Programming Note

Agilent Technologies
Quick Reference Guide
For the 8757D/E Scalar Network Analyzer

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Hewlett-Packard to Agilent Technologies Transition

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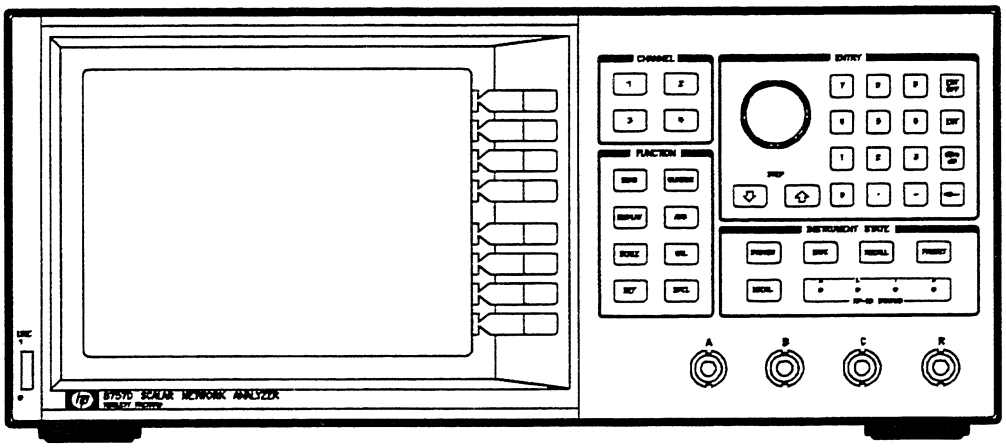
HP–IB Programming Note

HEWLETT PACKARD

Quick Reference Guide

For the HP 8757D/E Scalar Network Analyzer



Introduction

This programming note is a reference guide for the remote operation of the HP 8757D/E Scalar Network Analyzer with firmware revision 4.2 or greater. This note is intended for use by those familiar with HP–IB programming and the basic functions of the HP 8757D/E. For operation information for the analyzer, refer to the *Operating Reference* in the operating manual.

Note: Remote operation of the HP 8757D/E applies to operation with the HP Interface Bus (HP–IB) connector on the rear panel of the analyzer. Do not connect an HP–IB controller to the 8757 SYSTEM INTERFACE connector; HP–IB control of the instruments connected to this port is described in the "Passthrough" portion of this document.

HP–IB capabilities

The following codes describe the HP–IB electrical capabilities of the HP 8757D/E, using IEEE Std 488–1978 mnemonics (HP–IB, GP–IB, IEEE 488, and IEC–625 are all electrically equivalent). The mnemonics briefly translate as follows:

SH1: Source Handshake, complete capability.

AH1: Acceptor Handshake, complete capability.

T6: Talker, capable of basic talker, serial poll, and unaddress if MLA.

TE0: Talker, Extended address; no capability.

L4: Listener, capable of basic listener, and unaddress if MTA.

LE0: Listener, Extended address; no capability.

SR1: Service Request, complete capability.

RL1: Remote Local, complete capability.

PP0: Parallel Poll, no capability.

DC1: Device Clear, complete capability.

DT0: Device Trigger, no capability.

C0: Controller, no capability.

E1: Electrical specification indicating open collector outputs.

These codes are completely explained in the IEEE Std 488–1978 document, published by the Institute of Electrical and Electronic Engineers, Inc., 345 East 47th Street, New York, New York 11017.

Input data

The HP 8757D/E Scalar Network Analyzer accepts specific programming commands for selecting front panel key functions, most softkey functions and special HP–IB only functions. Line switch control and HP–IB address setting are not programmable. The analyzer can pass through HP–IB commands to a compatible Hewlett–Packard swept source, graphics plotter, and printer, connected to the 8757 SYSTEM INTERFACE. A list of compatible instruments is given in "8757 System Interface". In addition, some Hewlett–Packard Graphics Language (HP–GL) commands may be passed through to the CRT.

