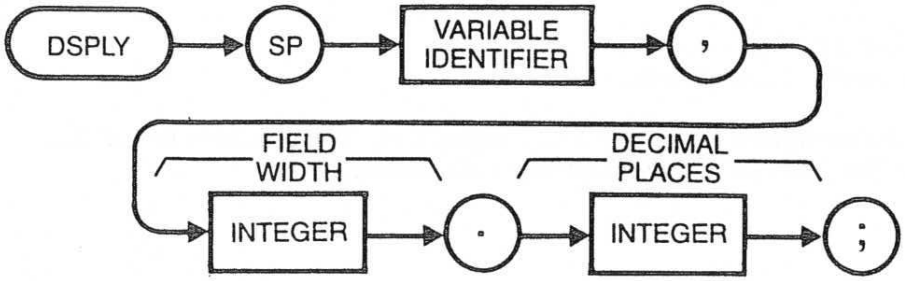

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DSPLY

Display

Description: The DSPLY command displays the value of a variable anywhere on the analyzer display. Use the PU and PA commands to position the variable on the 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 places. For example, the number 123.45 has a field of 7, and 2 decimal places.

Example:

```
OUTPUT 718;"PU;PA 50,50;DSPLY CF,15.0;"
```

The DSPLY command in the preceding example allows the programmer to check the value of the center frequency. The number, 15.0, is the total field width, 15, and the desired number of decimal places, 0.

The analyzer displays the data independent of PU or PD. The pen does not need to be down for data display.

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EE

Enable Entry

Description: The EE command sends values entered by the operator on the analyzer number keyboard to the controller. Generally, the sequence of programmed events is as follows:

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 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.

Syntax: See Figure 4-1

Example: The following program allows you to enter values on the analyzer. As values are entered, they appear on the computer screen. When 1 MHz is entered, "FINISHED" appears on the computer screen and the program is terminated.

```
10 ASSIGN @Sa TO 718
20 ON INTR 7 GOSUB Process_key
30 OUTPUT @Sa;"RQS 2;EE;"
40 ENABLE INTR 7;2
50 REPEAT
60  DISP "ENTER VALUE AND UNITS (ENTER 1MHZ TO EXIT)"
70 UNTIL New_value=1.E+6
80 OUTPUT @Sa;"HD;"!turn off active function
90 DISP "FINISHED"
100 STOP
110 !
120 Process_key:  !key process routine
130 A=SPOLL(@Sa)
140 IF BIT(A,1)=1 THEN
150  OUTPUT @Sa;"?;"
160  ENTER @Sa;New_value
170  PRINT "VALUE IS ";New_value
180  WAIT .1 !wait for value entry
190  OUTPUT @Sa;"EE;RQS 2;"
200  ENABLE INTR 7;2
210 ELSE !handle other interrupts here
220 END IF
230 RETURN
240 END
```


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EK

Enable Knob

Description: The EK command allows data entry with the front-panel knob when the analyzer is under remote control. The knob is functional, but other front panel functions remain inoperative.

Syntax: See Figure 4-1

Example: While the program is paused, the operator positions a marker on a signal that needs further analysis.

```
10 OUTPUT 718;"MKN;EK;"
20 PRINT "USE KNOB TO PLACE MARKER"
30 PRINT "PRESS CONTINUE WHEN DONE"
40 PAUSE
50 ! Analysis program inserted here
60 END
```

Press the ***CONTINUE*** key on the controller to resume program operation.

EM

Erase Graphics Memory

Description: The EM command clears out any user generated graphics and text. It can be used to clear the analyzer screen in preparation for the display of custom graphics. (EM does not remove annotation, graticule, display line, or threshold. If desired, these can be removed and used with EM as below.)

Execute the following line to blank the analyzer screen:

```
OUTPUT 718;"EM;BLANK TRA;BLANK TRB;GRAT OFF;ANNOT OFF;TH OFF;DL OFF;"
```

To reinstate the normal analyzer display, execute the following program line:

```
OUTPUT 718;"EM;CLRW TRA;GRAT ON;ANNOT ON;"
```

Syntax: See Figure 4-1

Example: `OUTPUT 718;"EM;"`

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EP

Enter Parameter Function

Description: The EP command sends values entered by the operator on the analyzer number keyboard to the parser.

Syntax: See Figure 4-1.

Example: `OUTPUT 718;"DL EP;"`

This example allows you to enter a value manually through the numeric keypad. When the value is terminated by the ***dBm*** or ***ENTER*** keys on the analyzer, the analyzer will be ready to execute more remote commands.

Note: Because the EP command uses the current active function, confirm that the correct active function is being used before executing the statement.

FA

Start Frequency

Description: The FA command specifies the start frequency value, performing the same function as the [START FREQ] softkey. When queried (? or OA), FA returns the start frequency, a real number, followed by a carriage-return/line-feed. The End-or-identify line (EOI) is asserted.

See HNLOCK for a description of the limits.

Syntax: See Figure 4-7. The AUTO parameter does not apply.

Example: `OUTPUT 718;"FA 88MZ;"`

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FB

Stop Frequency

Description: The FB command specifies the stop frequency value, performing the same function as the [STOP FREQ] softkey. When queried (? or OA), FB returns the stop frequency, a real number, followed by a carriage-return/line-feed. The End-or-identify state (EOI) is asserted.

See HNLOCK for a description of the limits.

Syntax: See Figure 4-7. The AUTO parameter does not apply.

Example: `OUTPUT 718;"FB 88MZ;"`

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FFT

Fast Fourier Transform

Description: The FFT command performs a Discrete Fourier Transform on the source trace array and stores the logs of the magnitudes of the results in the destination array. The maximum length of any of the traces is 401 points.

If the analyzer is in logarithmic mode, the data in the source trace is assumed to be logarithmic and will be converted to linear before transformed with FFT. Next, the source array is weighted with the function in the window trace (described below) to minimize amplitude inaccuracies, side lobes, etc. Finally, the transform is computed and the results are placed in the destination array.

The FFT results are displayed on the 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 sweeptime of the analyzer. The sweeptime 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 analyzer be 20 ms and the number of trace elements be 400. 20 msec divided by 400 equals 50 μsec, the sampling period. The sample rate is 1/50 μsec. Fmax equals 1/50 μsec divided by 2, or 10 kHz.

FFT is designed to be used in transforming zero span information into the frequency domain. Performing FFT on a frequency sweep will not provide time domain results.

The windowing function stored in the window trace may be selected with the TRACE WINDOW (TWNDOW) command or by the user storing his own values in that trace.

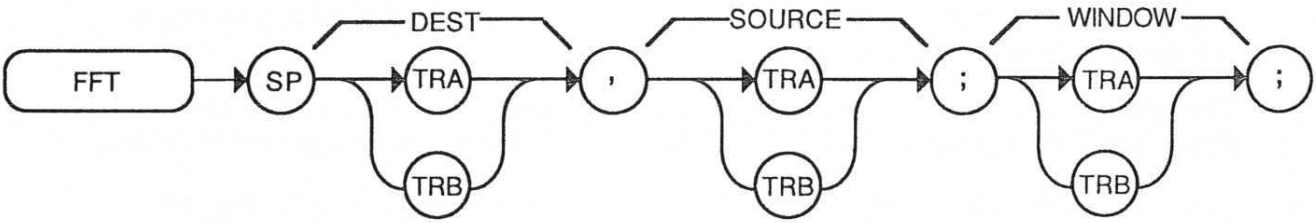
Note: After using the FFT command, the markers remain in FFT mode. For this reason, the markers must be turned off before continuing (see MKOFF).

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Note: The [FFT MEAS] softkey initiates a routine that first selects sample-detection mode, takes a sweep, and stores and places trace A in view mode (DET SMP;TS;VIEW TRA). Then the routine sets the trace window to flattop (TWNDOW TRB,FLATTOP) and FFT is run (FFT TRA,TRA,TRB). Finally, markers are turned off, a marker is placed at the highest peak, the FFT marker-readout mode is set, and a normal marker is activated (MKOFF ALL; MKPK; MKREAD FFT;MKN).

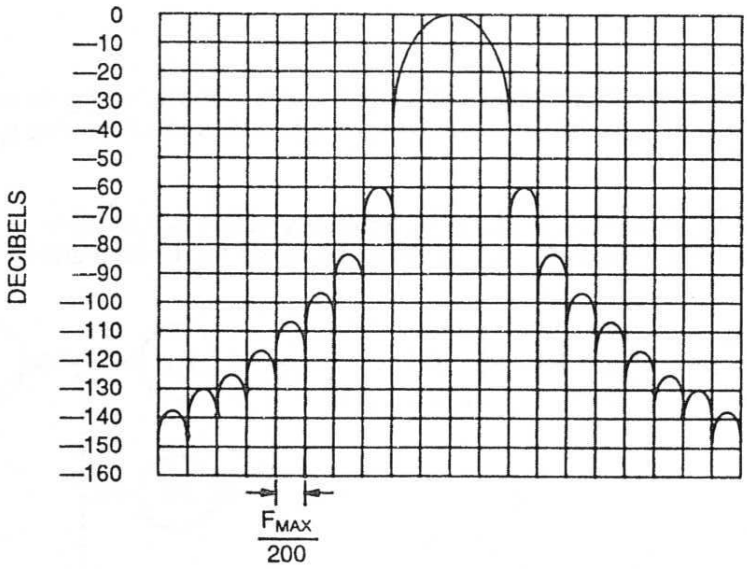
Note: TWNDOW should always be set before FFT is called.

Syntax:

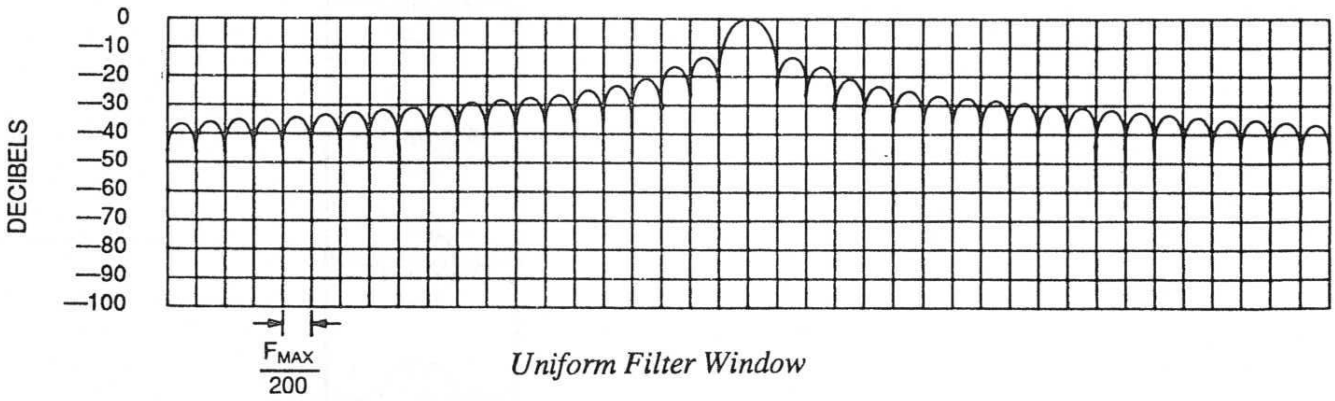


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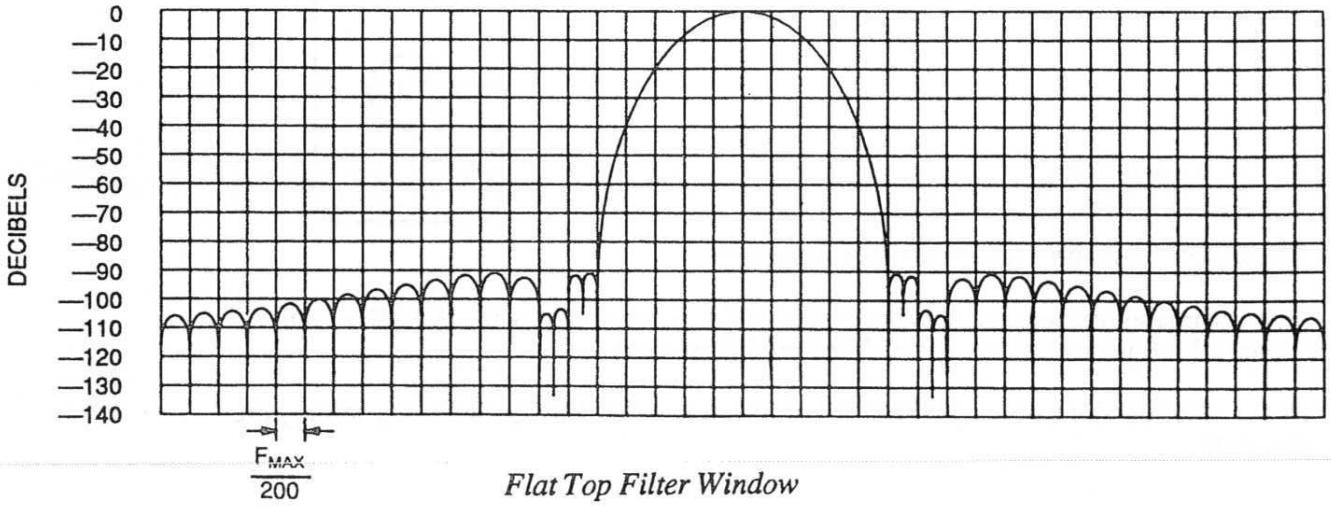
Filter Windows:



Hanning Filter Window



Uniform Filter Window



Flat Top Filter Window

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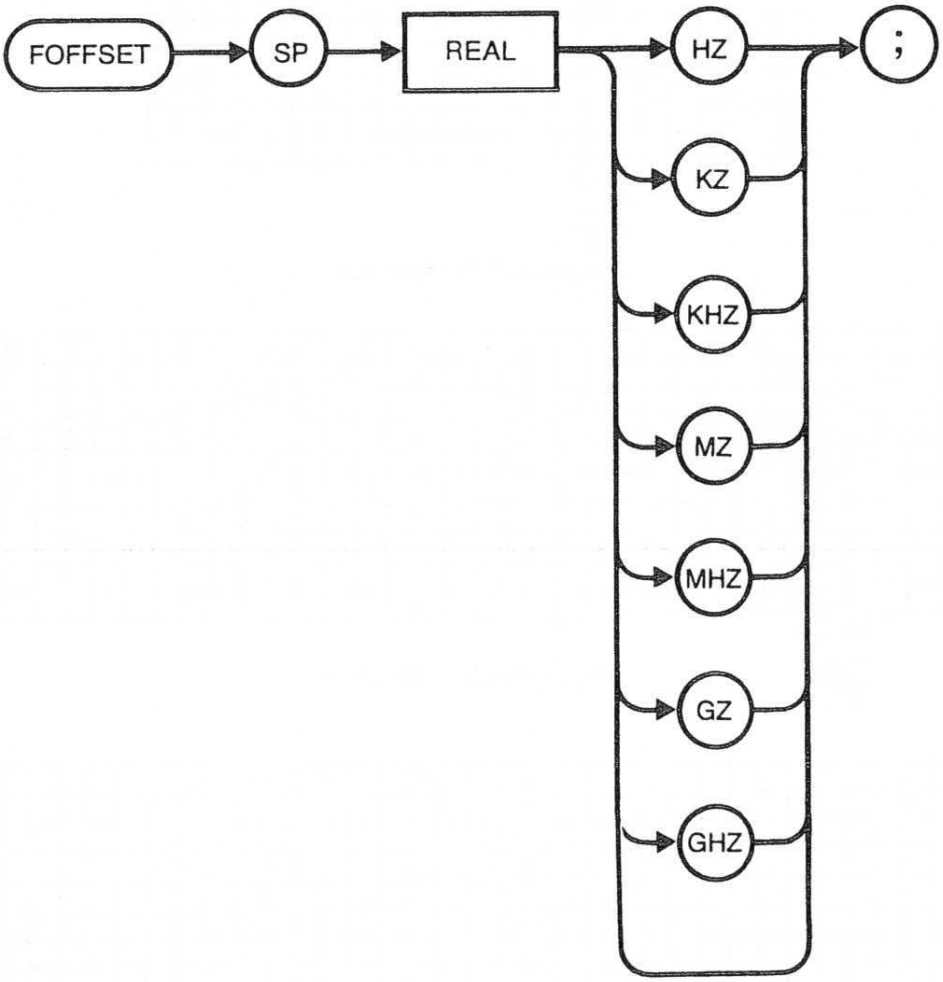
FOFFSET

Frequency Offset

Description: The FOFFSET command selects a value that offsets the frequency scale for all absolute frequency readouts (for example, center frequency). Relative values like span and delta marker 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 analyzer screen.

