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Errata

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HP References in this Manual

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

About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

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Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

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8752A

HP-IB Quick Reference

HEWLETT PACKARD

For the HP 8700-series analyzers

This document provides a quick reference for the HP-IB operation of the HP 8700-series analyzers, including the HP 8702, 8703, 8719, 8720, 8752, and 8753. Use this information as a reference to the syntax requirements and general function of the individual commands. You should already be familiar with making measurements with the analyzer using the front panel keys and with general programming of the instrument using the HP-IB.

Not all commands listed apply to all instruments. The general response of an instrument that does not support a specific operation is to report a syntax error when the command is input. Refer to the tutorial and reference information in other portions of the Operating and Programming manual, particularly the menu structures, for the specific instrument you are working with to determine its capabilities.

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Notation

Symbols used in this document are:

BOLD — Upper case bold characters represent the program keywords which must appear exactly as shown with no embedded spaces.

[ ] — Square brackets indicate that the enclosed information is optional.

[suffix] — Optional programmer entry Units Terminator for stimulus values:

Frequency Suffix	Time Suffix	Voltage Suffix	Power Suffix
	fs		
	ps		
GHz	ns		
MHz	us (micro)		
kHz	ms	mV	
Hz	s	V	dB

If no suffix is used, the instrument assumes the basic units (Hz or seconds) for the instruction. Upper and lower case characters are equivalent.

<appendage> — Characters enclosed in the <> brackets are qualifiers attached to the root mnemonic. An example is <**ON**|**OFF**> which shows that either **ON** or **OFF** can be attached to the code. Another is <**1-6**> which shows that the numeral **1**, **2**, **3**, **4**, **5**, or **6** can be attached to the code. There can be no spaces or symbols between the code and the appendage.

; — Semicolon is the required terminator character for each program instruction.

, — The comma is used in program instructions to separate a series of values.

(range of values) — Lower case characters enclosed in parentheses describe the range of values which may be input for the selected function.

value — A constant or a pre-assigned simple or complex numeric or string variable transferred to the instrument.

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Display Graphics

HP-GL subset

AF; Erases the user graphics display.

CS; Turns off the measurement display.

DF; Sets the default values.

DIX,Y; Sets absolute character direction.

x	y	Character direction
1	0	0°
0	0	90°
−1	0	180°
0	−1	270°

LB[text][etx]; Labels the display, placing the symbols starting at the current pen position. All incoming characters are printed until the etx symbol is received. The default etx symbol is the ASCII value 3 (not the character 3).

LTa; Specifies line type:

a	line
0	solid
1	solid
2	short dashes
3	long dashes

OP; Outputs P1 and P2, the scaling limits: 0,0,5850,4095.

PAx,y; Draws from the current pen position to x,y. There can be several pairs of x,y coordinates within one command. They are separated by commas, and the entire sequence is terminated with a semicolon.

PD; Pen down. A line is drawn only if the pen is down.

PG; Erases the user graphics display.

PRx,y; Plot relative: draws a line from the current pen position to a position y up and x over.

PU; Pen up. Stops anything from being drawn.

RS; Turns on the measurement display.

SIh,w; Sets the character size, for height h and width w in centimeters:

h	w	size
.16	.20	smallest
.25	.30	
.33	.39	
.41	.49	largest

SPn; Selects color: n = 1-7

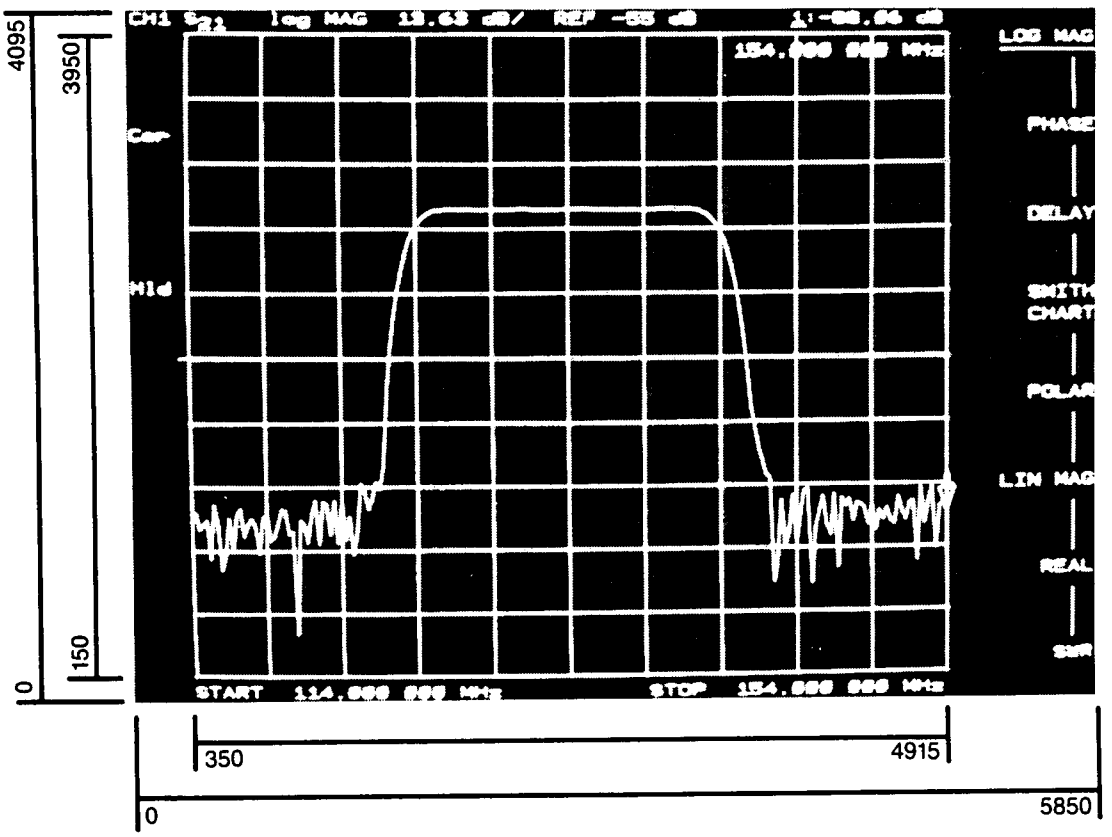
COLORm; m = 1-7

Accepted but ignored HP-GL commands

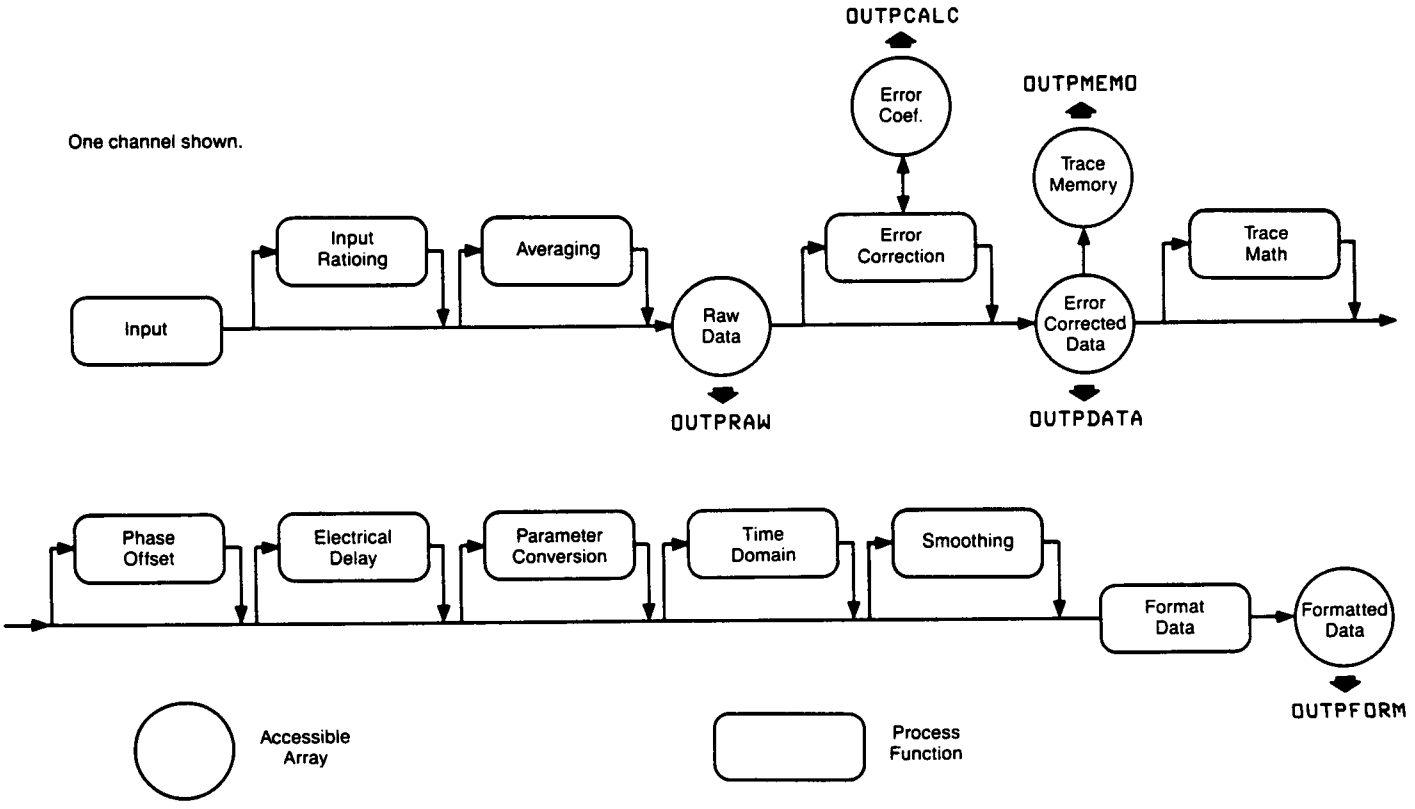
IM	Input service request mask
IP	Input P1, P2 scaling points
IW	Input window
OC	Output current pen position
OE	Output error
OI	Output identity
OS	Output status
SL	Character slant
SR	Relative character size

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User Graphics Units



Processing Chain



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Marker and Data Array Units

DISPLAY FORMAT	MARKER MODE	OUTPMARK value 1, value 2	OUTPFORM value 1, value 2	MARKET READOUT** value, aux value
LOG MAG		dB,*	dB,*	dB,*
PHASE		degrees,*	degrees,	degrees,*
DELAY		seconds,*	seconds,*	seconds,*
SMITH CHART	LIN MKR LOG MKR Re/Im R + jX G + jB	lin mag, degrees dB, degrees real, imag real, imag ohms real, imag Siemens	real, imag " " " "	lin mag, degrees dB, degrees real, imag real, imag ohms real, imag Siemens
POLAR	LIN MKR LOG MKR Re/Im	lin mag, degrees dB, degrees real, imag	real, imag " "	lin mag, degrees dB, degrees real, imag
LIN MAG		lin mag,*	lin mag,*	lin mag,*
REAL		real,*	real,*	real,*
SWR		SWR,*	SWR,*	SWR,*

* Value not significant in this format, but is included in data transfers.

** The marker readout values are the marker values displayed in the upper left hand corner of the display. They also correspond to the value and aux value associated with the fixed marker.

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Disk file names

Disk file names consist of a user-defined state name of up to 8 characters, such as FILTER, appended with up to two characters, defined by the instrument, which indicate what is in the file. ASCII files use the CITIFile format. Binary files are not meant to be decoded.

FILTERXX

The first character is the file type, telling the kind of information in that file.

The second character is a data index, used to distinguish files of the same type.

Char 1	Meaning	Char 2	Meaning
I	Instrument state	**(blank)**	
G	Graphics	**1**	Display graphics
		0	Graphics index
D	Error corrected data	**1**	Channel 1
		2	Channel 2
		Binary	
R	Raw data	**1 to 4**	Channel 1, raw arrays 1 to 4
		5 to 8	Channel 2, raw arrays 1 to 4
		CITIFILE: single file	
			Last digit 1 (ch 1) or 5 (ch 2)
F	Formatted data	**1**	Channel 1
		2	Channel 2
M	Memory trace	**1**	Channel 1
		2	Channe 2
1	Cal data, channel 1	**Binary:**	
		K	Cal kit
		0	Stimulus state
		1 to 9	Coefficients 1 to 9
		A	Coefficient 10
		B	Coefficient 11
		C	Coefficient 12
		CITIFILE: single file	
			last digit shows number of coefficients
2	Cal data, channel 2	**0 to C,K**	Same as channel 1