Programming data consists of a string of ASCII coded characters composed of one or more of the following control fields:

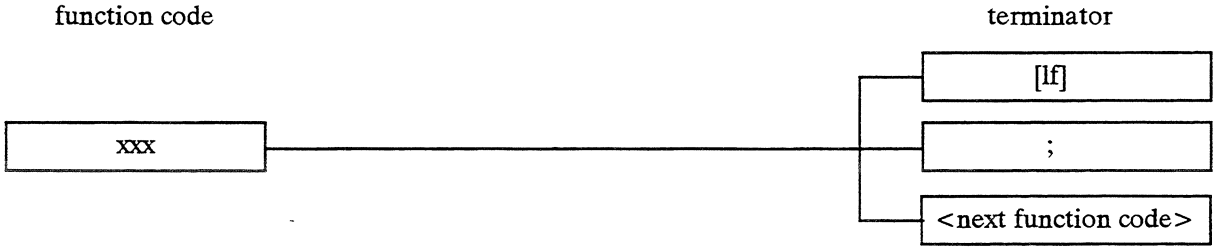
- Select channel
- Measure power/ratio
- Display measured data/memory
- Select scale
- Select reference value/position
- Select averaging
- Cursor functions
- Plot functions
- HP–GL graphics commands
- Instrument state/registers
- Special HP–IB only functions

Input syntax

The analyzer responds to program commands in the order in which they are received. The commands can be upper or lower case ASCII characters, and must be sent without any intervening alphanumeric characters or digits (spaces are ignored).

There are two input command terminators which can be universally applied to all analyzer input commands: a line feed ([lf]) or a semicolon (;). It is best to terminate all input programming commands with either a line feed or a semicolon. However, there are alternate choices in the use of terminators. Listed below in the syntax diagrams are all of the possible terminators that can be used with the various input commands.

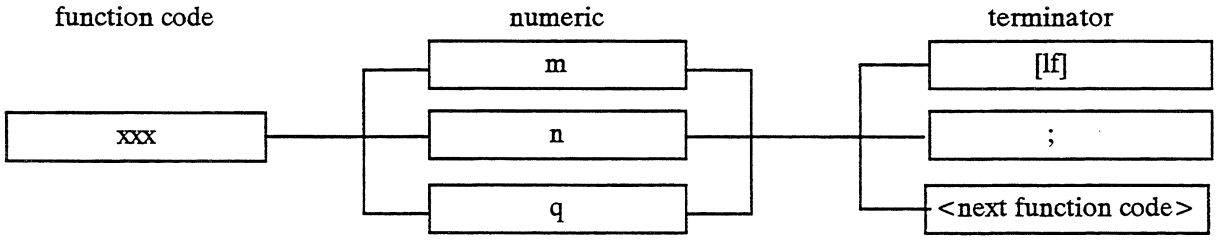
Input syntax #1: function code



Example: "C1 IA;ME[lf]"

Select channel 1 (C1), measure the power at the A detector (IA), display measured data (ME) on the CRT.

Input syntax #2: function code followed by a single digit numeric

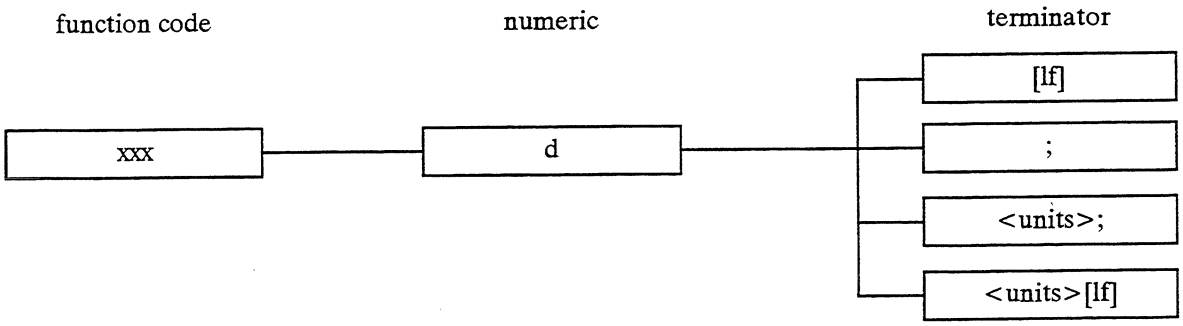


where: m = 0 function off
m = 1 function on
n = decimal integer 1 through 9
q = value unique to the particular function and explained under command description

Example: "MD1;RP4SV9[lf]"

Turn the square wave modulation on (MD1), set the reference position to the 4th graticule (RP4), and then save the front panel setting into register 9 (SV9).

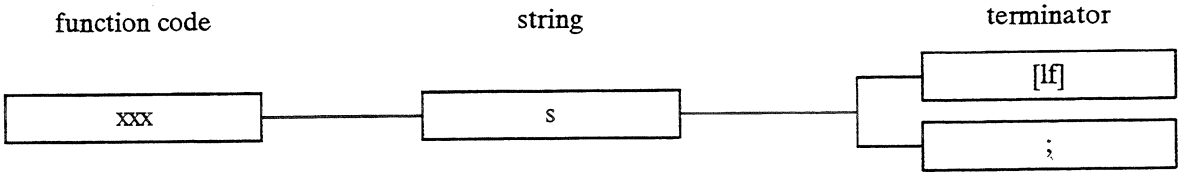
Input syntax #3: function code followed by a variable length numeric



where: d = Variable length parameter, including sign, decimal point, and exponent, if desired. The general format is ±D.DDDDDE±DD. Resolution or range of d is explained under the particular command description. When the value of d does not correspond to the function's resolution or range, d will be rounded and assigned the closest allowable value.