Syntax:



Example: `OUTPUT 718;"FOFFSET 100MZ;"`

This command replaces the previous value of the offset, if any, with 100 MHz. All displayed frequency values are modified by this amount.

Note: The functions of the FOFFSET command and the [FREQ OFFSET] softkey are identical.

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GRAT

Graticule

Description: The GRAT command turns the graticule on and off. When queried (?), GRAT returns the graticule state: ON or OFF.

Syntax: See Figure 4-4

Example: `OUTPUT 718;"GRAT OFF;"`

Note: Alternate command KSm turns off the graticule and KSn turns it on. The functions of the GRAT command and the [GRAT ON OFF] softkey are identical.

HD

Hold Data Entry

Description: The HD command disables data entry via the front panel number keyboard, blanks the active function readout, and deactivates any active function.

Syntax: See Figure 4-1

Example:
```
OUTPUT 718;"HD;"
OUTPUT 718;"CF 7 GZ;12 GZ;HD;14 GZ;"
```

The first line disables the active function. The second line causes an error at "14 GZ" and leaves CF at "12 GZ;" since HD deactivates any current function.

Note: The functions of the HD command and the ***HOLD*** key are identical.

HN

Harmonic Number

Description: The HN command returns an integer.

Single-band sweep: harmonic number 0 to 4
Multi-band sweep: —1

Syntax: See Figure 4-3

Example: `OUTPUT 718;"HN?;"`

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HNLOCK

Harmonic Number Lock

Description: The HNLOCK command forces the analyzer to use only the selected harmonic.

HNLOCK ON locks onto the harmonic necessary for the current center frequency, lowering the span, if necessary, due to the limits of the harmonic.

HNLOCK X locks onto harmonic band X and automatically selects the settings shown on Table 4-6.

Table 4-6

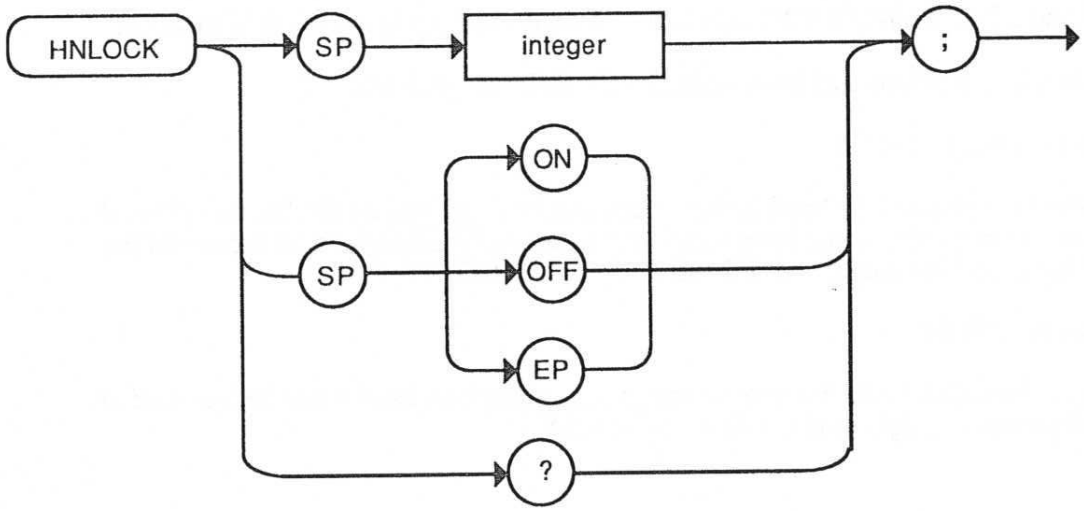
REMOTE COMMAND	EQUIVALENT SOFTKEY	FREQUENCY SETTINGS	
HNLOCK 0	BAND 0:	center frequency 1.45 GHz	span 2.9 GHz
HNLOCK 1	BAND 1:	center frequency 4.475 GHz	span 3.45 GHz
HNLOCK 2	BAND 2:	center frequency 9.4 GHz	span 6.8 GHz
HNLOCK 3	BAND 3:	center frequency 15.9 GHz	span 7 GHz
HNLOCK 4	BAND 4:	center frequency 20.55 GHz	span 2.9 GHz

Once HNLOCK is set, only frequencies and spans that fall within the frequency band of the current harmonic may be entered. The span automatically reduces to accomodate 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.

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Syntax:



Note: The HNLOCK command and the softkeys under the BAND LOCK menu are identical.

Note: HNLOCK? returns ON or OFF.

Band Lock 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 greater than the current stop frequency is entered, the (possibly modified) start frequency will be used for both the start and stop frequency so the span will be set to zero. If the start frequency and stop frequency 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 less than the current start frequency is entered, the (possibly modified above) stop frequency will be used for both the start and stop frequency so the span will be set to zero. (Also see FB.)

Center Frequency:

The span will be modified if necessary to get the center frequency requested without crossing the band edges. (Also see CF.)

Span:

The span will be limited as necessary to keep the start and stop within the band edges without changing the center frequency. The maximum span allowed is 3.6 GHz in bands 0 and 1, and 7 GHz in higher bands. (Also see SP.)

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Band Lock Off

The STOP and START FREQUENCIES will be 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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HNUNLK

Unlock Harmonic Number

Description: The HNUNLK command unlocks the harmonic number, allowing you to select frequencies and spans outside its range.

Syntax: See Figure 4-1

Example: The following program unlocks the harmonic number.

```
10 OUTPUT 718;"HNUNLK;"
20 END
```

Note: HNUNLK is equivalent to HNLOCK OFF.

ID

Identify

Description: The ID command returns the instrument identity to the controller (for example, "HP 8592A").

Syntax: See Figure 4-1

Example: The following program prints the instrument identifier on the computer screen.

```
10 OUTPUT 718;"ID;"
20 ENTER 718;A $
30 PRINTER IS 1
40 PRINT A $
50 END
```

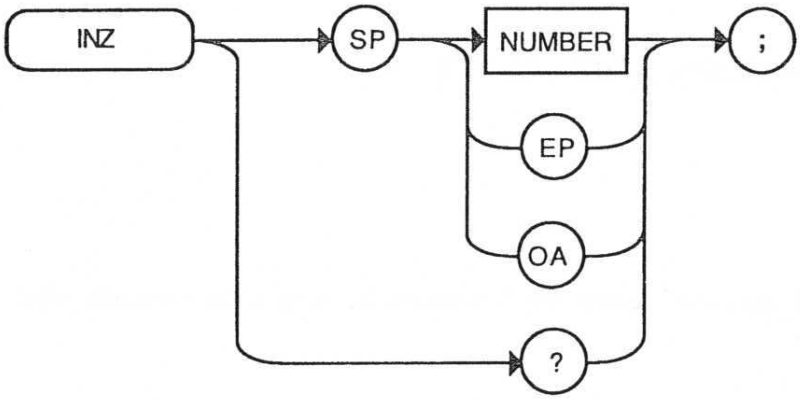

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INZ

Input Impedance

Description: The actual impedance can only be affected by internal hardware; the hardware only supports 50 ohms. The values allowed are 50 or 75 ohms. The INZ command is used for computation purposes during power/voltage conversions. The INZ command effects the amplitude results reported in any units other than relative power (dBm units). (See AUNITS command.)

Syntax:



Example: `OUTPUT 718;"INZ 50;"`

Note: The functions of the INZ command and the [INPUT IMPED] softkey are identical.

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IP

Instrument Preset

Description: The instrument preset command, IP, executes the following commands:

AMB OFF: Turns off A — B mode.
ANNOT ON: Turns on annotation.
AT: —10 dB
AUNITS DBM: Selects dBm amplitude units.
AUTO: Couples RB, AT, SS, ST, and VB. Turns off display line and threshold.
BLANK B: Blanks trace B.
CLRW A: Clears and writes trace A.
CONTS: Selects continuous sweep.
DET POS: Selects positive peak detection.
DL OFF: Display line off.
EM: Erase user graphics
FA: Sets the start frequency. 3000 MHz
FB: Sets the stop frequency. 22000 MHz
FOFFSET: 0
HD: Hold (Deactivates active function.)
HNLOCK OFF: Harmonic lock off, allowing multiband sweeping.
GRAT ON: Turns on the graticule.
INZ: Loaded from configurable location
LG: Selects 10 dB/DIV log scale.
MDS W: Selects data size of one word, which is two 8-bit bytes.
MKNOISE OFF: Turns off noise markers.
MKOFF: Turns off all markers.
MKPAUSE OFF: Turns off marker pause mode.
MKPX: 6dB minimum excursion for peak identification.
MKTRACK OFF: Turns off marker tracking.
ML: —10 dBm
PD: Puts pen down at current position.
RL: 0 dBm
ROFFSET: 0
RQS 40: Decimal 40 = Illegal Command or Hardware Broken
STATUS BYTE: clear
SS: 100 MHz step size
TH: one division above bottom graticule line, line off
TITLE: clear
TM FREE: Selects free run trigger mode.
TDF P: Selects parameter units output format.
VAVG OFF: Turns off video averaging.
VAVG LIMIT: 100

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Instrument preset automatically occurs when you turn on the analyzer, and is a good starting point for many measurement processes. When IP is executed remotely, the analyzer does not necessarily execute a complete sweep. PRESET sets CF to 12.5 GHz and span to 19 GHz.

Syntax: See Figure 4-1

Example: `OUTPUT 718;"IP;TS;"`

Note: IP does not clear state or trace registers.

LG

Logarithmic Scale

Description: The LG command specifies the vertical graticule divisions as logarithmic units without changing the reference level. The vertical scale may be specified (in integers) between 1 and 20 dB per graticule division. When queried, LG returns the dB/division value. If "LG?;" returns 0, then the analyzer is in linear mode.

Syntax: See Figure 4-6

Example: `OUTPUT 718;"LG 1DB;"`

Note: The functions of the LG command and the [LOG dB/DIV] softkey are identical.

LN

Linear Scale

Description: The LN command selects the LINEAR mode of operation and 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 mV become 30.16 mV, which equals —17.4 dBm.

Syntax: See Figure 4-1

Example:
```
OUTPUT 718;"LN;"
OUTPUT 718;"LN;RL 30MV;"
```

Note: The functions of the LN command and the [LINEAR] softkey are identical.

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MA

Marker Amplitude Output

Description: If the marker is on the screen, the MA command returns the amplitude level of the active marker to the controller. The marker amplitude is displayed in the upper-right corner of the analyzer screen. If both the delta marker and active marker are on the screen, MA returns the amplitude difference between the two markers. In zero span, MA returns the amplitude difference. To obtain the time difference, see MKD.

The data that is returned by "MA;" depends upon many command conditions including MKN, MKD, TDF, AUNITS, MDS and MKNOISE.

Syntax: See Figure 4-1

Example: MA is used in the following program to determine the amplitude value of the marker.

```
10 PRINTER IS 701
20 OUTPUT 718;"IP;SNGLS;"
30 OUTPUT 718;"CF 300MZ; TS;"
40 OUTPUT 718;"MKN;MKPK HI;"
50 OUTPUT 718;"MA;"
60 ENTER 718;A
70 PRINT A
80 END
```

Line 30 sets the start and stop frequencies. Line 40 activates a normal marker and peak search. Line 60 returns the amplitude to the controller. Lines 60 and 70 assign the amplitude to variable A and print the amplitude.

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MDS

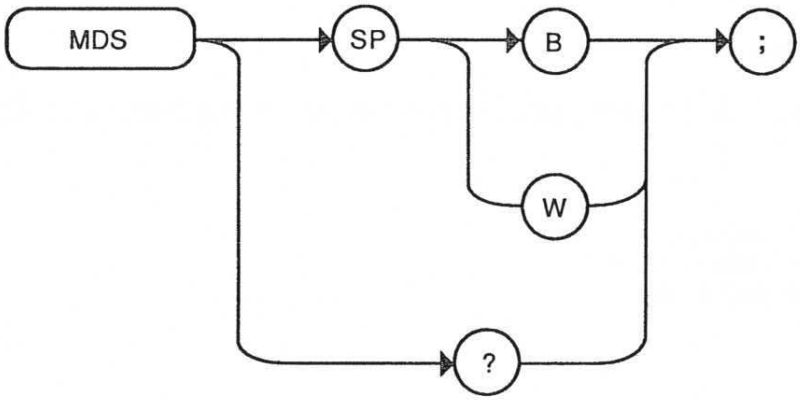
Measurement Data Size

Description: The MDS command formats binary measurements:

B selects a data size of one 8-bit byte.

W selects a data size of one word, which is two 8-bit bytes.