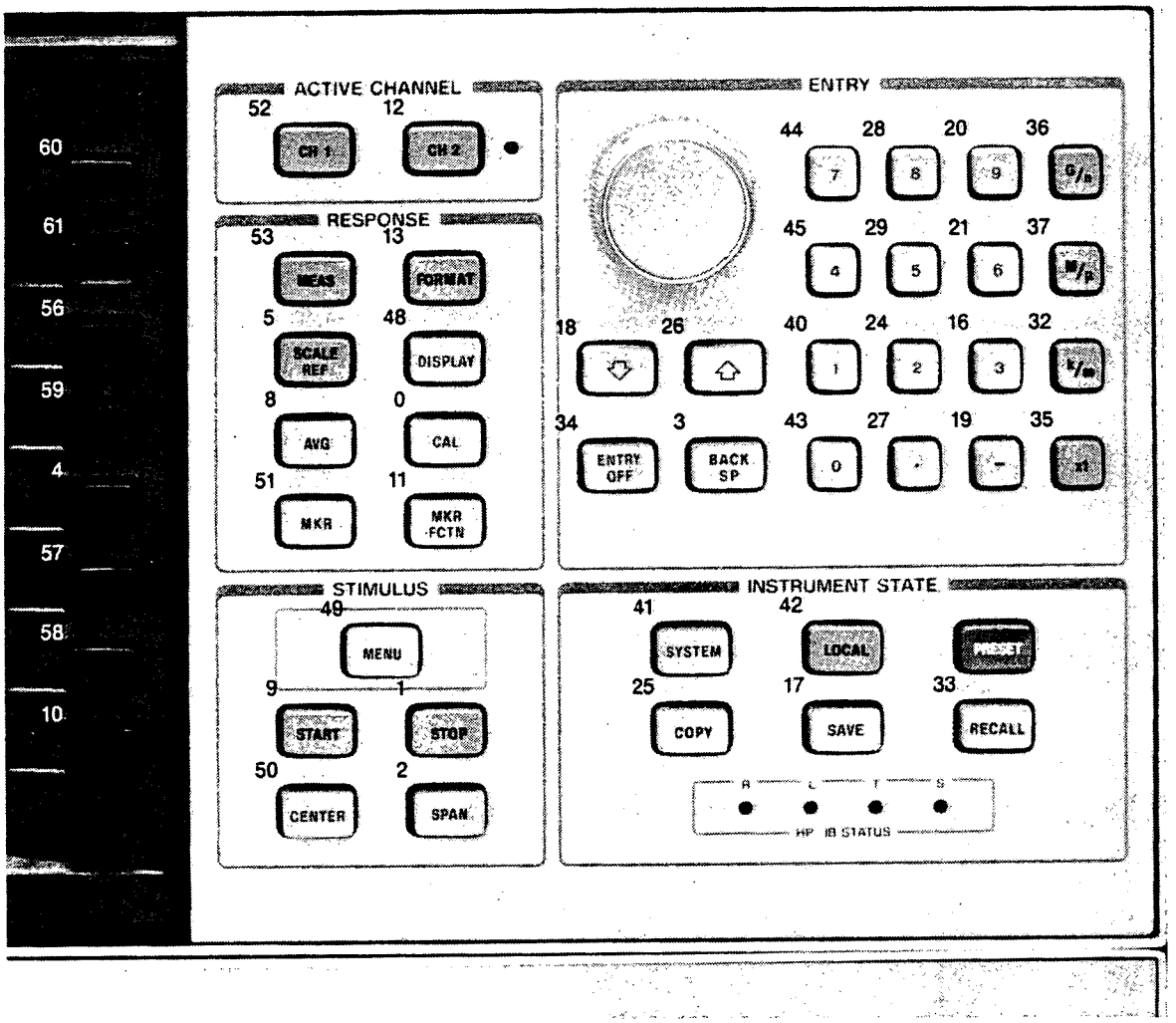
Multiple files

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Key Codes

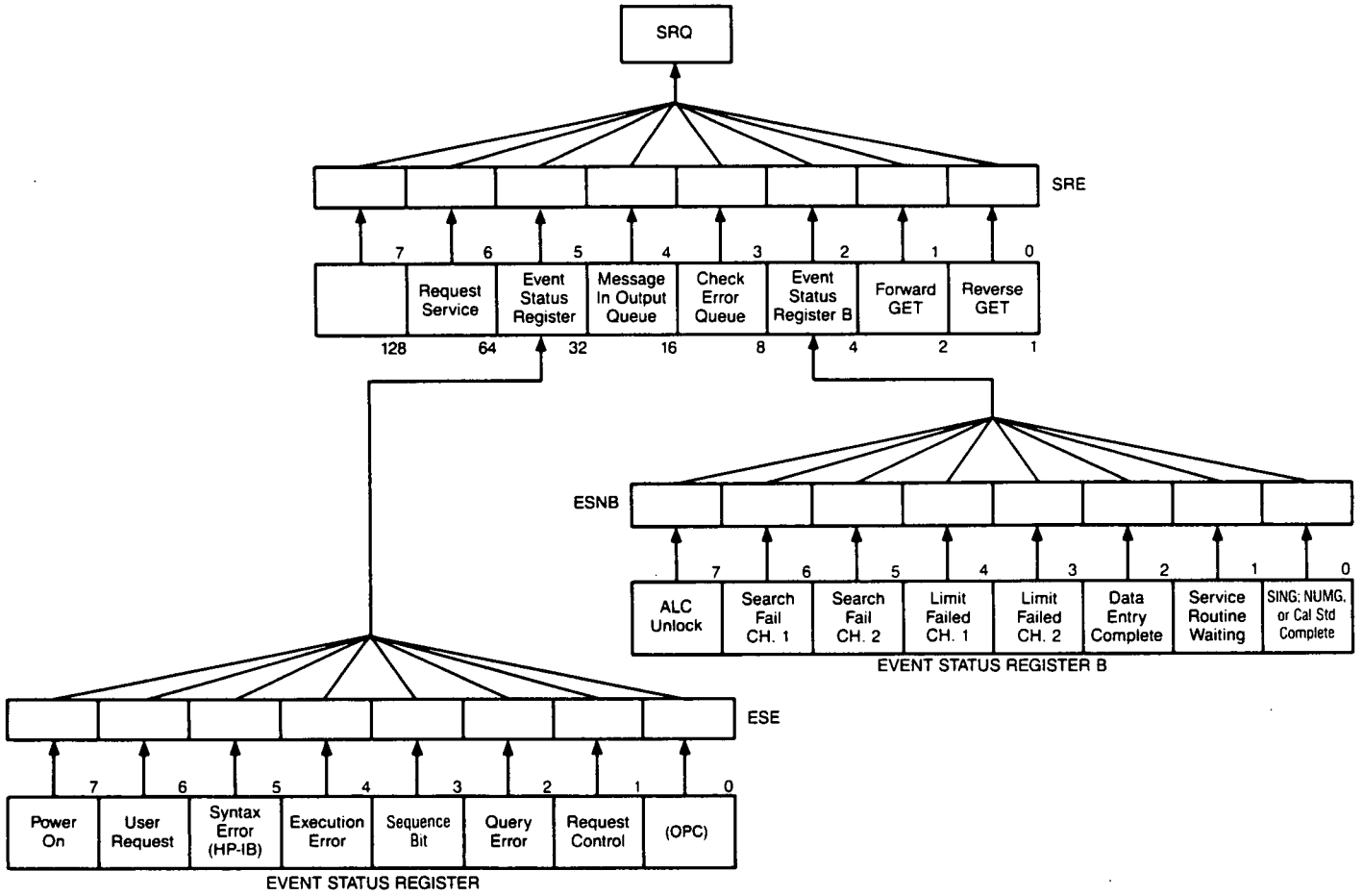
Notes:

1. Key code 63 is invalid key.
2. **OUTPKEY;** reports a knob turn as a −1.
3. If the two byte integer sent back from **KOR?** is negative, it is a knob count. If the knob count was negative, no modification is needed. If the knob count was positive, however, bit 14 will not be set. In this case, the number must be decoded by clearing the most significant byte, as by AND'ing the integer with 255.



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Status Reporting Structure



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Status Bit Definitions

Status Byte

Bit	Name	Description
0	Waiting for reverse GET	A one path, 2-port calibration is active, and the instrument has stopped, waiting for the operator to connect the device for reverse measurement.
1	Waiting for forward GET	A one path, 2-port calibration is active, and the instrument has stopped, waiting for the operator to connect the device for forward measurement.
2	Check event status register B	One of the enabled bits in event status register B has been set.
3	Check error queue	An error has occurred and the message has been placed in the error queue, but has not been read yet.
4	Message in output queue	A command has prepared information to be output, but it has not been read yet.
5	Check event status register	One of the enabled bits in the event status register has been set.
6	Request service,	One of the enabled status byte bits is causing an SRQ.

Event Status Register

Bit	Name	
0	Operation complete	A command for which OPC has been enabled completed operation.
1	Request control	The analyzer has been commanded to perform an operation that requires control of a peripheral, and needs control of HP-IB. Requires pass control mode.
2	Query error	The analyzer has been addressed to talk, but there is nothing in the output queue to transmit.
4	Execution error	A command was received that could not be executed. Commonly due to invalid operands.
5	Syntax error	The incoming HP-IB commands contained a syntax error. The syntax error is cleared only by a device clear or an instrument preset.
6	User request	The operator has pressed a front panel key or turned the knob.
7	Power on	A power on sequence has occurred since the last read of the register.

Event Status Register

Bit	Name	
0	Sweep or group complete	A single sweep or group has been completed since the last read of the register. Operates in conjunction with SING or NUMG.
1	Service routine waiting or done	An internal service routine has completed operation, or is waiting for an operator response.
2	Data entry complete	A terminator key has been pressed, or a value entered over HP-IB since last read of the register.
3	Limit failed, Ch 2	Limit test failed on channel 2.
4	Limit failed, Ch 1	Limit test failed on channel 1.
5	Search failed, Ch 2	A marker search was executed, but the target value was not found.
6	Search failed, Ch 1	Same as on channel 2.
7	ALC unlock	Unleveled output power at the beginning or end of a sweep. Data may be invalid.

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Calibration Types and Standard Classes

Class	Response	Response and Isolation	S11 1-port	S22 1-port	One path 2-port	Full 2-port	E/O Response and Match	O/E Response and Match
Reflection:[1]					●	●	●	●
S11A (opens)			●		●	●	●	●
S11B (shorts)			●		●	●	●	●
S11C (loads)			●		●	●		
S22A (opens)				●		●		
S22B (shorts)				●		●		
S22C (loads)				●		●		
Transmission:[1]					●	●		
Forward match					●	●		●
Forward thru					●	●	●	●
Reverse match						●		
Reverse thru						●		
Isolation:[1]					●	●		
Forward					●	●	●	●
Reverse						●		
Response	●							
Response and isolation:								
Response		●						
Isolation		●						

1. These subheadings must be called when doing 2-port calibrations.

Calibration Arrays

Array	Response	Response and Isolation	1-port	2-port[1]	E/O Response and Match	O/E Response and Match
1	E_R or E_T	E_X (E_D)[2]	E_D	E_{DF}	E_{DF}	E_{DF}
2		E_T (E_R)	E_S	E_{SF}	E_{SF}	E_{SF}
3			E_R	E_{RF}	E_{RF}	E_{RF}
4				E_{XF}	E_{XF}	E_{XF}
5				E_{LF}	E_{TF}	E_{LF}
6				E_{TF}		E_{TF}
7				E_{DR}		
8				E_{SR}		
9				E_{RR}		
10				E_{XR}		
11				E_{LR}		
12				E_{TR}		

Meaning of first subscript: D=directivity; S=source match; R=reflection tracking; X=crosstalk; L=load match, T=transmission tracking.