Example: "AF64;RL−10DB;SD0.5DB[lf]"
Set the averaging factor to 64 (AF64), set the reference level to −10 dB (RL−10 dB), and set the scale per division to 0.5 dB (SD0.5 dB).

Input syntax #4: function code followed by a string of bytes or characters



where: s = An ASCII string of characters or a sequence of 8−bit binary bytes, the length of which is unique to the particular function and is explained under the command description.

Example: WK1 TEST1;WT PASSBAND INSERTION LOSS[lf]"
Write softkey 1 with the label "TEST1" (WK1 TEST1), and write a title onto the CRT which says "PASSBAND INSERTION LOSS" (WT PASSBAND INSERTION LOSS).

Valid characters

Programming commands may be sent as upper or lower case ASCII characters. Spaces, unnecessary signs (+,−), leading zeros, carriage returns ([cr]) and unnecessary terminators are ignored by the analyzer. The parity bit (the eighth bit, MSB) of all ASCII coded characters will be ignored.

Any alphanumeric sequence which is not a recognized HP 8757D/E command will be noted on the CRT in the active entry area as "UNKNOWN CMD−" followed by the last one or two characters received by the analyzer over HP−IB. The analyzer will not lock out further HP−IB traffic, and will execute any subsequent valid command. Further, a syntax error service request (SRQ) will be output if that SRQ bit has been enabled in the request mask (see "Service Request" and "Status Byte"). If there are many errors in the alphanumeric sequence, only the last error is displayed in the active function area.

Programming data

See table 1 for HP−IB programming commands which control the analyzer.

Commands associated with the C detector are valid only for the HP 8757D Option 001. If a command associated with the C detector is sent to a standard HP 8757D (not Option 001) or an HP 8757E, it will be treated as an unknown command.

Commands associated with the internal power calibrator are valid only for the HP 8757D Option 002. If a command associated with the internal power calibrator is sent to an HP 8757D without option 002 or an HP 8757E, it will be treated as an unknown command.

Instrument preset

A self–test is first performed when the **[PRESET]** key is pressed or when the IP command is received by the analyzer. This is followed by presetting the analyzer and the instruments connected to the 8757 SYSTEM INTERFACE. All functions are turned off, then the following is set:

HP 8757D/E:

Channels 1 and 2 on.

- Measure power A on channel 1.
- Measure power B on channel 2.
- Measure power C[2] (or B) on channel 3[1].
- Measure power R on channel 4[1].
- Display measurement data in log magnitude format.
- Scale = 20 dB/division.
- Reference level 0 dB for all channels.
- Reference level step size = 20 dB.
- Averaging off.
- Averaging factor = 8.
- Cursor off.
- All labels on.
- Channel 1 as the active channel.
- Modulation drive on.
- Number of points = 401.
- Detector mode set for AC detection.
- Smoothing set for 5.0% of span (off).
- Cursor format = log magnitude.
- Search value = −3 dB[1].
- Adaptive normalization[1] off.
- Temperature compensation on.
- Repeat autozero off.
- Detector frequency offset[3] off, start and stop = 50 MHz.
- Detector amplitude offset set to 0[4].

SOURCE:
(connected to the 8757 SYSTEM INTERFACE)

- Instrument preset.
- Sweep time set to 200 ms.
- HP 8350B square wave modulation on.
- HP 8340/41 SHIFT PULSE on; RF Output on.
- HP 8360 scalar modulation on; RF Output on; analyzer mode.

PLOTTER:
(connected to the 8757 SYSTEM INTERFACE)

- Abort plot if in progress.
- P1 and P2 scaling points unchanged.
- Selection of plotter pens unchanged.

PRINTER:
(connected to the 8757 SYSTEM INTERFACE)

- Abort plot if in progress.

DISK DRIVE:[1] (No Longer Available from Agilent)
(connected to the 8757 SYSTEM INTERFACE)

- Aborts any data transfers in progress.
- Unit number unchanged.
- Volume number unchanged.
- ASCII or binary mode unchanged.