Syntax:



Example: `OUTPUT 718;"TDF B;MDS W;TRA?"`

The above example transfers trace A in binary, 2 bytes per word.

```
10 INTEGER TRACE_A (1:401)
20 ! READING A TRACE BACK IN "W" FORMAT
30 OUTPUT 718;"SNGLS;TS;"
40 OUTPUT 718;"TDF B;MDS W;TRA?;"
50 ENTER USING "#,401(W);TRACE_A(*)
```

The above example demonstrates how data is read back to the analyzer.

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MF

Marker Frequency Output

Description: If the marker is on the screen, the MF command returns the frequency value of the active marker to the controller. In delta marker mode, non-zero span, "MF;" returns the frequency difference between the two markers. In zero span, "MF;" returns the marker time, or the delta marker time.

Syntax: See Figure 4-1

Example: MF is used in the following program to determine the frequency value of the marker.

```
10 PRINTER IS 701
20 OUTPUT 718;"IP;SNGLS;"
30 OUTPUT 718;"FA 280MZ;FB 320MZ;TS;"
40 OUTPUT 718;"MKN;MKPK HI;"
50 OUTPUT 718;"MF;"
60 ENTER 718;F
70 PRINT F
80 END
```

Line 30 sets the start and stop frequencies. Line 40 activates a normal marker and peak search. Line 60 returns the frequency to the controller. Line 70 prints the frequency.

MKA

Marker Amplitude

Description: The MKA command specifies the amplitude of the active marker in dBm 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.

Syntax: See Figure 4-6

Example:

```
10 OUTPUT 718;"MKA?;"
20 ENTER 718;A
```

"A" will contain the amplitude value of the marker.

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MKCF

Marker to Center Frequency

Description: The MKCF command sets the center frequency equal to the marker frequency and moves the marker to the center of the screen.

Syntax: See Figure 4-1

Example: `OUTPUT 718;"MKCF;"`

Note: The functions of the MKCF and E2 commands and the [MARKER → CF] softkey are identical.

MKD

Marker Delta

Description: In non-zero span, the MKD function computes the frequency and amplitude difference between the active marker and the delta marker. In zero span, MKD computes the time and amplitude difference. To read the amplitude difference or amplitude ratio in LN display mode, use MA. These values are displayed on the analyzer screen.

If a delta marker is not on the screen, MKD places one at the specified frequency if using frequency markers, or at the current active marker. If an active marker is not on the screen, MKD positions an active frequency marker at center screen. 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).

In zero span, MKD?; computes and returns time differences. To attain amplitude, see MA.

Syntax: See Figure 4-7. AUTO parameter turns markers off.

Example: `OUTPUT 718;"MKD;"`

Note: The functions of the MKD and M3 commands and the [MARKER DELTA] softkey are identical.

MKF

Marker Frequency

Description: The MKF command specifies the frequency value of the active marker. When queried, MKF returns the active marker frequency as a real number. In zero span, "MKF?;" returns the time value.

Syntax: See Figure 4-7. UP moves the marker to the right and DN moves the marker to the left. AUTO does not apply.

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MKMIN

Marker Minimum

Description: The MKMIN command moves the active marker to the minimum value detected.

Syntax: See Figure 4-1

Example: `OUTPUT 718;"MKMIN;"`

MKN

Marker Normal

Description: The MKN command activates and moves the marker to the specified frequency (or CF if none is supplied). In non-zero span, "MKN?;" returns the frequency value. In zero span, "MKN?;" returns the time value.

Syntax: See Figure 4-7. The AUTO parameter turns markers off.

Example: `OUTPUT 718;"MKN 300MZ;"`

Note: The functions of the MKN and M2 commands and the [MARKER NORMAL] softkey are identical.

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MKNOISE

Marker Noise

Description: The MKNOISE command displays the average noise level at the marker and selects DET SMP. The value is normalized to a 1-Hz bandwidth. When queried, MKNOISE returns ON or OFF. 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/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. So the data values averaged are not situated exactly symmetrically with respect to marker position. At the trace end points, the 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 3db resolution bandwidth. The firmware assumes the noise bandwidth is 1.12 * 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 effects the measurement, if in log mode the log detector understates the noise response, to 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.

The final reported value will then be, with the result reported in dBm in a 1 HZ value:

In log detector mode
(Averaged value over 32 values) - 10 * (log[1.12*Resolution bandwidth]) +2.5dB

In Linear detector mode (dBm) units:
(Averaged value over 32 values) - 10 * (log[1.12*Resolution bandwidth]) +1.05dB

In linear 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)^2)*1.12*Resolution_bandwidth*0.78524

V_noise_marker =
V_average/(*1.12*Resolution_bandwidth*0.78524)^0.5

V_noise_marker =
V_average*1.06633/(Resolution_bandwidth)^0.5

Syntax: See Figure 4-4

Example: `OUTPUT 718;"MKNOISE ON;"`

Note: The functions of the MKNOISE and KSM commands and the [MKNOISE on OFF] softkey are identical.

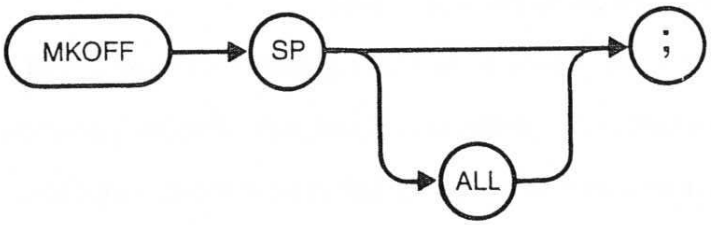
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MKOFF

Marker Off

Description: The MKOFF command turns off either the active marker or all markers displayed on the screen. If the ALL parameter is omitted, only the active marker is turned off.

Syntax:



Example: `OUTPUT 718;"MKOFF ALL;"`

Note: The functions of the MKOFF ALL and M1 commands and the [MARKERS OFF] softkey are identical.

MKPAUSE

Marker Pause

Description: The MKPAUSE command pauses the sweep at the active marker for the duration of the delay period. The "real" parameter refers to the delay period from 2 msec to 100 seconds. To turn pause off, turn off markers (or, send "MKPAUSE 0;").

Syntax: See Syntax for ST. Marker Pause Auto is equivalent to marker pause 0, turning off the pause.

Example: `OUTPUT 718;"MKPAUSE 100;"`

Note: The functions of the MKPAUSE command and the [MARKER PAUSE] softkey are identical.

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MKPK

Marker Peak

Description: The MKPK command positions the active marker on signal peaks. Executing MKPK HI, or simply MKPK, positions the active marker at the highest signal detected. If an active marker is on the screen, the parameters move the marker accordingly.

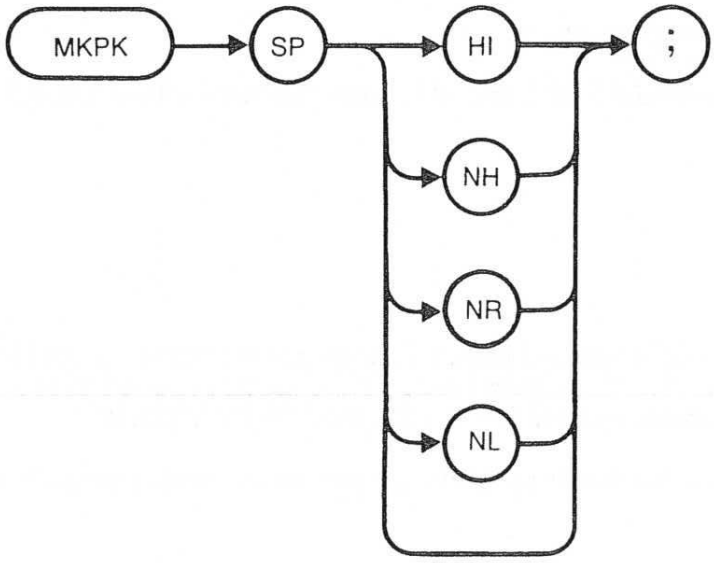
HI (highest) moves the active marker to the highest peak.

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.

Syntax:



Note: Alternate command E1 positions the marker at the highest signal peak. The functions of the MKPK HI command and the ***PEAK SEARCH*** key are identical. The MKPK parameters correspond to the [NEXT PEAK], [NEXT PK RIGHT], and [NEXT PK LEFT] softkeys.

Note: This function is for use with the frequency markers only.

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MKPX

Marker Peak Excursion

Description: The MKPX command specifies the minimum signal excursion for the analyzer's internal peak-identification routine. When queried with ?, MKPX returns the excursion value.

Syntax: See Figure 4-6. AUTO does not apply.

Example: `OUTPUT 718;"MKPX 8DB;"`

Note: The functions of the MKPX command and the [PEAK EXCURSN] softkey are identical. (See MKPK and PEAKS.)

MKRL

Marker to Reference Level

Description: The MKRL command sets the reference level to the amplitude value of the active marker.

Syntax: See Figure 4-1

Example: `OUTPUT 718;"MKRL;"`

Note: The functions of the MKRL and E4 commands and the [MARKER → RL] softkey are identical.

MKSP

Marker to Span

Description: The MKSP command sets the start and stop frequencies to the frequencies of the delta markers. (See MKD.) The left marker specifies start frequency, and the right marker specifies stop frequency. If MKD is off, there is no operation.

Syntax: See Figure 4-1

Example: `OUTPUT 718;"MKSP;"`

Note: The functions of the MKSP and KSO commands and the [MRK Δ → SPAN] softkey are identical.

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MKSS

Marker Step Size

Description: The MKSS command sets the center frequency step size to the frequency of the active marker. If in delta mode, the step size is set to the delta frequency (absolute value).

Syntax: See Figure 4-1

Example: `OUTPUT 718;"MKSS;"`

Note: The functions of the MKSS and E3 commands and the [MARKER → STEP] softkey are identical.

MKTRACK

Marker Track

Description: The MKTRACK command moves the signal with an active marker to the center of the screen and fixes the signal there. To keep a drifting signal at center screen, place the active marker on the desired signal before executing MKTRACK.

Syntax: See Figure 4-4

Example: `OUTPUT 718;"MKTRACK ON;"`

Note: The functions of the MKTRACK command and the ***SIGNAL TRACK*** key are identical. Alternate command MT0 turns marker track off, and MT1 turns it on.

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MKTYPE

Marker Type

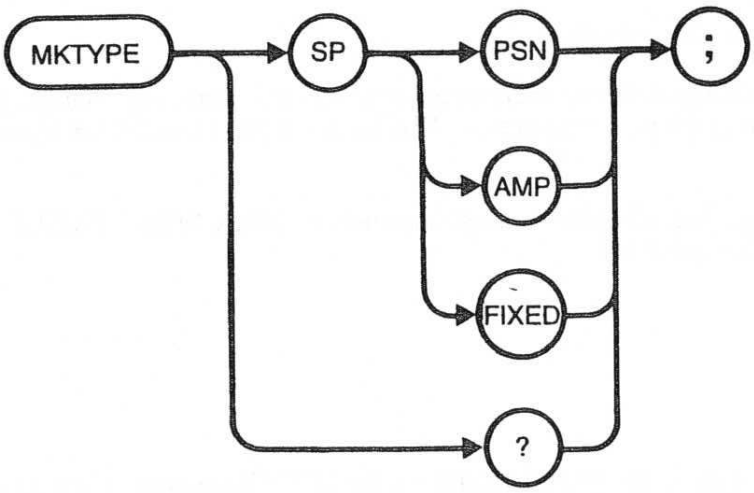
Description: The MKTYPE command changes the type of the current active marker.

AMP allows markers to be positioned according to amplitude, as shown in the example.

PSN allows markers to be positioned according to the horizontal position on the display.

FIXED allows a marker to be placed at any fixed point on the analyzer screen.

Syntax:



Example: `OUTPUT 718;"MKTYPE AMP;MKA -3;"`

The example positions a marker at the frequency value where the amplitude is closest to —3dBm.

Note: The functions of the MKTYPE AMP and the [MARKER AMPTD] softkey are identical.

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ML

Mixer 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. IP selects —10 dBm.

Syntax: See Figure 4-6. AUTO does not apply.

Example: `OUTPUT 718;"ML -40DM;"`

As the reference level is changed, the coupled input attenuator automatically changes to limit the maximum signal at the mixer input to —40 dBm for signals less than or equal to the reference level.

Note: The functions of the ML and KSO commands and the [MAX MXR LEVEL] softkey are identical. (Also see AT.)

MXMH

Maximum Hold

Description: While the trace is active and displayed, the MXMH command updates each trace element with the maximum level detected.

Syntax: See Figure 4-5

Example: `OUTPUT 718;"MXMH TRA;"`

Note: The functions of the MXMH TRA and A2 commands and the [MAX HOLD A] softkey are identical. The functions of the MXMH TRB and B2 commands and the [MAX HOLD B] softkey are identical.

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M4

Marker Zoom

Description: The M4 command activates a single marker at center frequency. The knob changes the position of the marker and the step keys change the frequency span; the center frequency is set to the value of the marker frequency with each press of the step keys. Press the ***LOCAL*** key before using the knob or step keys. The "UP" and "DN" parameters increase and decrease the span remotely.

Syntax: See Figure 4-7. AUTO turns off the function.

Example: `OUTPUT 718;"M4;"`

OA

Output Active Function Value

Description: The OA command sends the value of the active function to the controller.

Syntax: See Figure 4-1

Example: `OUTPUT 718;"ST 3;OA;"`

The example produces the value 3.

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OL

Output Learn String

Description: The OL command transmits information to the controller that describes the state of the analyzer when the OL command is executed. This information is called the learn string. The learn string can be sent from the controller back to the analyzer to restore the analyzer to its original state.

The learn string requires 114 bytes of storage space as is shown in Chapter 3, "Advanced Programming." (See "Saving States" in Chapter 3.)

Syntax: See Figure 4-1

Example:

```
10 DIM LEARN_STRING$[114]
20 OUTPUT 718;"OL;"    ! ASK FOR FIRST STATE
30 ENTER 718 USING "#,114A"; LEARN_STRING 8
40 DISP"CHANGE ANALYZER TO ALL OTHER STATE, THEN CONTINUE TO RESTORE FIRST
STATE
50 PAUSE
60 OUTPUT 718; LEARN_STRING$
```

Note: To restore the analyzer to the Learn_String$ state, you simply return the Learn_String$ to the analyzer. The Learn_String$ contains information to tell the analyzer that it is learn string data; therefore, a restore learn string command does not exist. (Also see RC and SAVES.)