Meaning of second subscript: F=forward; R=reverse.

1. One path, 2-port cal duplicates arrays 1 to 6 in arrays 7 to 12.
2. Response and isolation corrects for crosstalk and transmission tracking in transmission measurements, and for directivity and reflection tracking in reflection measurements.

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Alphabetical List of Codes

AB;
Measure and display A/B on the active channel.

ADDRCONT [value];
Controller HP-IB address.
Control is returned to this address after a pass control.

ADDRDISC [value];
Disk HP-IB address. (0-30)

ADDRPLOT [value];
Plotter HP-IB address.

ADDRPOWM [value];
Power Meter HP-IB address. (0-30)

ADDRPRIN [value];
Printer HP-IB address. (0-30)

ADJB;
Executes autobiasing of optical modulator.

ALC;
ALC control.

ALIS<**ON**|**OFF**>;
Select time domain span limit.
On to display past time domain alias-free range.
Preset selects ALISOFF;.

ALTAB;
Select alternate sweeps for Channel 1 and Channel 2.

ANAB;
Analog bus Enable.

ANAI;
Measure and display data at the Analog Input (ANALOG IN).

ANNO<**ON**|**OFF**>;
Select measurement annotation.
S-parameter test set=On;
Reflection/transmission test set=Off.

AR;
Measure and display A/R on the active channel.

ASAMP <**ON**|**OFF**>;
Switch A, sampler to: ON = LW, OFF = RF.

ASEG;
Measure all frequency list segments.

ASSS;
Assert the sequence status bit.

ATTP<**1**|**2**>[value];
Set port 1 or port 2 attenuator (0-90 dB, 10 dB steps).

AUTO;
Automatic selection of REF VALUE and SCALE for the active channel.

AUTB <**ON**|**OFF**>;
Enable or disable autobiasing of optical modulator.

AVERFACT [value];
Set averaging factor for active channel.

AVER<**ON**|**OFF**>;
Select averaging for active channel.
AVERON [value]; can also be used.

AVERREST;
Restart averaging on the active channel.

BACI [0-100];
Background intensity percent.

BANDPASS;
Select time domain bandpass mode.

BEEPDONE<**ON**|**OFF**>;
Beep when done:
Save instrument state, Calibration standard, Data trace saved.

BEEPFAIL<**ON**|**OFF**>;
Beep when limit test failure.

BEEPWARN<**ON**|**OFF**>;
Beep when warning message displayed.

BR;
Measure and display B/R on the active channel.

BSAMP <**ON**|**OFF**>;
Switch B, sampler to: ON = LW, OFF = RF.

C0 [value]; $x10^{-15}F$
C1 [value]; $x10^{-27}F$
C2 [value]; $x10^{-36}F$
C3 [value]; $x10^{-45}F$
Open circuit capacitance model values:
$C=C0+(C1*F)+(C2*F^2)+(C3*F^3)$

CAL1;
Begin measurement calibration.

CALFCALC [value];
Set current frequency power meter calibration factor.

CALFFREQ [value[freq suffix]];
Select power meter calibration factor frequency.

CALFSEN<**A**|**B**>;
Edit the sensor A or B calibration factor table.

CALIAPOW; A input.
CALIARPO; A/B ratio.
CALIBPOW; B input.
CALIBRPO; B/R ratio.
Begin power calibration sequence for selected measurement.

CALIEORM;
Select E/O response and match calibration.

CALIFUL2;
Select Full 2-Port measurement calibration.

CALIOERM; CALIOERM;
Select O/E response and match calibration.

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CALIONE2;
Select One-Path 2-Port measurement calibration.

CALIRAI;
Select Response and Isolation measurement calibration for current parameter.

CALIRESP;
Select Response measurement calibration for current parameter.

CALIS111;
Select 1-Port measurement calibration for current parameter at port 1.

CALIS221;
Select 1-Port measurement calibration for current parameter at port 2.

CALK35MM; 3.5 mm
CALK7MM; 7 mm
CALKN50; type-N, 50Ω
CALKN75; type-N, 75Ω
CALKOPTS; Standard optical
CALKOPTU; User-defined optical
CALKUSED; Use-defined electrical
Begin measurement calibration using selected cal kit.

CALN;
Select Cal none.

CALPRECE; O/E DUT
CALPRESP; Response cable
CALPRFSC; Source RF cable
CALPRFTC; Total RF cable
Select calibration standard class. Measure if single standard in class, or, if multiple standards in class, use **STAN**<char>; and **DONE**; to measure standards in class.

CALSRECC; Receiver coefficients
CALSRECD; Receiver from disc
CALSSOUC; Source coefficients
CALSSOUD; Source from disc
Select standard location for source/receiver model.

CBRI [0-100];
Color brightness percent.

CENT [value[suffix]];
Set CENTER stimulus value.

CHAN1; Channel 1
CHAN2; Channel 2
Select Active measurement Channel.

CHOPAB;
Alternate measurements between Channel 1 and Channel 2 at each frequency point.

CLAD;
Class done, modify cal kit, specify class.
Current standard class is complete.

CLASS11A; S11A; S11 1-port
CLASS11B; S11B; S11 1-port
CLASS11C; S11C: S11 1-port
CLASS22A; S22A: S22 1-port
CLASS22B; S22B: S22 1-port
CLASS22C; S22B: S22 1-port
Select port 1 (S11) and port 2 (S22) calibration standard class. Measure if single standard in class, or, if multiple standards in class, use **STAN**<char>; and **DONE**; to measure standards in class.

CLEA<**1-5**>;
CLEARALL;
Clear specified Save/Recall register or all.

CLEAL;
CLEL;
Clear current list:
Frequency list, Power Loss list, or Limit Test list.

CLEASE<**1-6**>;
Clear specified test sequence.

CLES;
CLS;
Clear Status. Clears (0) status byte, event status registers, and event status enable registers.

COAX;
Define current cal standard as Coaxial (linear phase).

COEF<**A-I**>;
Set optical cal **STDTSOUR**; and **STDTRECE**; coefficients.

COEFA <**1-4**> [value];
Set numerator coefficients of response model.

COEFB <**1-4**> [value];
Set denominator coefficents of response model.

COEFDELA [value];
Set delay coefficient of response model.

COEFK;
Set scaling coefficent of the response model.

COLOCH1D; Ch 1 data, limit line
COLOCH1M; Ch 1 memory
COLOCH2D; Ch 2 data, limit line
COLOCH2M; Ch 2 memory
COLOGRAT; Graticule
COLOMEM1; Memory 1
COLOMEM2; Memory 2 and Ref. line
COLOTEXT; Text
COLOWARN; Warning message
Specify display element to change color.

COLOR [**0-100**];
Specify saturation percent.

CONS;
Continue test sequence.

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CONT;
Continuous sweep trigger mode.

CONV1DS; Reciprocal (1/S)
CONVOFF; Conversion Off
CONVYREF; Y: reflection
CONVYTRA; Y: transmission
CONVZREF; Z: reflection
CONVZTRA; Z: transmission
Convert current measurement.

COPYFRFT;
Copy file titles to register titles.

COPYFRRT;
Copy save/recall register titles to disc.

CORI<**ON**|**OFF**>;
Select Interpolative error correction for active channel.

CORR<**ON**|**OFF**>;
Select error correction for active channel current parameter set.

COUC<**ON**|**OFF**>;
Couple/Uncouple channel stimulus values.

COUP<**ON**|**OFF**>;
Couple power when uncoupled channels.

COUS <**ON**|**OFF**>;
Switch coupling to measurement parameter on or off.