The following analyzer conditions are not changed during a PRESET (IP) command execution:

- Reference position.
- Trace memory.
- Save/Recall registers.
- HP–IB addresses.
- Request mask.
- Limit lines[1].
- Title.
- User–defined plot.
- 8757 SYSTEM INTERFACE bus control on/off.
- Repeat autozero timer.
- Display intensity[1].
- Display colors[1].
- Plot buffer.

Passthrough

Programming commands and data may be sent to Hewlett–Packard instruments connected to the 8757 SYSTEM INTERFACE and the analyzer CRT. This is accomplished by first sending the PASSTHROUGH command (PTd), where d is the decimal address of the device being addressed. Subsequent addressing of the 8757 SYSTEM INTERFACE address will pass through commands to the selected device. The PTd command may be sent at any time. The default addresses for PASSTHROUGH commands are as follows:

HP 8757D/E Analyzer	16 decimal
8757 SYSTEM INTERFACE	17 decimal
HP 8757D/E CRT	15 decimal
Hewlett–Packard Source	19 decimal
Hewlett–Packard Plotter	05 decimal
Hewlett–Packard Printer	01 decimal
Hewlett–Packard Disk Drive	00 decimal

The following section explains how to pass through commands to instruments connected to the 8757 SYSTEM INTERFACE and the analyzer CRT.

8757 SYSTEM INTERFACE

This rear panel connector is physically similar to the HP–IB port, but is specifically used to control the following instruments:

Sources
HP 8350B Sweeper
HP 8340B Synthesized Sweeper
HP 8341B Synthesized Sweeper
HP 8360 Series Synthesized Sweeper

1. HP 8757D only.
2. HP 8757D Option 001 only.
3. HP 8757D with HP 85037 series precision detector only.
4. For the HP 8757E, the detector amplitude offset is not changed at PRESET.

Plotters
HP 7470A Two–pen Plotter
HP 7475A Six–pen Plotter
HP 7550A/B Eight–pen Plotter

Printers
HP 2225A ThinkJet Printer
HP 3630A PaintJet Printer
HP 2227B QuietJet Plus Printer

Disk Drives
HP 9122 Dual 3.5 in. Disk Drive

The transfer of commands and data is performed by first sending a PASSTHROUGH command (PTd) to the analyzer, where d is the decimal address of the desired device. Subsequent addressing of the 8757 SYSTEM INTERFACE will pass through commands to the instrument selected.

The address of the 8757 SYSTEM INTERFACE is determined by complementing the least significant bit of the current analyzer address. For example, since the analyzer default address is 16 decimal (10000 binary), the default 8757 SYSTEM INTERFACE address is 17 decimal (10001 binary). As another example, if the analyzer address is set to 7 decimal (111 binary), then the 8757 SYSTEM INTERFACE address becomes 6 decimal (110 binary).

This example shows how to pass through commands to the source, with address 19 decimal, using the analyzer default address (16 decimal):

1. Address device 16 (the HP–IB port on the analyzer) and send the command "PT19;".
2. Address device 17 (the 8757 SYSTEM INTERFACE) and send commands to the source.
3. Address device 16. This returns the analyzer to its normal HP–IB operation.

This example shows how to pass through commands to the plotter, with address 05 decimal, using the analyzer default address (16 decimal):

1. Address device 16 (the HP–IB port on the analyzer) and send the command "PT05;".
2. Address device 17 (the 8757 SYSTEM INTERFACE) and send commands to the plotter.
3. Address device 16. This returns the analyzer to its normal HP–IB operation.

CRT graphics

The CRT screen of the analyzer may be used as if it were an external HP–IB graphics plotter. By defining the analyzer CRT as the plot device used by the computer, the operator may pass through graphics commands which will plot graphics on the CRT.

The graphics commands are mostly a subset of the Hewlett–Packard Graphics Language (HP–GL), shown in table 4. The analyzer graphics characters used for labeling are shown in table 5, "HP 8757D/E Modified ASCII Code Conversion Table". These modified ASCII characters are available only when explicitly using the (LB) command; many desktop computer plotter commands use different character sets.

The address of the CRT is the analyzer address minus 1. The default address of the analyzer is 16 decimal, therefore the default address of the CRT is 15 decimal.

This example shows how to pass through commands to the CRT, with address 15 decimal, using the analyzer default address (16 decimal):

1. Address device 16 (the HP–IB port of the analyzer) and send the command "PT15;".
2. Address device 17 (the 8757 SYSTEM INTERFACE) and send graphics commands to the CRT.
3. Address device 16. This returns the analyzer to its normal HP–IB operation.

Output data

The analyzer has several output modes that allow you to learn or interrogate the instrument state and to output data. The following output modes are available:

- Learn String
- Interrogate Function
- Status
- Error
- Data
- Identity

The program codes and syntax to enable each function are shown in table 3.