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PA

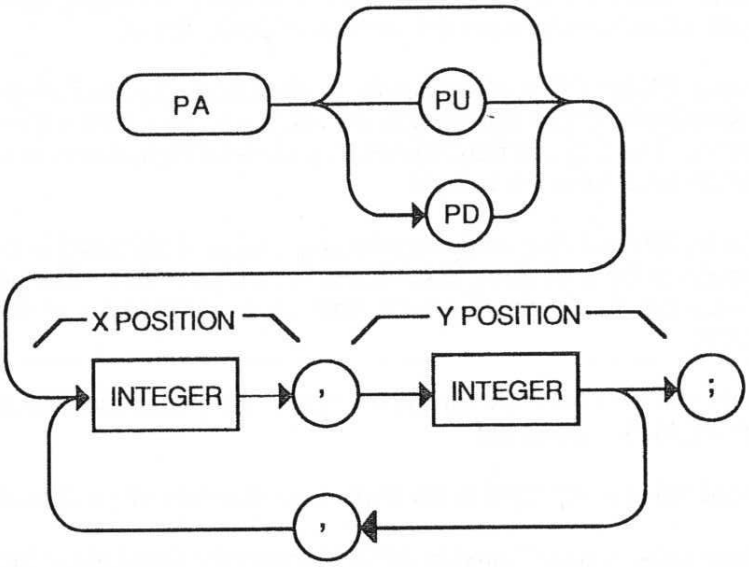
Plot Absolute

Description: The PA command specifies in display units a vector location on the analyzer screen relative to reference coordinates 0,0. 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.

The lower-left coordinate corresponds to (Xmin, Ymin) and the upper-right coordinate corresponds to (Xmax, Ymax).

Screen Coordinates:	Graticule Coordinates:
(Xmin, Ymin) = (-40, -22)	(Xmin, Ymin) = (0,0)
(Xmax, Ymax) = (471, 233)	(Xmax, Ymax) = (400,200)

Syntax:



Example: This example draws a rectangle on the analyzer's screen.

```
10  OUTPUT 718;"IP;BLANK TRA;"
20  OUTPUT 718;"ANNOT OFF;GRAT OFF;"
30  OUTPUT 718;"PU;"
40  OUTPUT 718;"PA 100,100;PD 100,150,"
50  OUTPUT 718;"150,150,150,100,100,100;"
60  END
```

Line 20 clears the display. Line 30 specifies PU, which prevents the inital vector from being drawn. Line 40 specifies the starting point of the rectangle to be drawn by the program. The PD command causes a vector to be drawn on the screen according to the coordinates specified in the program. Line 50 gives the coordinates for the remaining points of the rectangle.

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PD

Pen Down

Description: The PD command determines whether or not the lines drawn by the next set of PA/PR commands will be visible. The PA command, plot absolute, or PR, plot relative, may be used to mark the starting point of the vector. PD may then be used to drop the pen.

Syntax: See Figure 4-1

Example: See the example for the PA command.

PEAKS

Peaks

Description: The PEAKS command sorts signal peaks by frequency or amplitude, stores the results in the destination trace, and returns the number of peaks found.

When sorting by frequency, PEAKS first computes the horizontal position of all peaks. These positions are consecutively loaded into the destination trace, the lowest 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, 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 value occupying the first element.

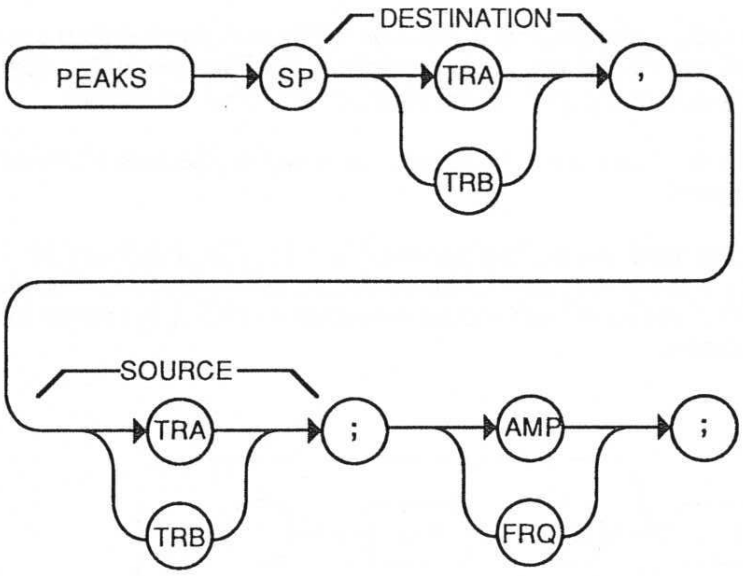
PEAKS sorts only signals that are above the threshold value. To change the threshold, use the TH command before PEAKS is executed.

If necessary, the last sorted value is repeated to fill remaining elements of the destination trace.

To be classified as a signal peak, a signal must be MKPX above the threshold value and rise and fall the MKPX dB value.

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Syntax:



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PLOT

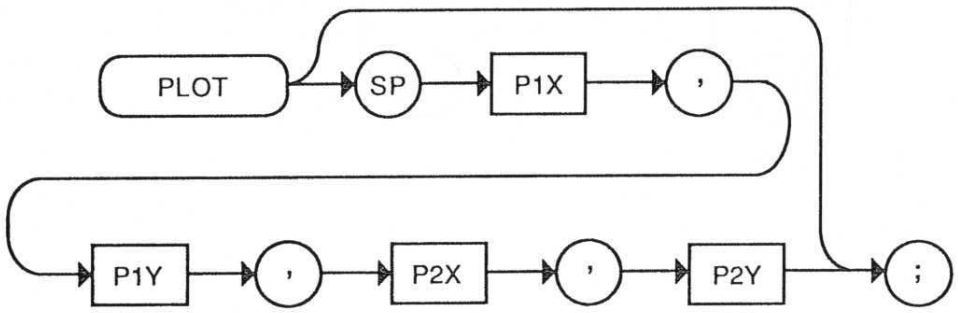
Plot

Description: The trace data, graticule, and annotation of the analyzer's screen can be directly transferred to a plotter via the analyzer's interface. PLOT immediately initiates a plotter dump of the screen data to the specified device (softkey labels excluded).

The example below 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 (P1x, P1y; P2x, P2y) may 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.

Syntax:



Example: The following computer program is used to plot analyzer data. The plotter is at address 05 and the analyzer is at address 18. (The program is only valid for HP 200 and 300 series computers.)

```
10 !PLOTTER IS AT ADDRESS 705
20 !ANALYZER IS AT 718
30 DIM P$[80]
40 OUTPUT 705;"OP;"
50 ENTER 705;P$
60 OUTPUT 718;"PLOT";P$
70 SEND 7;LISTEN 5 TALK 18 DATA
80 END
```

Note: The functions of the PLOT command and the ***PLOT*** key on the front of the analyzer are identical. Specify the plotter by pressing ***CONFIG*** and [PLOTTER ADDRESS] and entering an address.

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PP

Preselector Peak

Description: The PP command peaks the preselector. Set the desired trace to clear-write mode, place a marker on a desired signal, then execute PP. To read the new preselector peaking number, use the PRSDAC command. Commands following PP are not executed until after the analyzer has finished peaking the preselector.

Preselector peak 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 DELTA] 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 master. A "CAL: PEAKING" message appears on the active graticule area to indicate operation of the peaking routine. PRESELECTOR PEAK only operates in the 2.7 - 22 GHz preselector bands.

Example: `OUTPUT 718;"PP;"`

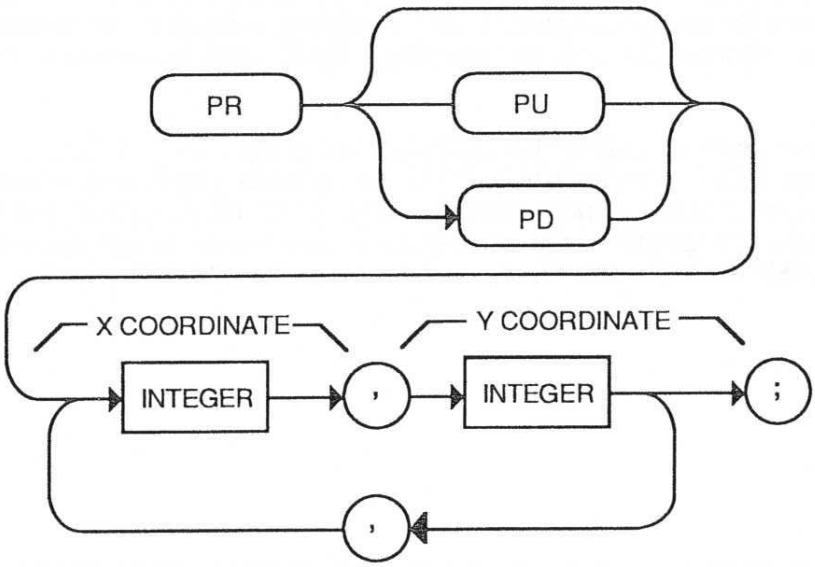
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PR

Plot Relative

Description: The PR command specifies a new plot location on the analyzer screen relative to its current coordinates. 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 analyzer to draw or not draw the vectors on the screen. (See the PU and PD commands.)

Syntax:



Example:

```
10 OUTPUT 718;"PU;PA 0,100;"
20 OUTPUT 718;"PD;PR100,0,0,-100,-100,0,0,100;"
```

PD (pen down) tells the analyzer to display the vectors drawn in accordance with the vector coordinates (x,y pairs) that follow the PR command. Vectors are drawn to the four corners of a rectangle.

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PRINT

Print

Description: The PRINT command initiates a print dump of the screen data to the specified printer.

Syntax: See Figure 4-1

Example: The following program is used to print analyzer data. The printer address is 1 and the plotter address is 18. (The program is only valid for HP 200 and 300 series computers with an HP raster graphics printer, such as the HP Thinkjet.)

```
10 OUTPUT 718;"PRINT;"
20 SEND 7;LISTEN 1 TALK 18 DATA
```

Note: The functions of the PRINT command and the ***PRNT*** key on the front of the analyzer are identical. Specify the printer address by pressing ***CONFIG***, [PRINTER ADDRESS], and entering an address before sending the print command. (See PLOT.)

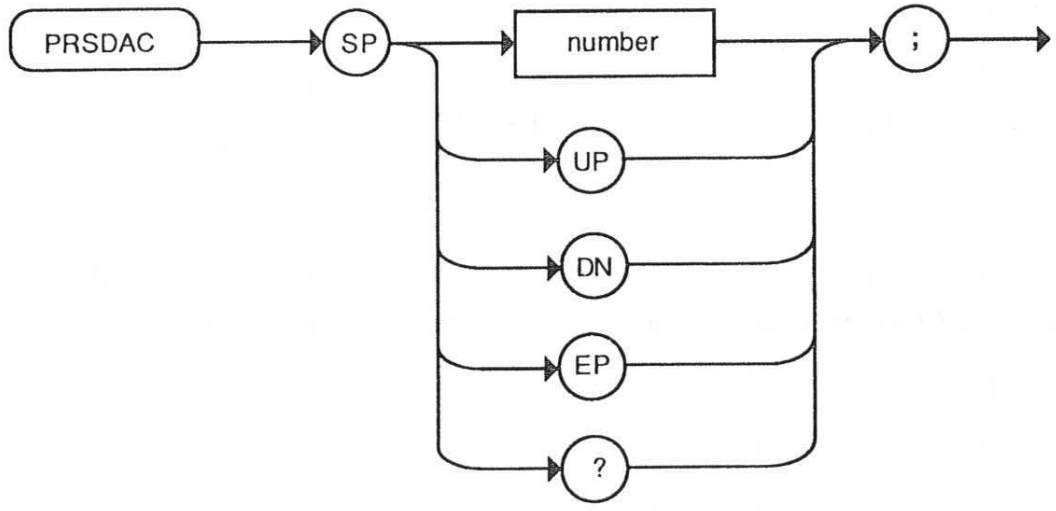
PRSDAC

Preselector DAC Number

Description: The PRSDAC command returns the preselector peak DAC number.

Parameters: number: integer from 0 to 3840.
UP/DN: increments of 1.

Syntax:



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PSTATE

Protect State

Description: Enables and disables SAVES and SAVET.

Syntax: See Figure 4-4

Note: The PSTATE command is equivalent to the [SAVE LOCK] softkey.

PU

Pen Up

Description: The PU command instructs the analyzer not to plot vectors on the analyzer screen.

Syntax: See Figure 4-1

Example: See the syntax diagram for PA and PR

RB

Resolution Bandwidth

Description: The RB command specifies the resolution bandwidth. Available bandwidths are 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, and 3 MHz. The coupling between video bandwidth or sweeptime and resolution bandwidth is not changed by this command. Execute RB AUTO to re-establish coupling. (Also see AUTO.)

Syntax: See Figure 4-7

Example:
```
OUTPUT 718;"RB 1KZ;"
```

Note: The functions of the RB command and the [RES BW] softkey are identical.

RCLS

Recall State

Description: The RCLS command recalls analyzer states from one of the nine state registers.

Syntax: See Figure 4-2

Example:
```
OUTPUT 718;"RCLS 3;"
```

The example recalls a previously saved state from register 3.

Note: The functions of RCLS and the ***RECALL*** key are identical. (Also see OL.)

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RCLT

Recall Trace

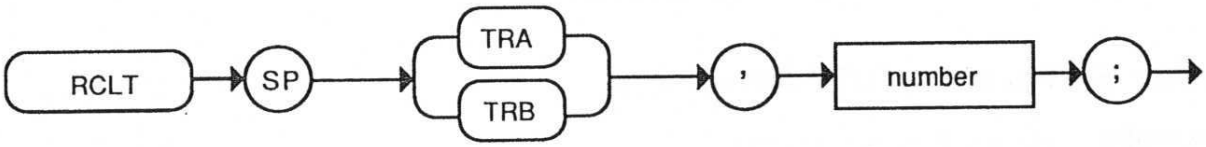
Description: The RCLT command recalls previously-saved trace data to the display along with the corresponding instrument state.

Note: The RCLT TRB command is equivalent to the [RECALL TRACE] softkeys.

Parameters:

TRA: recalls the trace data to Trace A.
TRB: recalls the trace data to Trace B.
number: integer from 0 to the TRCMEM —1.

Syntax:



Example: The following program saves trace A and recalls it to trace B.

```
10 OUTPUT 718;"IP;CF 300MZ;SP 20MZ;"
20 OUTPUT 718;"SAVET TRA,1;"
30 OUTPUT 718;"IP;"
40 OUTPUT 718;"RCLT TRB,1;"
50 END
```

REV

Revision

Description: The REV command returns the firmware revision number and HP date code (for example, 860910 indicates September 10, 1986). The firmware revision number and HP date code also appear when the instrument is first turned on, but not in the same format.