CWEXT;
CW mode using external input.

CWFREQ [value[freq suffix]];
Select CW frequency in single frequency measurement modes.
During frequency list edit, set center frequency of current segment.

CWTIME;
Select CW time sweep type.

D1DIVID2<**ON**|**OFF**>;
Perform complex divide of current
Channel 1 data by current Channel 2 data and display in
Channel 2. Dual channel only.

DATI;
Active channel data stored to trace memory.

DEBU<**ON**|**OFF**>;
Select HP-IB program debug mode to display instrument commands.

DECRLOOC;
Decrement test sequence loop counter by one.

DEFC;
Set default colors.

DEFOKIT;
Default optical kit.

DEFS [std no.];
Define number of cal standard to be modified.

DELA;
Select DELAY format for current measurement.

DELO;
Delta Marker mode Off.

DELR<**1-4**>;
Select delta reference marker.

DELRFIXM;
Select fixed marker as delta reference marker.

DEMOAMPL; Amplitude Demodulation
DEMOOFF; Demodulation Off
DEMOPHAS; Phase Demodulation
Select CW Time transform demodulation.

DEVT1PE; 1-port electrical
DEVT1PO; 1-port optical
DEVTEE; E/E
DEVTEO; E/O
DEVTOE; O/E
DEVTOO; O/O
Specify current device type.

DFLT;
Select default plotter setup.

DIRS [value];
Set the number of files in directory at disc initialization.

DISCUNIT [value];
Specify disc unit number.
Usually 0 (left drive); 1 (right drive).

DISCVOLU [value];
Specify disc volume number.

DISM<**ON**|**OFF**>;
Select display of all four marker values.

DISPDATA; Display data
DISPDATM; Display both data and memory
DISPDDM; Display data divided by memory
DISPDMM; Display data minus memory
DISPMATH; Display current math function
DISPDPM; Display data plus memory
DISPDTM; Display data times memory
DISPM1DM; Display memory 1 divided by memory 2
DISPM1MM; Display memory 1 minus memory 2
DISPM1PM; Display memory 1 plus memory 2
DISPM1TM; Display memory 1 times memory 2
DISPM2DM; Display memory 2 divided by memory 1
DISPM2MM; Display memory 2 minus memory 1
DISPM2PM; Display memory 2 plus memory 1
DISPMEMO; Display memory only
Select display for active channel.

DIVI;
Select complex divide default trace math.

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DONACAL;
DONARCAL;
DONBCAL;
DONBRCAL;
Done with power meter calibration sequence.

DONE;
Done with standard class during cal.

DONM;
Done with modify test sequence.

DOSE<**1-6**>;
Do specified test sequence.

DOWN;
Decrement current active function value.

DRIVPORT <**ON**|**OFF**>;
Drive port; ON=LW, OFF=RF.

DUAC<**ON**|**OFF**>;
Select dual (On) or single channel (Off) display.

DUPLSE<**1-6**>**SEQ**<**1-6**>;
Duplicate test sequence (from-to).

EOCAL;
Internal E/O service calibration parameter.

EDITDONE;
Done with edit frequency list or edit limit line table.

EDITLIML;
Begin edit limit line table.

EDITLIST;
Begin edit frequency list.

ELEA [value];
Electrical attenuation for power cal.

ELED [value[time suffix]];
Set electrical delay for active channel.

EMIB;
Beep during test sequence.

ENTO;
Entry Off.
Turn off active function and clear entry area.

ESB?;
Output event status register B value.

ESE [value];
Specify bits of event status register to be summarized by bit 5 of the status byte.

ESNB [value];
Specify bits of event status register B to be summarized by bit 2 of the status byte.

ESR?;
Output event status register value.

EXET;
Execute a service test.

EXTAOPTI;
Extension auxiliary optical port.

EXTMDATA<**ON**|**OFF**>; Error-corrected data
EXTMFORM<**ON**|**OFF**>; Formatted data
EXTMGRAP<**ON**|**OFF**>; User graphics
EXTMRAW<**ON**|**OFF**>; Raw data arrays
Specify data types included in register storage to disc.

EXTOINPU;
Extension optical input.

EXTOSOUR;
Extension optical source.

EXTT<**ON**|**OFF**>; External/Internal trigger
EXTTPOIN; External trigger
Select internal or external measurement trigger mode.

FAST;
Select fast plot speed.

FIXE;
Define load standard type as fixed.

FOCU [**0-100**];
Set CRT focus value percent.

FORM1; Instrument internal binary
FORM2; IEEE 32-bit fp (8 bytes/point)
FORM3; IEEE 64-bit fp (16 bytes/point)
FORM4; ASCII
FORM5; PC-DOS 32-bit fp (8 bytes/point)
Select HP-IB trace data input/output formats.

FREO;
Select frequency annotation Off.
(Preset to turn On).

FREQOFFS<**ON**|**OFF**>;
Select frequency offset mode.

FREQRANG<**3GHZ**|**6GHZ**>;
Select frequency doubler in HP 85047 test set.

FRER;
Select internal trigger free-run sweep (same as CONT;).

FRES<**ON**|**OFF**>;
Select frequency subset cal On/Off.

FULP;
Select full page plot.

FWDI; Isolation
FWDM; Load match
FWDT; Tracking
Select forward transmission (S21) calibration standard class. Measure if single standard in class, or, if multiple standards in class, use **STAN**<char>; and **DONE**; to measure standards in class.

GATECENT [value[time suffix]];
Set gate center.

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GATE<ON|OFF>;
Select gate off/on.

GATESPAN [value[time suffix]];
GATESTAR [value[time suffix]];
GATESTOP [value[time suffix]];
Set gate span, start, stop values.

GATSMAXI; Maximum
GATSMINI; Minimum
GATSNORM; Normal
GATSWIDE; Wide
Select gate shape.

GUIS;
Begin guided setup instructions.

HARMOFF;
HARMSEC; Second harmonic
HARMTHIR; Third harmonic
Select harmonic measurement.

HOLD;
Hold present measurement.
Restart using **CONT**;.

IDN?;
Output ASCII instrument identification string. "HEWLETT PACKARD,<model>,<op sys rev>"

IFBW [value];
Select IF bandwidth.

IFLCEQZE<1-6>; Loop counter equals zero
IFLCNEZE<1-6>; Loop counter does not equal zero
IFLTFAIL<1-6>; Limit test fail
IFLTPASS<1-6>; Limit test pass
Branch from executing test sequence to specified test sequence if condition is satisfied.

IMAG;
Select display of Imaginary data using cartesian format for active channel.

INCRLOOC;
Increment test sequence loop counter by one.

INDEREFR;
Index of refraction.

INID;
Initialize disc for instrument data storage.

INPUCALC<01-12>;
Store measurement calibration error coefficient set real/imaginary pairs input via HP-IB into instrument memory. Select appropriate cal type then input necessary coefficient sets (see **OUTPCALC**n;) then issue **SAVC**;. Issue **SING**; or **CONT**; to measure.

INPUCALK; Input cal kit, use **SAVEUSEK**;
INPUCALR; Receiver cal data
INPUCALS; Source cal data
INPUDATA; Active channel corrected data
INPUFORM; Active channel formatted data
INPULEAS; Learn string
INPUPMCAL<1-2>; Power meter calibration array
INPURAW<1-4>; Active channel raw data array
Input specified data via HP-IB.

INSMEXSA; External source, auto
INSMEXSM; External source, manual
INSMNETA; Standard analyzer
INSMTUNR; Tuned receiver
Select instrument mode.
INTE [0-100];
Set display intensity percent.

ISOD;
Done with isolation part of 2-port cal.

ISOL;
Begin isolation part of 2-port cal.

KEY [keycode];
Send keycode. See Keycode table.
Equivalent to actually pressing a key.

KITD;
Done with modify cal kit.
Modified cal kit replaces existing kit.

KOR?;
Output two byte key code or knob count.
See Keycode table.
Positive value=key code.
Negative value can be converted to knob count.

LABEFWDM ["string"]; Forward match
LABEFWDT ["string"]; Forward transmission
LABERESI ["string"]; Response, Response & Isolation
LABERESP ["string"]; Response
LABEREVM ["string"]; Reverse match
LABEREVT ["string"]; Reverse transmission
LABES11A ["string"]; S11A (opens)
LABES11B ["string"]; S11B (shorts)
LABES11C ["string"]; S11C (loads)
LABES22A ["string"]; S22A (opens)
LABES22B ["string"]; S22B (shorts)
LABES22C ["string"]; S22C (loads)
Define standard class label during modify cal kit.

LABK ["string"]; Electrical cal kit
LABO ["string"]; Optical cal kit
Define cal kit label during modify cal kit.

LABS ["string"];
Define standard label during modify cal kit.

LASEXT;
Select external laser.

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LASEINT;
Select internal laser.

LASEOFF;
Laser off.

LASEON;
Laser on.

LEFL; Left lower
LEFU; Left upper
Set plot quadrant option.

LIMD [value];
Set limit line delta value.

LIMIAMPO [value];
Set limit line amplitude offset.

LIMILINE<**ON**|**OFF**>;
Select limit line display.

LIMIMAOF [value[suffix]];
Marker to limit line stimulus offset.
Center limit lines using active marker position and limit line amplitude offset.

LIMISTIO [value[suffix]];
Set limit line stimulus offset.

LIMITEST<**ON**|**OFF**>;
Select limit test.

LIML [value]; Lower limit
LIMM [value]; Middle limit
LIMS [value]; Stimulus break point limit
LIMTFL; Flat line
LIMTSL; Sloping line
LIMTSP; Single point
LIMU [value]; Upper limit
Define characteristics of limit test segment.

LINFREQ;
Select linear frequency sweep.

LINM;
Select cartesian Linear Magnitude format for active channel.

LINTDATA [value]; Data
LINTMEMO [value]; Memory
Set line type plot options.

LISFREQ;
Select frequency list sweep mode.

LISV;
List data values to display.

LOAD<**1-5**>;
Recall specified disc file.
Must pass control.

LOADREC<**1-5**>;
Load specified receiver cal data disc file.

LOADSEQ<**1-6**>;
Load specified test sequence disc data file.

LOADSOU<**1-5**>;
Load specified source cal data disc file.

LOGFREQ;
Select log frequency sweep.

LOGM;
Select log magnitude display format for active channel.

LOOC [value];
Set value of test sequence loop counter.

LOWPIMPU; Impulse
LOWPSTEP; Step
Select time domain stimulus model.

LRN?;
Output learn string.

LWALCI <**ON**|**OFF**>;
LW ALC IN : ON=EXT, OFF=INT.;

LWALCO <**ON**|**OFF**>;
LW ALC on or off.

LWALCV [value];
Save value of LW ALC.

MANTRIG;
Select manual trigger.

MARK<**1-4**>[value[suffix]];
Select active marker.
Move it to specified stimulus value.

MARKBUCK [0-# of pts-1];
Move active marker to specified data point number.

MARKCENT [value[suffix]];
Move active marker to Center stimulus value.

MARK<**COUP**|**UNCO**>;
Select Markers always coupled/uncoupled.
Preset selects Coupled.

MARKCW;
Change Center stimulus value to active marker stimulus value.

MARKDELA;
Set electrical delay to balance phase at marker frequency.
Delay=zero seconds; flat phase at marker.

MARK<**DISC**|**CONT**>;
Select Discrete (measured data points only), or
Continuous (linear interpolation between actual data points),
Preset selects Discrete.

MARKFAUV [value[suffix]];
Set fixed marker auxiliary value offset.

MARKFSTI [value[suffix]];
Set fixed marker stimulus offset value.

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MARKFVAL [value];
Set fixed marker position value offset.

MARKMAXI;
Select Marker Search mode; execute search for maximum data value.

MARKMIDD;
In limit table segment edit, change the segment middle value to the current marker amplitude.

MARKMINI;
Select Marker Search mode; execute search for minimum data value.

MARKOFF;
Select all markers and marker functions Off.

MARKREF;
Change reference position value to current marker amplitude value.

MARKSPAN;
Change stimulus span to current delta marker stimulus value.

MARKSTAR;
Change stimulus start to current marker stimulus value.

MARKSTIM;
In limit table segment edit, change the limit stimulus break point to the current marker stimulus value.

MARKSTOP;
Change stimulus stop to current marker stimulus value.

MARKZERO;
Fixed marker moves to current active marker position and becomes delta ref marker.

MATI;
MATI to current memory.

MAXF [value[freq suffix]];
Maximum frequency for current cal standard.

MEASA; Input A
MEASB; Input B
MEASE01; Transmission measurement E/O
MEASE02; Transmission measurement E/O (aux)
MEASOE1; Transmission measurement O/E (port 1)
MEASOE2; Transmission measurement O/E (port 2)
MEASOFF; Marker function measure off
MEASR; Input R
Select measurement for active channel.

MEASTAT<**ON**|**OFF**>;
Select trace statistics.

MEASOO1;
Transmission measurement O/O.

MEAS 002;
Transmission measurement O/O (aux).

MEAS01;
Optical reflection measurement.

MEAS02;
Optical reflection measurement (aux).

MEMO1;
Display memory 1.

MEMO2;
Display memory 2.

MEM1I;
Memory 1 to memory 2.

MEM2I;
Memory 2 to memory 1.

MENUAVG;
MENUCAL;
MENUCOPY;
MENUDISP;
MENUFORM;
MENUMARK;
MENUMEAS;
MENUMRKF;
MENU<**ON**|**OFF**>;
MENURECA;
MENUSAVE;
MENUSCAL;
MENUSTIM;
MENUSYST;
Display specified softkey menu.

MINF [value[freq suffix]];
Minimum frequency for current cal standard.

MINU;
Select display of complex data minus memory.

MODB [value];
Optical modulator bias.

MODEI;
Model to memory.

MODI1;
Modify current electrical cal kit.

MODIO;
Modify current optical cal kit.

MOD RF <**ON**|**OFF**>;
Optical modulator RF input: ON=ext, OFF=int.

NEWSE<**1-6**>;
Modify specified test sequence.

NEXP;
Display next page of operating parameters list.

NOOP;
No Operation.
Sets Operation Complete status bit.

NUMG [value];
Restart averaging, execute the specified number of groups of sweeps, then hold.

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NUMR [value];
Set number of power meter readings per point during cal.

OFSD [value[time suffix]];	Electrical delay
OFSL [value];	Electrical loss
OFSOINDR [value];	Optical refractive index
OFSOLENG [value];	Physical length
OFSOLOSS [value];	Optical loss
OFSORPOW [value];	Percent reflectance
OFSZ [value];	Electrical offset line Z0.

Specify offset characteristics of current cal standard.

OMII;
Omit isolation part of cal.

OPC[**?**];
Operation complete.
If ?, send "1" when following command is complete.

OPEP;
Display operating parameters list.

OPTA [value];
Set optical attenuator.

OUTPACTI;	Active function value.
OUTPAFR;	Signal Processor RF frequency
OUTPAPER;	Smoothing aperture, stimulus units.
OUTPCALC<**01-12**>;	Active cal set array
OUTPCALK;	Current cal kit (Form1)
OUTPCALR;	Receiver cal data
OUTPCALS;	Source cal data
OUTPCNTR;	Service, abus counter.
OUTPDATA;	Active channel corrected data
OUTPERRO;	Error message (ASCII #,"string")
OUTPFORM;	Active channel formatted data
OUTPIDEN;	Instrument id string (see IDN?;)
OUTPKEY;	Last key pressed (Keycode table)
OUTPLEAS;	Instrument learn string (Form1)
OUTPLIMF;	Limit test, failed point
OUTPLIML;	Limit test, each point
OUTPLIMM;	Limit test, marker position
OUTPMARK;	Active marker (x,y,stimulus)
OUTPMPUL;	Current memory data
OUTPMEMO;	Pulse width (x,y,duty cycle)
OUTPMRIS;	Rise time (x,y,z)
OUTPMSTA;	Marker stats (mean, std dev, p-p)
OUTPMUPL;	Output pulsewidth
OUTPMWID;	Bandwidth search (bw, center, Q)
OUTPMWIL;	Band search (bw,center,Q,loss)
OUTPOPTS;	Service, option sum
OUTPPLOT;	HP-GL plot string
OUTPPMCAL<**1**|**2**>;	Power meter cal, Channel
OUTPPRIN;	Raster dump to printer
OUTPRAW<**1-4**>;	Current raw data
OUTPRFFR;	External source frequency
OUTPSEQ<**1-6**>;	Specified test sequence
OUTPSTAT;	Status byte (FORM4)
OUTPTESS;	Test status
OUTPTITL;	Display title (FORM4)
OUTPTPLL;	True pll sequence

Output specified data via HP-IB.