Syntax: See Figure 4-1

Example: The following program prints the revision date on the computer screen.

```
10 OUTPUT 718;"REV;"
20 ENTER 718;A
30 PRINTER IS 1
40 PRINT A
50 END
```


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RL

Reference Level

Description: The RL command specifies the amplitude value of the top graticule on the screen, which is called the reference level.

The reference level can be specified from —139.9 dBm to +50dBm. The reference level and input attenuator couple 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 analyzer.

Syntax: See Figure 4-6. AUTO does not apply.

Example: `OUTPUT 718;"RL -10DM;"`

Note: The functions of the RL command and the reference level function (accessed when ***AMPLITUDE*** is pressed) are identical.

Note: RL may affect the attenuation value.

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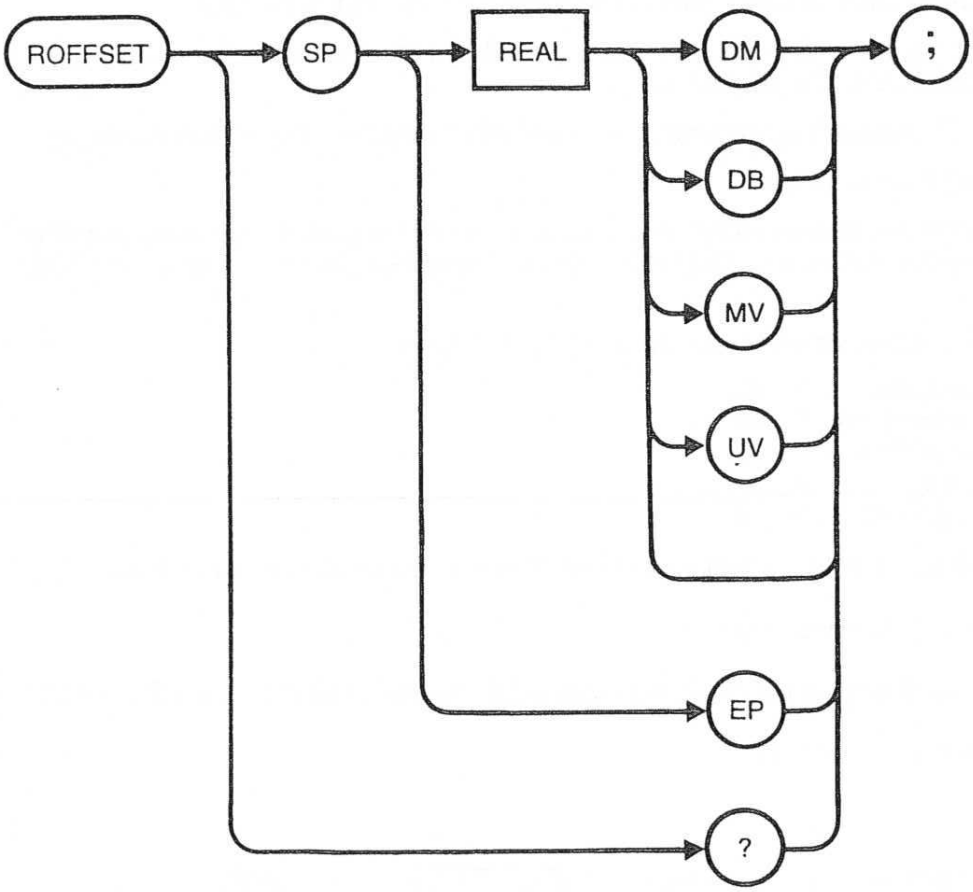
ROFFSET

Reference Level Offset

Description: The ROFFSET command offsets all amplitude readouts on the screen without affecting the trace. 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"` eliminates an amplitude offset.

Syntax:



Example: `OUTPUT 718;"ROFFSET -12DM;"`

Note: The functions of the ROFFSET and KSZ commands and the [REF LVL OFFSET] softkey are identical.

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RQS

Service Request Mask

Description: The RQS sets a bit mask for service requests. (See SRQ.) Each bit in the status byte is defined as follows:

1 indicates the units key was pressed and "SRQ 102" appears on the analyzer screen. (If you activate the units key bit, it will remain active until you activate EE and press a units key. See EE, only user for Enable Entry, EE mode.)

2 indicates end of sweep and "SRQ 104" appears on the analyzer screen. (If you send any RQS value that contains mask value 4, another sweep will be taken. See example.)

3 indicates broken hardware and "SRQ 110" appears on the 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 analyzer command was used and "SRQ 140" appears on the screen.

0 (LSB) 6, and 7 are not used.

Note: The analyzer screen numbers 102, 104, and 110 are the octal values corresponding to the status register values, i.e., SRQ 102 = Bits 6 = octal 100 and bit 2 = octal 2 are both true.

Example: Assignment of values for the mask is as follows:

Illegal command	=	32
Command complete	=	16
Hardware broken	=	8
End of sweep	=	4
Units key pressed	=	2

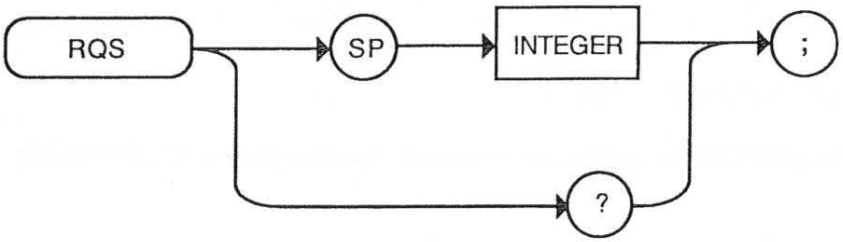
To send a mask with hardware broken and end of sweep, the mask is equal to 10 (8 + 2).

Send: `OUTPUT 718;"RQS 10;"`

To activate all conditions in the mask, the mask value is equal to 62 (32 + 16 + 8 + 4 + 2)

Send: `OUTPUT 718;"RQS 62;"`

Syntax:



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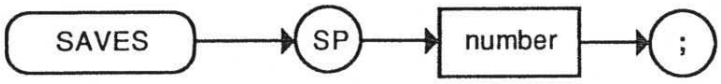
SAVES

Save State

Description: The SAVES command saves the currently-displayed instrument state in the specified state register if it has not been locked by the PSTATE command.

Parameters:
number: integer from 0 to 9.

Syntax:



Example: The following program saves the instrument state in state register 1.

```
10 OUTPUT 718;"IP;CF 300MZ;SP 20MZ;"
20 OUTPUT 718;"SAVES 1;"
30 END
```

Note: The functions of the SAVES command and the ***SAVE*** key are identical. (Also see OL.)

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SAVET

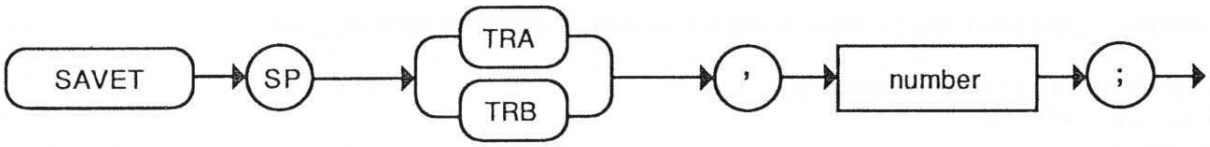
Save Trace

Description: The SAVET command saves the selected trace and state in the specified register if it has not been locked by PSTATE ON. (See SAVES command.)

Parameters:

TRA: stores the contents of Trace A.
TRB: stores the contents of Trace B.
number: integer from 0 to the TRCMEM —1.

Syntax:



Example: The following program saves both the trace and the instrument state.

```
10 INPUT "SELECT THE TRACE YOU WISH TO SAVE (TRA OR TRB)",Save_trace$
20 INPUT "SELECT THE REGISTER NUMBER",Reg_number
30 OUTPUT 718;"SAVET ";Save_trace$;", ";Reg_number;";"
40 END
```

Note: The SAVET and TRA commands are equivalent to the [SAVE TRACE] softkeys.

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SNGLS

Single Sweep

Description: The SNGLS command sets the analyzer to single_sweep mode. Each time TS (take sweep) is sent, one sweep is initiated, as long as the trigger and data entry conditions are met. SNGLS allows a 0 GHz to 22 GHz span. (Also see TS.)

Syntax: See Figure 4-1

Example: `OUTPUT 718;"SNGLS;"`

Note: The functions of the SNGLS and S2 commands and the [SINGLE SWEEP] softkey are identical.

Note: The values are bounded by the instrument range only; therefore, band 0 can be included in a multiband sweep in single mode.

SP

Span

Description: The SP command changes the total displayed frequency range symmetrically about the center frequency. The frequency span readout refers to the displayed frequency range. Divide the readout by ten to determine the frequency span per division. If span width couples to the resolution and video bandwidths, 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 it couples. All of these functions normally couple, unless RB, VB, or ST have been executed.

Since span is affected by frequency, change the frequency before changing span. (See HNLOCK.)

Specifying 0 Hz enables zero span mode, which configures the analyzer as a fixed-tuned receiver.

Syntax: See Figure 4-7. The AUTO parameter does not apply.

Example: `OUTPUT 718;"SP 10MZ;"`

Note: The functions of the SP command and the ***SPAN*** key are identical.

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SRQ

Service Request

Description: A service request is a method for the analyzer to notify an external controller of an analyzer condition. The service request condition is also displayed on the 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:

1. Units key pressed in enable entry mode
2. End of sweep
3. Hardware broken
4. Command complete
5. Illegal remote command.

A service request is generated only if the proper request mask bit has been set (see RQS) and either the condition itself or the Simulate Service Request (see RQS command) 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 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. To reenable the Units Key Pressed interrupt, you must send a new RQS mask. See the RQS command for detailed information.

As mentioned, you can simulate a service request condition. Choose the desired interrupt conditions from the RQS command table, 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 comand to the 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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Example: `OUTPUT 718;"RQS 8;SRQ 8;"`

In the previous example, the hardware broken interrupt is generated. A program can then respond to the interrupt exactly in the same way as it would under a true broken hardware condition.

Interface Differences

As implemented on the HP-IB interface, an analyzer service request asserts the SRQ control line on the HP-IB.

On the HP-IL interface, the analyzer can send a Service Request to the loop. This is similar to asserting the SRQ control line.

On the RS-232 interface, the 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** following 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

Additionally, the HP-IB and HP-IL interfaces support interface commands to read the status byte:

On HP-IB in HP series 200 or 300 BASIC, the statement `SPOLL(Device_address)` may be used to read the status byte.

On HP-IL in HP-71 BASIC, the `SPOLL(Device_specifier)` instruction may 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. Since there is no interrupt signal to the RS-232 controller, the use must periodically ask the 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.

Syntax: See Figure 4-2

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Table 4-7 Analyzer Status Register

BIT NUMBER	DECIMAL EQUIVALENT	ANALYZER STATE	DESCRIPTION
7	128		Not Used
6	64	SRQ ENABLE	Service Request Line is assigned by the analyzer
5	32	ILLEGAL COMMAND	Set when illegal command present
4	16	COMMAND COMPLETE	Any command is completed
3	8	HARDWARE BROKEN	Hardware Broken
2	4	END OF SWEEP	Set when any sweep is completed
1	2	UNIT KEY	Set when unit key pressed
0	1		Not Used

SS

Center Frequency Step Size

Description: The SS command specifies center frequency step size. This command is designed for use with the UP and DN parameters.

Syntax: See Figure 4-7. The AUTO parameter removes it as an active function but does not have an effect on its value.

Example: `OUTPUT 718;"SS 10MZ;"`

Note: The functions of the SS command and the [CF STEP SIZE] softkey are identical.

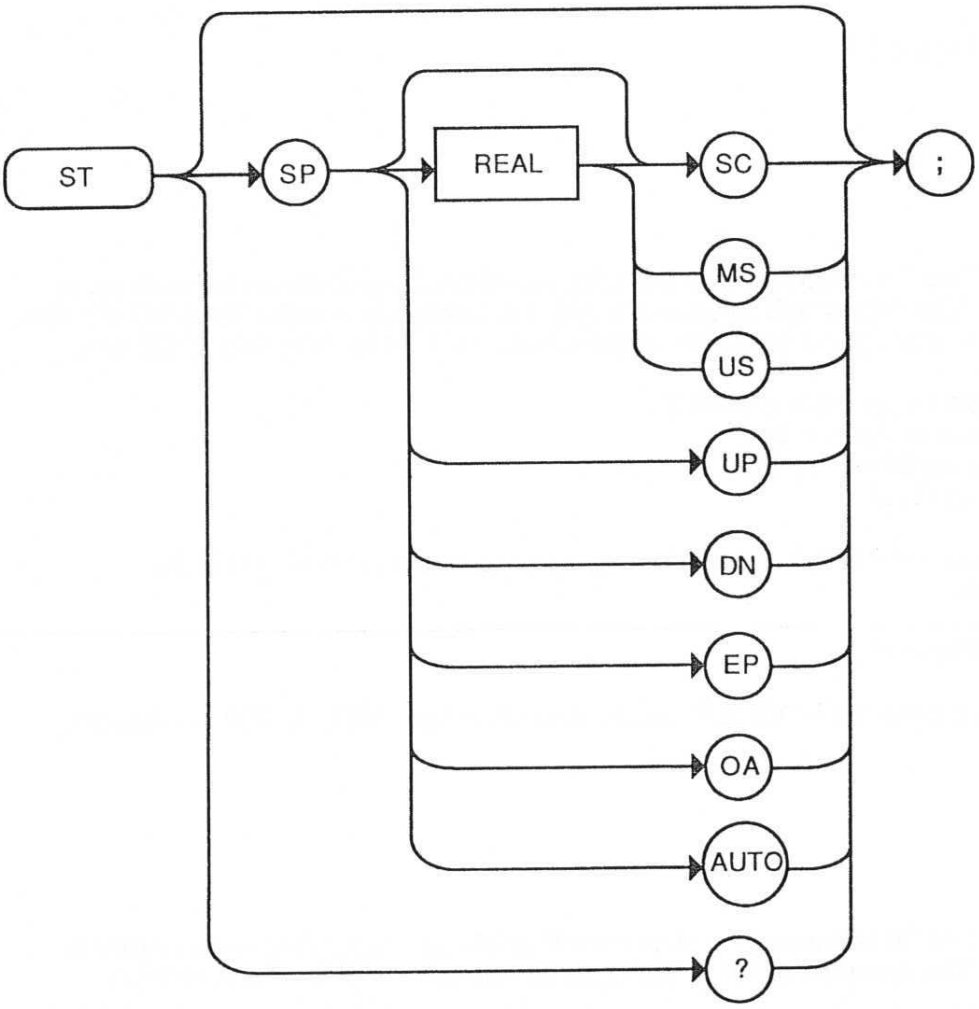
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ST

Sweep Time

Description: The ST command specifies the time in which the analyzer sweeps the displayed frequency range. The minimum time is 20 msec/GHz.

Syntax:



Example: `OUTPUT 718;"ST 100MS;"` sets the sweep time to 100 milliseconds.

Note: The functions of the ST command and the [SWEEP TIME] softkey are identical.

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STB

Status Byte Query

Description: The STB command returns to the controller the decimal equivalent of the ibts set in the status byte (see commands RQS and SRQ). STB is equivalent to a serial poll command. The RQS and associated bits are cleared in the same way that a serial poll comand would clear them. For more information, refer to Appendix B of the Installation Manual.

Syntax: See Figure 4-8

TA

Transfer A

Description: The TA command transfers trace A amplitude values from the analyzer to the controller. 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 analyzer settings.
3. Take one complete sweep (TS).
4. Transfer data (TA).

This procedure ensures that the current settings of the analyzer are reflected in the transferred data.

Syntax: See Figure 4-1

Note: Items are separated by CR/LR and are dependent upon MDS & TDF commands.

TB

Transfer B

Description: The TB command transfers trace B amplitude values from the analyzer to the controller. The operation of TB is similar to the operation of TA. (Also see TA.)

Syntax: See Figure 4-1

Example: `OUTPUT 718;"TB;"`

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TDF

Trace Data Format

Description: The trace data format, TDF, command formats trace information for return to the controller.

M, measurement units, returns values in display units from -32768 to +32767.

P, parameter units, returns absolute measurement values such as dBm or Hz.

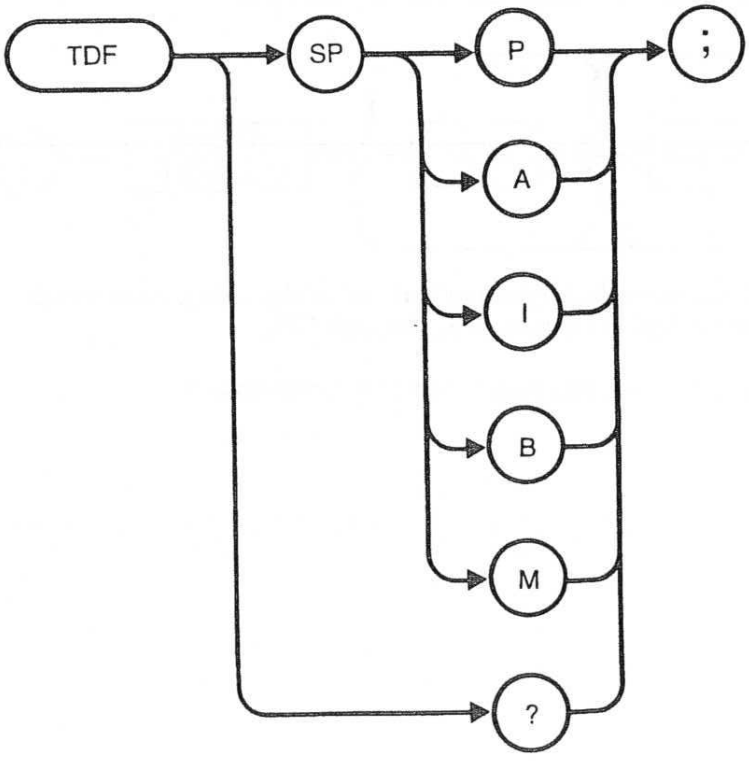
A returns data as an A-block data field. The MDS command determines whether data comprises one or two 8-bit bytes.

I returns data as an I-block data field. The MDS command determines whether data comprises one or two 8-bit bytes.

Specifying **B** enables binary format. The MDS command determines whether data comprises one or two 8-bit bytes.

A, **B**, **I**, and **M** are defined in the analyzer's internal amplitude units (log: hundredths of dBm; linear volts: 8,000 = top graticule line and 0 = bottom graticule line). **P** is in the current parameter unit specified by AUNITS.

Syntax:



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Example: `OUTPUT 718;"TDF M;"`

Note: Alternate commands O1, O2, O3, and O4 provide backward compatibility for other Hewlett-Packard spectrum analyzers.

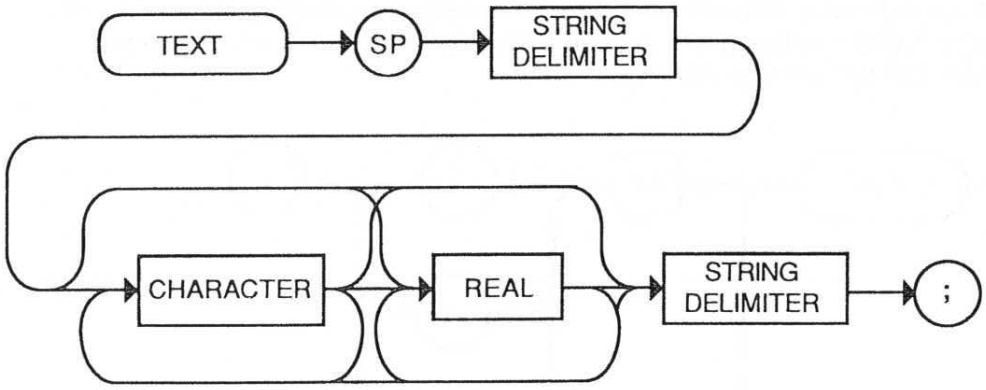
O1 = "TDF P"
O2 = "TDF B; MDS W;"
O3 = "TDF M;"
O4 = "TDF B; MDS B;"

TEXT

Text

Description: The TEXT command writes text on the analyzer screen at the current pen position.

Syntax:



The string delimiters, which mark the beginning and end of the string, must match. Characters are alphanumeric ASCII characters 32 through 126.

Example: `OUTPUT 718;"PA 80,80;TEXT%CONNECT ANTENNA%;"`

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TH

Threshold

Description: Similar to a base line clipper, the TH command blanks signal responses below the threshold level. The threshold level is nine graticule divisions below the reference level unless otherwise specified. The UP and DN commands move the threshold one division. (Also see AUTO.) The threshold level is annotated in reference level units at the lower-left corner of the analyzer screen and appears as a line on the display.

Syntax: See Figure 4-6. The AUTO parameter deactivates the threshold function.

Example: `OUTPUT 718;"TH UP;"`

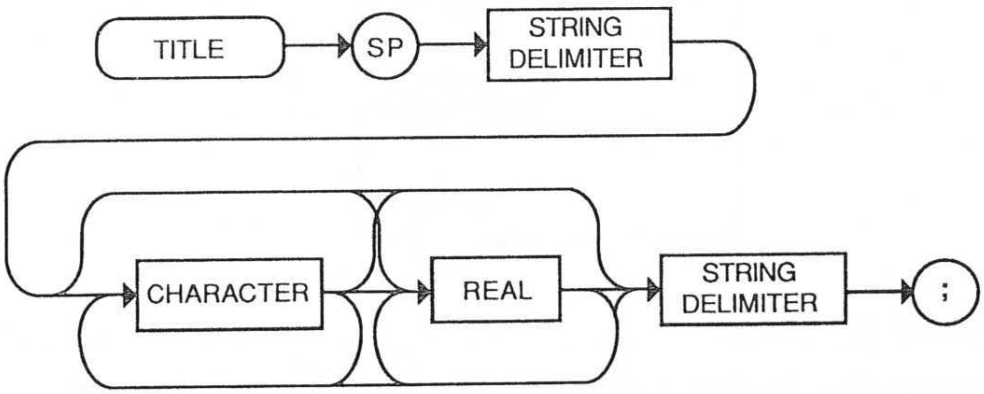
Note: Alternate command T0 turns the threshold off. The functions of the TH command and the [THRESHOLD] softkey are identical.

TITLE

Title

Description: The TITLE command activates the title mode. This function writes a message at the top of the analyzer screen. Any character on the controller keyboard can be written. The full width of the display is available for writing a maximum of 58 characters. However, the marker readout may interfere with the last 21 characters. IP removes the message.

Syntax:



Example: `20 OUTPUT 718;"TITLE%Adjust Antenna%;"`

Note: The functions of the TITLE command and the [SCREEN TITLE] softkey are identical.

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TM

Trigger Mode

Description: The TM command selects a trigger mode: free, line, video, or external. Query returns the trigger mode. The conditions of the trigger modes are described below.

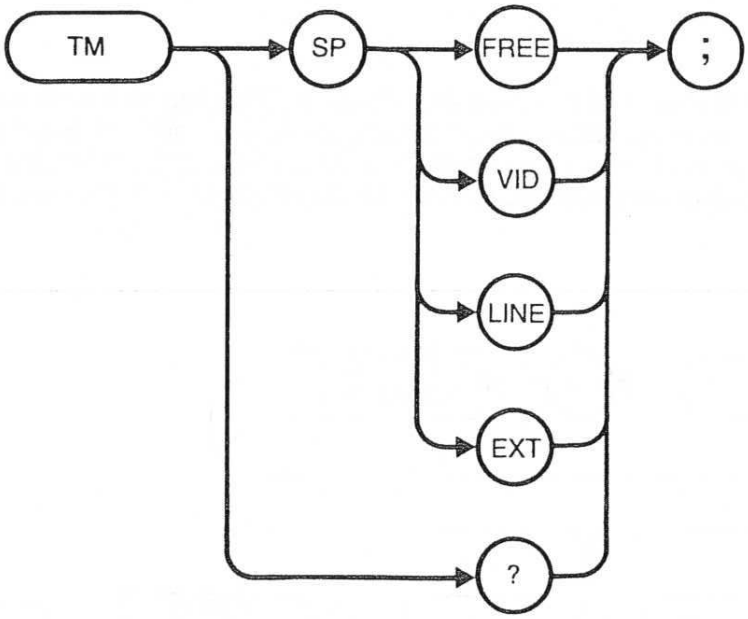
FREE allows the next sweep to start as soon as possible after the last sweep.

LINE allows the next sweep to start when the line voltage passes through zero, going positive.

VID allows the next sweep to start if the detected RF envelope voltage rises across a level set by the display line.

EXT allows the next sweep to start when an external voltage level passes through approximately 1.5 volts, going positive. The external trigger signal level must be between 0 V and +5 V.

Syntax:



Example: `OUTPUT 718;"TM EXT;"`

Note: The functions of the TM command and the ***TRIG*** key are identical. Alternate commands allow you to select the trigger modes: FREE (T1), LINE (T2), EXT (T3), VID (T4).

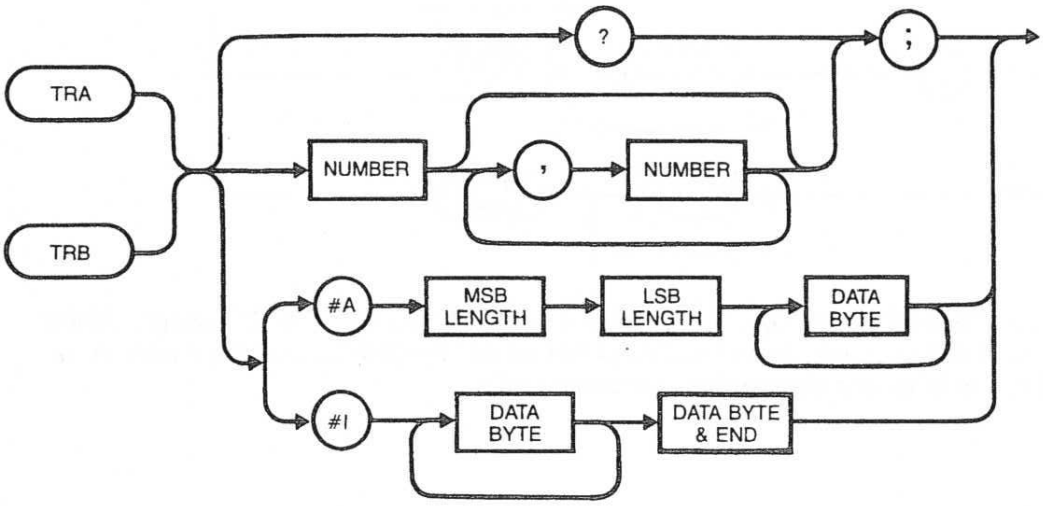
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TRA/TRB

Trace Data Input/Output

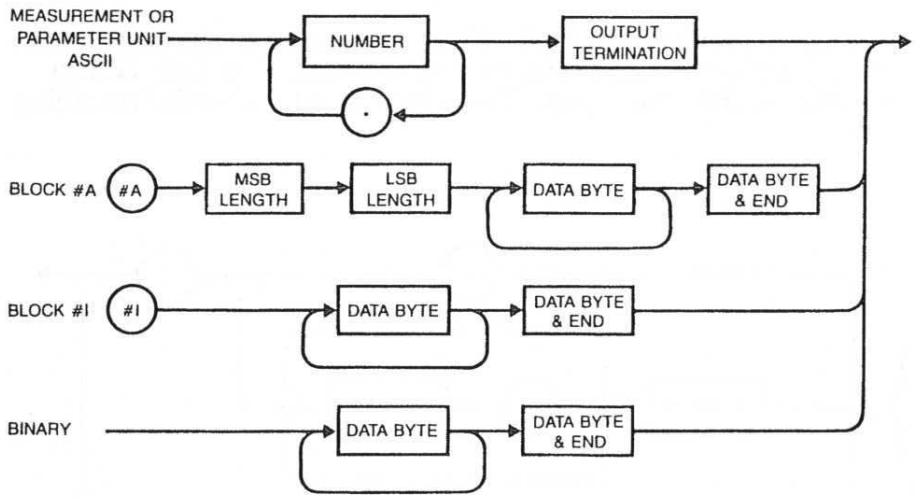
Description: This command provides a method for reading or storing values into a trace. Input in #A or #I is considered as measurement units independent of Trace Data Format (TDF). Enter words in measurement units only. The output format is specified according to TDF and MDS.

Syntax:



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The form of the query response is dependent upon the previously used Trace Data Format command as follows:



Example: See "Saving Trace Data" in Chapter 3 which illustrates "TDF P" format. Since TRA/TRB are fixed in length, there are always 401 or 802 bytes to be read from trace A or trace B if they are in binary input or binary output mode.

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TRCMEM

Trace Memory

Description: The TRCMEM command returns a non-negative integer that indicates the total number of trace registers available for SAVET and RCLT.

Syntax: See Figure 4-3

Example: `OUTPUT 718;"TRCMEM?;"`

Note: A TRCMEM value of three indicates that trace registers 0, 1, and 2 are available for use.