PAUS;
Pause in test sequence.

PCB [value];
Pass Control Back address.
See **ADDRCONT**;.

PDATA<**ON**|**OFF**>;
Select data trace plot option.

PEEK;
PEEL<memory address>;
Peek/Poke location.
Service use only.

PENNDATA [value];	Data trace, limit lines
PENNGRAT [value];	Graticule
PENNMARK [value];	Markers and marker text
PENNMEMO [value];	Memory trace
PENNTEXT [value];	Text and User graphics

Define plotter pen color for portion of plot.

PGRAT<**ON**|**OFF**>;
Select graticule plot option.

PHAO [value];
Set phase offset.

PHAS;
Select cartesian phase format for active channel.

PLOS<**FAST**|**SLOW**>;
Select plotter pen speed.
Preset selects fast.

PLOT;
Request a plot.
Requires pass control mode.

PMEM<**ON**|**OFF**>;
Select memory trace plot option.

PMKR<**ON**|**OFF**>;
Select marker and marker text plot option.

PMTRTTIT;
In test sequence, read power meter/HP-IB value into title string.

POIN [value];
Define number of points in current frequency list segment.

POKE value;
Change contents of memory location.
Service use only.

POLA;
Select Polar display format for active channel.

POLMLIN;	lin mag, phase
POLMLOG;	log mag, phase
POLMRI;	real, imaginary

Select polar format marker units.

PORE<**ON**|**OFF**>;
Select Port Extensions On/Off.

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PORT1 [value[time suffix]];
PORT2 [value[time suffix]];
PORTA [value[time suffix]];
PORTB [value[time suffix]];
Set port extensions electrical delay.

PORTR [value[time suffix]]; Reflection
PORTT [value[time suffix]]; Transmission
Set port extensions electrical delay

POWE [value];
Set source output level (dBm).

POWLFREQ [value[freq suffix]];
Define current frequency in the power loss list.

POWLLIST;
Begin power loss list edit for power meter cal.

POWLLOSS [value];
Set the power loss value for the current frequency in the power loss list.

POWM<**ON**|**OFF**>;
Selects that HP 436 (On) or HP 438 (Off) is used in service procedures.

POWOM<**ON**|**OFF**>;
Select guided setup instructions at instrument power up.

POWS<**ON**|**OFF**>;
Select Power sweep mode.

POWT<**ON**|**OFF**>;
Set Power Trip Off, then On to clear port input power overload condition.

PRES;
Instrument Preset.

PRIC;
Select color print.

PRINALL;
Copy measurement display to printer according to plot options.

PRINSEQ<**1-6**>;
Print specified test sequence.

PRIS;
Select standard print.

PSOFT<**ON**|**OFF**>;
Select plot softkey labels option.

PTEXT<**ON**|**OFF**>;
Select plot text option.

PULV [value];
Set pulse width search value.

PULW<**ON**|**OFF**>;
Select pulse width search Off/On.

PURG<**1-5**>;
Purge specified file from disc.
Requires pass control.

PWMCEACS; Cal each sweep; no cal sweep
PWMCOFF; Correction Off
PWMCONES; One sweep cal; use cal sweep
Select power meter cal.
Preset selects Off.

PWRLOSS<**ON**|**OFF**>;
Select power loss table.
Preset selects Off.

RAID;
Done with Response and Isolation cal. If all necessary standard classes have been measured, a cal set is created.

RAIISOL;
Measure Isolation standard in Response & Isolation cal.

RAIRESP;
Measure Response standard in Response & Isolation cal.

RAMD;
Response and match cal done.

READRECT; Receiver
READSOUT; Source
Read disc electro-optical cal data file titles.

REAL;
Select Real cartesian format for active channel.

RECA<**1-5**>;
Recall the specified instrument state.

RECCSTDI; Current coefficients
RECDSTDI; Load from disk.
Select receiver model.

RECEOUT <**ON**|**OFF**>;
Select path to receiver output; ON=CAL, OFF=OPT.

RECO;
Recall colors.

REFD;
Done with Reflection part of Full 2-port cal.

REFL;
Begin Reflection part of Full 2-port cal.

REFP [value];
Set Reference Position Line graticule.
0=bottom; 10=top.

REFT;
Recall register titles from disk.
Requires pass control mode.

REFV [value];
Set current format reference position line value.

RESC;
Resume last measurement calibration sequence.

RESD;
Restore measurement display.

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RESM;
Reset mode 1.

RESPDONE;
Finished with Response cal. If all necessary standards are measured, a cal set will be created.

REST;
Measurement restart.

REVI; Isolation
REVM; Load match
REVT; Tracking
Select reverse transmission (S12) calibration standard class. Measure if single standard in class, or, if multiple standards in class, use **STAN**<char>; and **DONE**; to measure standards in class.

RFLP;
Select reflection port.

RIGL; Right Lower
RIGU; Right Upper
Select plot quadrant.

RIST<**ON**|**OFF**>;
Select rise time search Off/On.

RSCO;
Reset color.

RST;
Instrument Preset.

S11;
S12;
S21;
S22;
Select parameter displayed on current active channel.

SADD;
Add a segment to current frequency list or limit table.

SAMC<**ON**|**OFF**>;
Select internal sampler correction Off/On.
Preset selects On.

SAV1;
Finished with 1-port cal. If all necessary standards are measured, a 1-port cal set is created.

SAV2;
Finished with 2=Port cal. If all necessary standards are measured, a 2-port cal set is created.

SAVC;
Create a cal set using current error coefficient arrays.

SAVE<**1-5**>;
Save the current instrument state in specified register.

SAVEOPTK;
Save active optical cal kit as optical user cal kit.

SAVERECC; Receiver
SAVESOUC; Source
Store current electro-optical coefficients.

SAVEUSEK;
Store the active calibration kit as the User kit.

SAVUASCI; Save using CITIFile ASCII
SAVUBINA; Save using binary
Select disc file format.
See Disc File Name table.

SCAL [value];
Set graticule x-axis or polar scale/division for current format.

SCAPFULL; Full plot.
SCAPGRAT; Expand to P1 and P2.
Select plot option.

SDEL;
Delete current frequency list segment or limit table segment.

SDON;
Done with current frequency list segment or limit table segment, include segment in list.

SEAL; Search Left
SEAR; Search Right
Initiate marker search left or right from current position for selected Min, Max, or Target. Message if not found.

SEAMAX; Search for Maximum
SEAMIN; Search for Minimum
SEAOFF; Search Mode Off
SEATARG [value]; Search for target.
Select Marker Search mode; execute search.

SEDI [value];
Edit current or specified frequency list segment.

SEQWAIT [value];
In test sequence, wait integer seconds.

SETF;
Set harmonic frequency steps for time domain low pass transform.

SETZ;
Define Z0 of Smith Chart, Inverted Smith,
Load cal standard type, **CONVZ**; and **CONV**;.
Preset selects Z0=50 ohms.

SHOM;
In test sequence, show menu.

SING;
Single sweep or set of sweeps, then hold.

SLID;
Sliding load done.

SLIL;
Define load standard type as sliding.

SLIS;
Slide is set; measure sliding load.

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SLOPE [value];
Enter power slope value (dB/GHz)

SLOP<**ON**|**OFF**>;
Select power slope Off/On.