TS

Take Sweep

Description: The take sweep command starts and completes one full sweep before the next command is executed. TS 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 previously set by the instrument is displayed in trace A.

```
OUTPUT 718;"IP;CF 11MZ;SP 20MZ;VIEW TRA;"
```

A TS command inserted before VIEW makes the analyzer take one complete sweep before displaying trace A. This allows the analyzer sufficient time to respond to each command in the sequence.

```
OUTPUT 718;"IP;CF 11MZ;SP 20MZ;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 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 analyzer completes its sweep.

Syntax: See Figure 4-1

Example: `OUTPUT 718;"IP;SNGLS;TS;"`

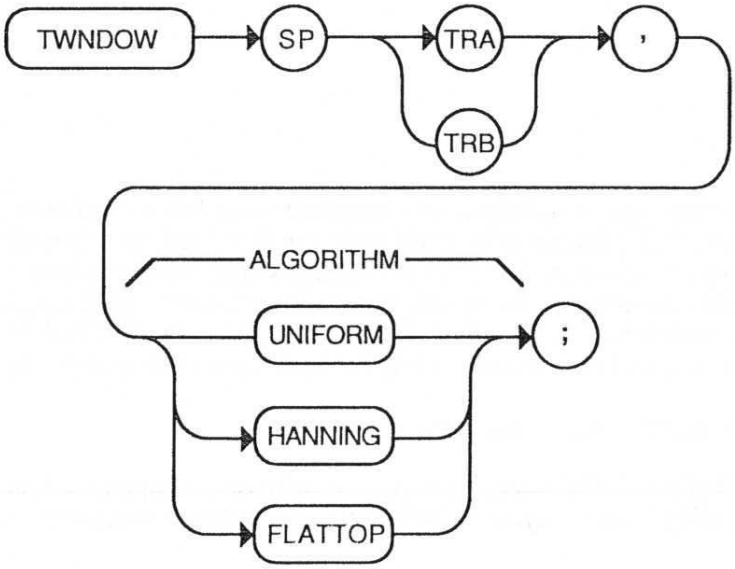
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TWNDOW

Trace Window

Description: The TWNDOW command creates a window trace array for the Fast Fourier Transform Function (FFT). 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.

Syntax:



UP

Up Command

Description: Increases value of active function by the applicable step size.

Syntax: See Figure 4-1

Example: `OUTPUT 718;"IP;RB1KZ;UP;"`

Note: The example sets the resolution bandwidth to 3 kHz.

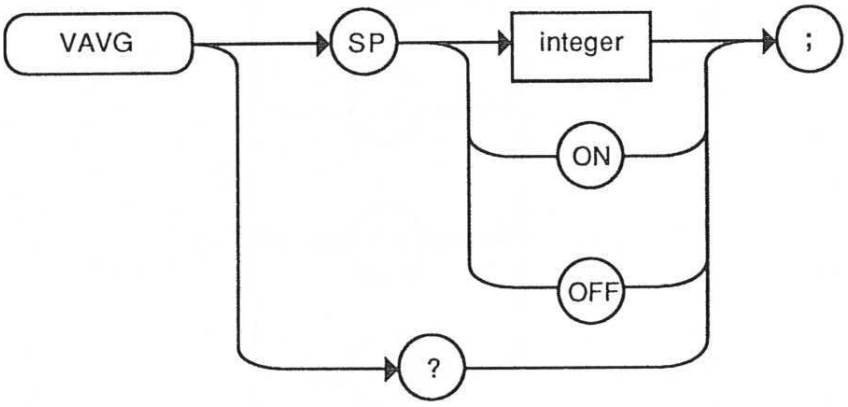
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VAVG

Video Average

Description: The VAVG command enables the video averaging function, which averages trace points to smooth the displayed trace. Use VAVG to view low-level signals without slowing the sweep time. Video averaging can lower the noise floor more than a 1-Hz video bandwidth if a large number of sweeps has been specified for averaging. Video average may also be used to monitor instrument state changes (changing bandwidths, center frequencies, etc.) while maintaining a low noise floor. The active function readout indicates the number of sweeps to be averaged; the default is 100 unless otherwise specified.

Syntax:



Example: `OUTPUT 718;"VAVG 150;"`

Note: Alternate command KSG turns video averaging on and KSH turns it off. The functions of the VAVG command and the [VIDEO AVERAGE] softkey are identical.

VB

Video Bandwidth

Description: The video bandwidth command specifies the video bandwidth, which is a post-detection filter. VB allows you to change the post-detection filter from 30 Hz to 3 MHz in a 1, 3, 10 sequence. The resolution , video bandwidth, and sweep time normally couple. Executing VB uncouples video bandwidth from res bandwidth. (It does nothing to the sweeptime/res bw coupling.) Executing AUTO recouples it to RBW.

Syntax: See Figure 4-7

Example: `OUTPUT 718;"VB 10KZ;"`

Note: The functions of the VB command and the [VIDEO BW] softkey are identical.

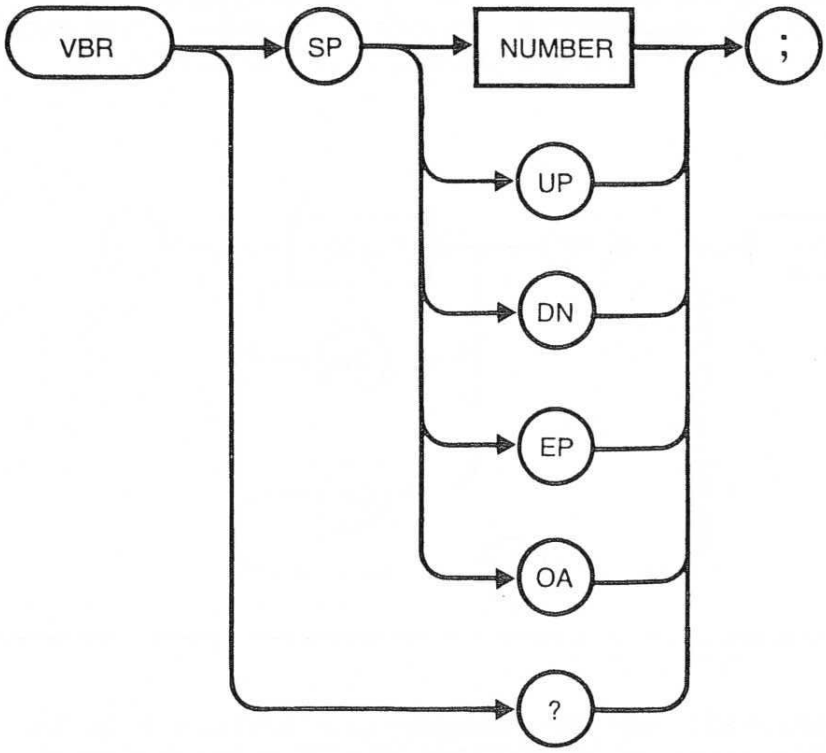
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VBR

Video Bandwidth Ratio

Description: The VBR is multiplied by the resolution bandwidth to determine the automatic setting of video bandwidth if it is coupled to the res bandwidth. The VBR is selected in a 0.1, 0.3, 1, 3, 10 sequence.

Syntax:



Example: `OUTPUT 718;"VBR 1;"`

Note: The functions of the VBR command and the [VBW/RBW RATIO] softkey are identical.

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VIEW

View

Description: The VIEW command displays trace A or trace B and stops the sweep when one trace appears on the screen in clear-write mode. The trace is not updated. When VIEW TRA is executed, the contents of trace A are stored in display memory. When VIEW TRB is executed, the contents of trace B are stored in display memory.

Syntax: See Figure 4-5

Note: The functions of the VIEW TRA and A3 commands and the [VIEW TRACE A] softkey are identical. The functions of the VIEW TRB and B3 commands and the [VIEW TRACE B] softkey are identical.

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APPENDIX A

Analyzer Messages

The analyzer can generate various messages that appear on its screen during operation to provide an indication of progress through a procedure or 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 analyzer hardware is probably broken.
- User-created error messages appear when the analyzer is used incorrectly. They are usually generated during remote operation.
- Informational messages indicate analyzer 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).

`ADC-GND FAIL`
Indicates a failure in the processor - A/D ±15V supplies can cause ADC-GND and ADC-2V. (H)

`ADC-TIME FAIL`
Indicates a failure in the processor - A/D A +5V supply can cause this. (H)

`ADC-2v FAIL`
Indicates a failure in the processor - A/D ±15V supplies can cause ADC-GND and ADC-2V. (H)

`CAL: FM SPAN SENS FAIL`
The analyzer could not set up span sensitivity of the FM coil. (H)

`CAL: LINEAR DET FAIL`
The linear calibration routine failed. (H)

`CAL: RES BW AMPL FAIL`
The relative insertion loss of the resolution bandwidth is incorrect. (H)

`CAL: SPAN SENS FAIL`
The calibration span sensitivity routine failed. (H)

`CAL:_ _ _`
During the calibration routine, messages may appear on the display indicating the routine is progressing: MC DELAY, FM DELAY, DONE, SWEEP, SWP DELAY, FREQ, SPAN, AMPTD, 3dB BW, ATTEN, LOG AMP, PEAKING, YTF. (M)

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COMMAND ERROR: _ _ _
The specified command is not recognized by the analyzer. The analyzer will recognize the commands described in Chapter 4. (U)

CONFLICT TABLE OVERFLOW
A command has been used that is not compatible with the analyzer. (U)

FAIL: _ _ _
An error was discovered during the power-up check. The 4-digit by 8-digit code indicates the type of error. Error codes are described in the Support Manual. (H)

INVALID AUNITS: _ _ _
The amplitude units are not valid. See the AUNITS command. (U)

INVALID DETECTOR: _ _ _
The specified detector is not valid. See the DET command. (U)

INVALID ENTER FORMAT
The enter format is not valid. See the appropriate command description to determine the correct format. (U)

INVALID HP-IB ADDRESS OR OPERATION
An HP-IB operation was aborted due to an incorrect address or invalid operation. (U)

INVALID HP-IB OPERATION REN TRUE
The HP-IB operation is not allowed. (Usually caused by print/plot when a calculator is on the interface bus.) (U)

INVALID HP-IL ADDRESS OR OPERATION
An HP-IL operation was aborted due to an incorrect address or invalid operation. (U)

INVALID HP-IL OPERATION REN TRUE
The HP-IL operation is not allowed. (Usually caused by print/plot when a calculator is on the interface bus.) (U)

INVALID OUTPUT FORMAT
The output format is not valid. See the appropriate command description to determine the correct format. (U)

INVALID RS-232 ADDRESS OR OPERATION
An RS-232 operation was aborted due to an incorrect address or invalid operation. (U)

INVALID TRACE: _ _ _
The specified trace is invalid. See trace commands (VIEW, MXMH, CLRW or BLANK). (U)

INVALID TRIGGER MODE: _ _ _
The specified trigger mode is invalid. See the TM command. (U)

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INVALID WINDOW TYPE:
The specified window is invalid. See the TWNDOW command. (U)

MEAS UNCAL
The measurement is uncalibrated. Check the sweep time, span, and bandwidth settings. (U)

PARAMETER ERROR:
The specified parameter is not recognized by the analyzer. See the appropriate command description to determine the correct parameters. (U)

SRQ
The specified service request is active. Service requests are a form of informational message and are explained in Appendix B of the Installation Manual. (M)

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APPENDIX B

HP-IB Option 021

What You'll Learn in This Appendix

This appendix tells you how to connect a computer to your HP 8592A Spectrum Analyzer with the Hewlett-Packard Interface Bus (HP-IB), if that option was selected.

Your HP 8592A Option 021 has an HP-IB connector on the rear panel, as shown in Figure B-1.

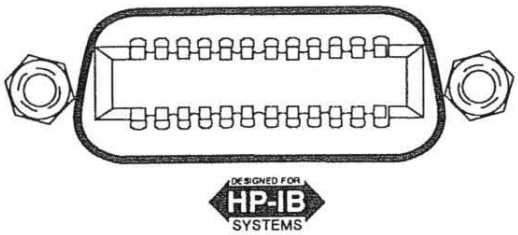


Figure B-1

The HP-IB system utilizes a party-line bus structure. Devices such as the analyzer are connected on the party line with HP-IB cables. A computer gives instructions and is the "controller." The analyzer takes orders and is the "listener." The 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.

When you turn on the HP 8592A, the HP-IB address will appear on the screen (for example, `HP-IB ADRS: 18`). If necessary, you can reset the address of the HP 8592A by pressing ***CONFIG*** and [ANALYZER ADDRESS]. (You may use any address between 0 and 30. Usually, 1 is set aside for printers, and 5 for plotters.)

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APPENDIX C

HP-IL Option 022

What You'll Learn in This Appendix

This chapter tells you how to connect a computer to your HP 8592A Option 022 with the Hewlett-Packard Interface Loop (HP-IL), if that option was selected.

Introducing the Hewlett-Packard Interface Loop

The analyzer and all devices included in the HP-IL system are connected together in series. They communicate using HP-IL messages, which convey instructions and data. All HP-IL messages travel only in one direction. Each message sent on the loop is passed sequentially from one device to the next. If the message doesn't affect a particular device, the device passes the message on to the next device in the loop. When the message reaches the intended device, the device responds as directed and (usually) passes the message on to the next device. Eventually the message returns to the sender. All components of an HP-IL system have roles. The four roles defined for HP-IL components are:

Controller: The component that is responsible for issuing instructions to other components in the HP-IL system. Only one component can be the controller. The remaining components are often referred to as devices. The role of controller can be transferred to another device, but there can be only one controller at a time.

Talker: A component that has been assigned by the controller to send data to other devices. The controller can be a talker.

Listener: A component that has been assigned by the controller to receive data from the talker. The controller can be a listener.

Idle: A component is idle if it is not a talker or listener. Although a component may be idle, it still responds to instructions issued by the controller and passes all messages on to the next device. Each component of the HP-IL system connects into the loop using two connectors: one male and one female. This arrangement prevents improper connections HP-IL. The analyzer has two HP-IL connectors on the rear panel, as shown in Figure C-1.

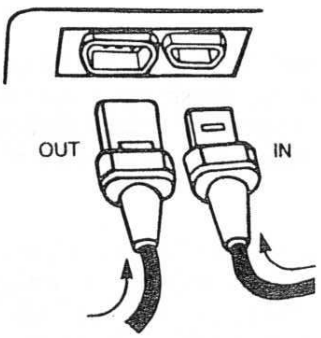


Figure C-1

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HP-IL Addressing

When the controller of the HP-IL system configures the loop, it automatically assigns each device an address according to its position on the loop. Addresses are sequential: the first device (connected to the controller's OUT receptacle) is given the address 1. The next position is address 2 and so on. The last device (connected to the controller's IN receptacle) is given the highest address.

The analyzer is located in position 1 in the loop for the test programs in this chapter.

When you turn on the analyzer, its HP-IL address will appear on the screen (for example, `HP-IL ADRS: 1)`. If necessary, you can change the address of the analyzer by pressing ***CONFIG*** and [ANALYZER ADDRESS]. Remember that this address will be changed when the controller configures the HP-IL loop.

There are several methods of identifying the HP 8592A with the HP-71B Handheld Computer.

- Address: The physical position of the HP 8592A on the HP-IL loop with respect to the present controller.
- Device word: The HP 8592A is of class INSTRMT.
- Device ID: The HP 8592A device ID is HP8592A.
- Accessory ID: The HP 8592A accessory ID is 90.

Refer to your computer HP-IL documentation for more complete HP-IL information.

Using the Computer as a Solid State Camera

The following two programs, "SAVSTATE" and "RCLSTATE," comprise what can be termed Solid-state camera application. The first program, "SAVSTATE," captures the measurement data and settings for Trace A, and saves it, along with the filename, time, and date, in a file in the HP-71B memory. In effect, a snapshot of the analyzer data and settings is stored in the computer's memory.

The "RCLSTATE" program retrieves the data from the HP-71B memory and sends it to the analyzer. The filename, date, and time at which the snapshot was taken are displayed in the title area of the analyzer screen. Trace data is put into trace B and trace B is put into view mode. Trace A remains available to make other measurements, which can be compared with trace B, if desired.

The filename in which the trace A data is stored can be up to eight characters long. The program does not check for the existence of a file with the same filename, and will write new data in place of the old file data. Each file requires about 1 kilobit of computer memory. To find how much memory is left in the HP-71B, enter:

MEM ***Endline***

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A useful feature of the solid-state camera is that any analyzer equipped with an HP-IL interface (Option 022) can be used to view the stored data. It does not need to be the analyzer from which the data was obtained.

Assigning User-Defined Keys

The two programs, or any programs for that matter, can be assigned a particular computer key. When a key is pressed, the assigned program executes. To assign the "S" key to "SAVSTATE" and the "R" key to "RCLSTATE," enter the following:

```
DEF KEY 'S','RUN "SAVSTATE"':
DEF KEY 'R','RUN "RCLSTATE"':
```

Refer to the "Customizing the HP_71" section of your HP-71B Owner's Manual for more details on key assignment. To run the programs, simply press three keys on the HP-71B:

g 1 USER S for the "SAVSTATE" program
g 1 USER R for the "RCLSTATE" program

This technique can be used with other programs in this manual. For example, note that the first program in Chapter 2 is PROG1. We can assign a key for PROG1. You can run any of these programs with only three key strokes.

Subprograms

These two programs introduce the concept of subroutines, also known as subprograms. Subroutines are programs that perform complex functions and processes and are accessible simply by referencing the subroutine name (for example, GOSUB 'FILESAVE'). Subroutines are located after the "END" statement, and can be referenced anywhere in the main program.

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Taking A Snapshot

This programming example stores the data measured by the analyzer, the analyzer state, the date, the time, and the filename in a file in the HP-71B. By deleting the comment lines in the program, the amount of memory taken up by the program can be reduced by more than 50%.

```
10 ! File = SAVSTATE
20 RESET HPIL
30 RESTORE IO
40 DESTROY ALL
50 ! dimension Trace and Learnstring strings
60 DIM T$[802],L$[114]
70 ! dimension Prompt, Filename, and Title strings
80 DIM P$[20],F$[15],T1$[30]
90 A=DEVADDR("HP8592A") ! analyzer address
100 GOSUB 'GETSTATE'
110 GOSUB 'FILESAVE'
120 END
130 'GETSTATE': ! loads the current state into T$ & L$
140 ! ask analyzer for Trace A in binary format
150 OUTPUT :A ;"TDF B;TA;"
160 ! enter Trace A into T$
170 ENTER :A USING "#,802A";T$
180 ! ask analyzer for learnstring
190 OUTPUT :A ;"OL;"
200 ! enter learnstring into L$
210 ENTER :A USING "#,114A";L$
220 RETURN
225 ! FILESAVE saves the state in a file in main ram
230 'FILESAVE':
240 ! set up the prompt string P$
250 P$="        "&CHR$(27)&"<"&CHR$(255)&"SAV"
260 ! ask for filename from user
270 INPUT "FILENAME ?",P$;F$
280 ! truncate filename to 8 characters
290 F$=F$[1,8]
300 ! put the filename, date, and time into T1$
310 ! the date is reformatted to read mm-dd-yy
320 T1$="  "&F$&"       "&DATE$[4,5]&"-"&DATE$[7,8]
330 T1$=T1$&"-"&DATE$[1,2]&"  "&TIME$[1,5]
340 ! open file F$ and assign it to channel #1
350 ASSIGN #1 TO F$
360 ! print the Title, Trace, and
365 ! Learnstring strings to the file F$
370 PRINT #1;T1$,T$,L$
380 ! close the file F$ and channel #1
390 ASSIGN #1 TO *
400 RETURN
```


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Viewing a Snapshot

This program, "RCLSTATE," retrieves the information from a HP-71B file that was created by the program "SAVSTATE." The learnstring is sent to the analyzer. It then transmits the trace data to trace B and puts trace B in view mode. Last, it displays the filename, date, and time of the "snapshot" in the title area of the analyzer screen. Thus, you can view data collected from any number of places and times.

```
10 ! File = RCLSTATE
20 RESET HPIL
30 RESTORE IO
40 DESTROY ALL
50 ! dimension Trace and Learnstring strings
60 DIM T$[802],L$[114]
70 ! dimension Prompt, Filename, and Title strings
80 DIM P$[20],F$[15],T1$[30]
90 A=DEVADDR("HP8592A") ! analyzer address
100 GOSUB 'FILEGET'
110 ! send the learnstring to the analyzer
120 OUTPUT :A USING "114A";L$
130 ! put the analyzer in continuous sweep mode
140 OUTPUT :A ;"CONTS"
150 ! blank Trace A, clear-write Trace B, view Trace B
160 OUTPUT :A ;"BLANK TRA;CLRW TRB;VIEW TRB;"
170 ! send trace data into Trace B of analyzer
180 OUTPUT :A USING "2A,802A";"IB";T$
190 ! view Trace B
200 OUTPUT :A ;"VIEW TRB;"
210 ! put the Title string into the title area
215 ! of the analyzer display
220 OUTPUT :A ;"TITLE!";T1$;"!"
225 ! clean up the screen
230 OUTPUT :A ;"HD;ANNOT OFF;ANNOT ON;"
240 END
250 'FILEGET': ! gets the state from a file in main ram
260 ! set up the prompt string P$
270 P$="        "&CHR$(27)&"<"&CHR$(255)&"RCL"
280 ! ask for filename from user
290 INPUT "FILENAME ?",P$;F$
300 ! truncate filename to 8 characters
310 F$=F$[1,8]
320 ! open file F$ and assign it to channel #1
330 ASSIGN #1 TO F$
340 ! read Title, Trace, and Learnstring strings
345 ! from the file F$
350 READ #1;T1$,T$,L$
360 ! close the file F$ and channel #1
370 ASSIGN #1 TO *
380 RETURN
```


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APPENDIX D

RS-232 Option 023

What You'll Learn in This Appendix

This appendix explains how to connect a computer to the HP 8592A Spectrum Analyzer, using the RS-232 interface and contains information pertaining to RS-232 signals, cable connections, and baud rate.

Introducing the RS-232 Interface

Your analyzer has an RS-232 connector on the rear panel, if that option was selected as shown in Figure D-1.

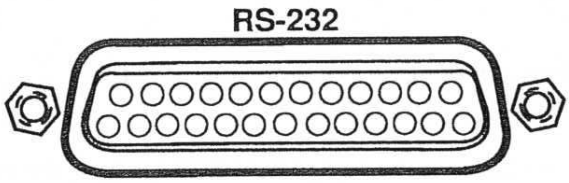


Figure D-1

The RS-232 interface or connection, 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 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 3-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 analyzer exchange data. The baud rate of each of the two RS-232 devices must be the same.

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What Is RS-232?

RS-232 is a means of communication between instruments. RS-232 uses serial data transmission where the data is transmitted one bit at a time. There are two data carrying signals:

- Transmit Data (TxD) — the serial data output. This line connects to the RxD input line.
- Receive Data (RxD) — the serial data input. This line connects to the TxD output line.

In addition to the data signals, there are five other signals used to control the flow of data. Listed below are the personal computer handshake signal descriptions:

- Request To Send (RTS) — Output signal indicates the system is ready to communicate. This line is true at power-up and stays true while power is on.
- Clear To Send (CTS) — Input signal indicates that the system is ready to receive data.
- Data Terminal Ready (DTR) — Output signal from the analyzer. When the input buffer is full, this line will go false.
- Data Set Ready (DSR) — Input to the analyzer to lockout the front panel, when true. The front panel is enabled when this line is false.
- Data Carrier Detect (DCD) — Input to the analyzer. If DCD is true, the analyzer will receive data from the PC. If false, no data will be input. The data will be ignored.

The analyzer checks its CTS input before transmitting data to the computer. If the CTS line is false, the analyzer will not transmit data. The analyzer transmits data when the CTS line goes true.

The 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. Baud rates of 1200 and 9600 baud are very common.

The programs contained in this manual will all function at 1200 baud. Some are set to run at 9600 baud. If your RS-232 connection handshake lines perform as described, you can use a 9600-baud data rate. If you need to change the baud rate, refer to the "Setting the Analyzer Baud Rate" section of this appendix.

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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:
Xon/Xoff, ENQ/ACK (Enquire, Acknowledge) not supported by analyzer

When BREAK is issued to the analyzer with Option 023, the following occurs:

1. Aborts present command
2. Clears the input buffer
3. Clears output buffer
4. Stops all trace output in process
5. Reinitializes command parser

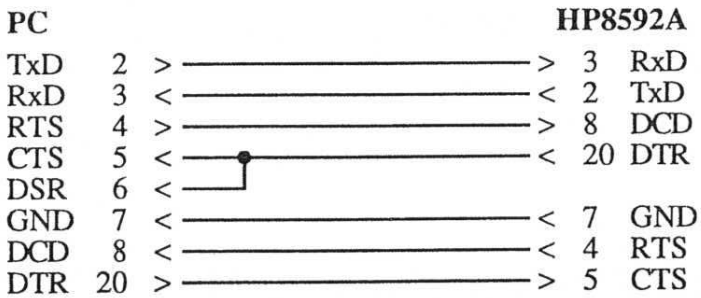
BREAK does not:

1. Invoke instrument preset
2. Clear SRQ off screen
3. 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.

Table D-1 lists the signal connections between a personal computer and the analyzer.

Table D-1. Full Handshaking Connection

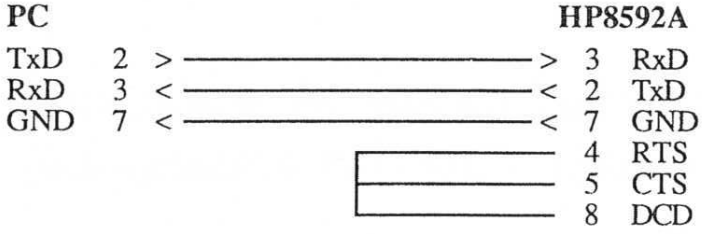


If your computer operates with only three wires, you can use the cable connections in Table D-2.

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Some computers require that the CTS, DSR and DCD inputs be true before serial transmission can occur. To solve this problem, you can wire these three signals to the PC RTS line.

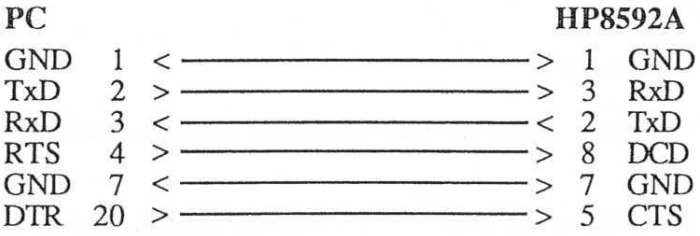
Table D-2. 3-Wire Connection



Connecting a ThinkJet Printer

To connect an HP ThinkJet printer to the analyzer, use the information in Table D-3.

Table D-3. ThinkJet Printer Connection



ThinkJet Printer Mode Switches:

HP MODE
Perf Skip
PL 8 1/2 x 11
USASCII
BAUD up to 9600
No Parity
8 bits
DTR

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Connecting a Modem

To connect a modem to the analyzer, use the information in Table D-4. The connection is for a Hayes 1200 Modem and the analyzer.

Table D-4. Modem Connection

PC				HP8592A	
GND	1	<	>	1	GND
TxD	2	>	>	2	TxD
RxD	3	<	<	3	RxD
CTS	5	>	>	5	CTS
GND	7	<	>	7	GND
CD	8	>	>	8	CD
DTR	20	<	>	20	DTR

System Settings

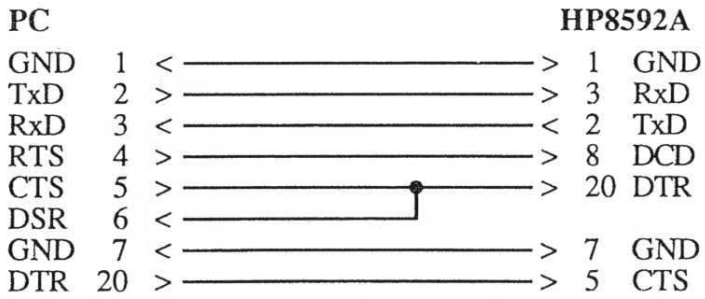
Select 1200 baud for both the modem and the analyzer.

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Connecting an HP-GL Plotter

To connect an HP-GL Plotter to the analyzer, use the information in Table D-5.

Table D-5. 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 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)
Standalone:	←	Duplex:	→ (Full)
Monitor Mode:	→ (normal)	Hardwire:	←
Local	→ (normal)	DTR-Bypass:	→ (normal)

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HP 8592A Front-Panel Lockout

If you wish to lock out the front panel of the analyzer, set the analyzer DSR input true. You can accomplish this by connecting the analyzer DSR input to the PC RTS output.

DSR True — Front-panel lockout (an R will appear on the screen.

DSR False — Front-panel active (you can use the keyboard).

Setting the HP 8592A Baud Rate

The baud rates of the analyzer and the PC must be the same. For example, to set the analyzer to 9600 baud, use the following procedure:

1. Press the ***CONFIG*** key on the analyzer.
2. Press the [BAUD RATE] softkey.
3. Press these numerical keys: ***9***, ***6***, ***0***, ***0***, ***Hz***.

   To set the baud rate to 1200 baud, substitute these keypad keys: ***1***, ***2***, ***0***, ***0***, ***Hz***.

Note: Some of the programs in this manual require 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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