SM<**1-8**>
SM2<**D,E,H,L, or M**>;
Service, source control.

SMIC;
Select Smith chart display format for current channel.

SMIMGB;	G ± jB
SMIMLIN;	linear magnitude, phase angle
SMIMLOG;	20log10(linear mag), phase angle
SMIMRI;	real/imaginary pair
SMIMRX;	R ± jX

Select Smith chart marker readout format.

SMOOAPER [0.1-20];	Smoothing aperture
SMOOOFF;	Smoothing Off
SMOOON [0.1-20];	Smoothing On

Control smoothing for selected channel.
value = percent of span: 0.1, 0.2, 0.5,...20 sequence.

SOFR;
Display instrument operating system revision.

SOFT<**1-8**>;
Select the softkey function for the current displayed menu.

SOUCSTDI;	Current coefficients
SOUDSTDI;	Load from disc.

Select source model.

SPAN [value[suffix]];
Set stimulus span.

SPAR<**ON**|**OFF**>;
S-parameter notation On/Off.

SPECFWDM	stanAno[,stanBno...[stanGno]];
SPECFWDT	stanAno[,stanBno...[stanGno]];
SPECRESI	stanAno[,stanBno...[stanGno]];
SPECRESP	stanAno[,stanBno...[stanGno]];
SPECREVM	stanAno[,stanBno...[stanGno]];
SPECREVT	stanAno[,stanBno...[stanGno]];
SPECS11A	stanAno[,stanBno...[stanGno]];
SPECS11B	stanAno[,stanBno...[stanGno]];
SPECS11C	stanAno[,stanBno...[stanGno]];
SPECS22A	stanAno[,stanBno...[stanGno]];
SPECS22B	stanAno[,stanBno...[stanGno]];
SPECS22C	stanAno[,stanBno...[stanGno]];

Specify from 1 to 7 standards in each calibration standard class.
StanAno = first standard in class,
StanGno = last standard in class.

SPEG<**ON**|**OFF**>;
Select gate markers.

SPLD<**ON**|**OFF**>;
Select split display On/Off.

SRE [value];
Service request enable. (0-256)
Value defines bits enabled to generate SRQ.

SSEG [value];
Measure specified single segment of frequency list.

STAF [value[freq suffix]];
Set start frequency with transform On.

STAN<**A-G**>;
Measure cal standard in current standard class.

STAR [value[suffix]];
Set Start stimulus value.

STB?;
Output status byte.

STDD:
Done with current standard definition.

STDODEFI;
Done with optical cal standards.

STDTARBI;	1-port arbitrary impedance
STDTDELA;	Delay/Thru 2-port
STDTFRES;	Fresnel
STDTLOAD;	1-port Z0 load
STDTOPEN;	Open circuit
STDTOTHR;	Thru
STDTRECE;	Receiver
STDTREFL;	Reflector
STDTSHOR;	Short circuit
STDTSOUR;	Source
STDTTHRR;	Thru/receiver

Define current standard type.

STOP [value[suffix]];
Set Stop stimulus value.

STOR<**1-5**>;
Store file to disc.

STORSEQ<**1-6**>;
Store specified test sequence.

STPSIZE [value[freq suffix];
Define current frequency list segment step size.

SVCO;
Save colors.

SWEA;
Select sweep time, auto.

SWET [value[time suffix]];
Set sweep time.

SWR;
Select SWR display for active channel.

TAKCS;
Begin power meter calibration sweep.

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TALKLIST;
Set instrument to talker/listener mode.

TERI [value];
Define real terminal impedance of arbitrary impedance standard.

TESR<**1,2,4,6,or 8**>;
Service, send test response.

TESS?;
Return "1" if S-parameter test set.
Return "2" if doubler test set.

TEST [value];
Service, select test.

TIMDTRAN<**ON**|**OFF**>;
Select time domain transform On/Off.

TINT [**0-100**];
Set color hue
(0=red, 100=violet).

TITF<1-5>["string"];	Disk file.
TITL ["string"];	CRT title.
TITR<**1-5**>["string"];	Save/recall register.
TITSEQ<**1-6**>["string"];	Test sequence.
TITSQ ["string"];	Current test sequence.
TITTMEM ["string"];	Trace memory.
TITTPMTR ["string"];	Power meter address
TITTPRIN ["string"];	printer address

Send title string to specifed function.

TO<**1-2**><**ON**|**OFF**>;
Service, test record option.

TRACK<**ON**|**OFF**>;
Select marker search tracking Off/On.

TRAD;
Done with transmission part of Full 2-port cal.

TRAN;
Begin transmission part of Full 2-port cal.

TRAP;
Display transform parameters.

TRAS [value[freq suffix]];
Enter new frequency span with transform On.

TRIG;
Select HP-IB triggered data acquisition.
Instrument does Hold, sets status bit, then wait for HP-IB Group Execute Trigger for next measurement step, executes trigger, then sets status bit.
Exit using **FRER;, CONT;, or PRES**;.

TST?;
Initiate self-test sequence;
Return zero if pass.

TTLOH; High
TTLOL; Low
Defines active level of test set TTL output.

UP;
Increment current active function value.

USEPASC;
Instrument enters pass control mode.

USESENSA; Sensor A
USESENSB; Sensor B
Select power sensor.

VELOFACT [value];
Define velocity factor of transmission medium.

VOFF [value];
Define frequency offset value.

WAIT;
Wait for a clean sweep.

WAVE;
Define cal standard as Waveguide (dispersive) phase).
Standard rectangular waveguide,
MAXF; sets cutoff frequency.

WAVL 1300;
Optical wavelength is 1300 nm..

WAVL 1550;
Optical wavelength is 1550 nm.

WIDT<**ON**|**OFF**>;
Select bandwidth search On/Off.

WIDV [value];
Define bandwidth search value in current format.

WINDMAXI;	Maximum window
WINDMINI;	Minimum window
WINDNORM;	Normal window
WINDOW [value];	Arbitrary window
WINDUSEMOFF;	Above commands define window
WINDUSEMON;	Trace memory defines window

Select time domain window shape.

WRSK<**1-8**>["string"];
Enter new softkey label.

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List of OPC'able Codes

The Operation Complete (OPC) function allows syncronization of the program by causing a specific action when the current command has completed executing, before the next command begins executing. There are two forms for this process. The function is enabled by issuing **OPC**; or **OPC?**; prior to an OPC'able command. An example of this usage is **OPC**; **PRES**;. In this instance, the Operation Complete bit is automatically set when the Preset command has completed execution. Issuing **OPC?**; prior to the command causes the instrument to set the Operation Complete status bit then output a "1" when the command has completed execution.

Following is an alphabetical list of OPC'able commands.

ADJB;
CHAN1;
CHAN2;
CLEARALL;
DATI;
DONE;
DON<A,B,AR,BR>CAL;
EDITDONE;
EXTTOFF;
EXTTPOIN;
FREQOFFS<ON|OFF>;
FREQRANG<3GHZ|6GHZ>;
HARMOFF;
HARMSEC;
HARMTHIR;
INSMEXSA;
INSMEXSM;
INSMNETA;
INSMTUNR;
ISOD;
MANTRIG;
MATI;
MEM1I;
MEM2I;
MODEI;
NOOP;
NUMG;
PRES;
RAID;
RECA<1-5>;
REFD;
RESPDONE;
RST;
SAV1;
SAV2;
SAVC;
SAVE<1-5>;
SING;
STAN<A-G>;
TRAD;
WAIT;

Interrgate Instrument State (Query) Commands

All instrument functions can be interrogated to find the current On/Off state or value.

For instrument state commands, append the question mark (**?**) character instead of <**ON|OFF**>to interrogate the state of the functions. An example is **AVER?**;. The analyzer responds to the next controller Enter operation with a "1" or a "0" to indicate On or Off, respectively.

For settable functions such as **SCAL** [value];, using **SCAL?**; causes the analyzer to respond to the next controller enter operation by outputting the current function value then clearing the instrument entry area.

If a command that does not have a defined response is interrogated, the instrument outputs a zero.

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