Learn string

Selected with the OL program code, the analyzer outputs a learn string of 300 bytes in length (150 bytes for the HP 8757E) . This binary data string completely describes the present instrument state (excluding the storage registers, trace memory, title, limit line data, and source settings) of the analyzer. This information is packed and encoded for minimal storage requirements, thereby making data analysis difficult. When stored in an ASCII character data string, the learn string can later be input to the analyzer to restore that instrument state by using the INPUT LEARN STRING command.

Interrogate function

The interrogate function is selected with the OP program code and followed immediately by the program code for the function to be interrogated. The analyzer will output the present value for the function that was selected to be interrogated. The units of the output value will be the same as the units available for setting the value, if it can be set. The functions valid for interrogation are: AF, BW, DA, DB, DC, DR, DTSTR, DTSTPx, DS, FD, NS, OD, ON, RL, RP, SD, SL, SO, SP, SR, SS, and ST.

Status

Selected with the OS program code, the analyzer will output 2 sequential 8–bit bytes giving the present instrument status. The first status byte is equivalent to the status byte of the serial poll; the second status byte is an extended status byte which provides additional information. See table 6 for a description of each status byte. The status bytes are cleared upon execution of either a serial poll, device clear (DCL), selective device clear (SDC), PRESET, or sending the CS or OS commands.

Error

Selected with the OE1 or OE2 program codes, the analyzer will output one 8–bit byte giving the present status of display channels 1 or 2, respectively. This can be used with the HP 8757D to determine which channel has failed the specified limit test, if limit lines were enabled.

Data

The analyzer outputs data from the designated display channel in one of four formats: ASCII formatted data, Extended ASCII formatted data, binary formatted data, and extended binary formatted data.[1] The two ASCII formats are the more general purpose formats and are the easiest to interpret the output values. Binary or extended binary formatted data provides the fastest data transfer rates and is usually the choice when transfer speed is a major concern. The data format is selected by using the FDx commands. The data format must be selected before a data transfer is attempted.

Identity

Selected with the OI program code, the analyzer will output a message which identifies it from other scalar network analyzers. Both the model number and the software revision are provided. This is helpful in system applications where software is written to run on more than one scalar network analyzer.

Trigger

The HP 8757D/E does not respond to the group execute trigger (GET) message.

Clear

The device clear (DCL) and selective device clear (SDC) messages clear all status bytes, the request mask, the HP–IB of the analyzer, and the 8757 SYSTEM INTERFACE.

Remote/Local

The analyzer goes to remote when the remote enable (REN) line on the interface is low (true) and it receives its listen address. In remote, all front panel functions are disabled except the LINE switch and the **[LOCAL]** key. The **[LOCAL]** key can be disabled via the LOCAL LOCKOUT (LLO) command. The state of the REN line is also sensed by the 8757 SYSTEM INTERFACE. An instrument on the 8757 SYSTEM INTERFACE designated as the pass through instrument (with the PTd command) is placed in remote or local depending on the state of the REN line. When the analyzer is placed in local lockout, the HP–IB source is also placed in local lockout.

The analyzer goes to local when it receives the GO TO LOCAL (GTL) command or when the REN line goes high (false). It will also return to local when the **[LOCAL]** key is pressed unless the LOCAL LOCKOUT (LLO) command has been executed.

Service request

The analyzer can initiate a service request (SRQ) whenever one of the following conditions exist:

- HP–IB command syntax error.
- End of operation (sweep or plot completed).
- Self–test failed.
- Any front panel key pressed.
- Numeric entry completed (HP–IB or front panel).
- Softkey only pressed.
- Battery voltage low.
- Rotary knob activity.
- Requested action not possible.
- Limit test failed.[1]
- Operation failure[1] (power calibration failed).

For further information, execute a serial poll or the OUTPUT STATUS (OS) command. A serial poll operation consists of sending the analyzer its talk address, sending the SERIAL POLL ENABLE (SPE) command, reading the status byte on the bus, and sending the SERIAL POLL DISABLE (SPD) command. The SRQ is cleared only by executing either a serial poll, device clear (DCL), selective device clear (SDC), PRESET, or sending the CS or OS commands.

The request mask function (RMd) is used to specify a particular set of conditions for initiating a service request (SRQ). The mask value is determined by summing the decimal values of each selected function or condition that is desired. If a bit in the request mask is set to zero, that bit in the status byte will be masked and an SRQ cannot be initiated. For example, the command (RM41) indicates an SRQ can be initiated by the functions of bits 0, 3, and 5. The default value of the request mask at power–on is 00000000 or 0 decimal (no SRQ's are initiated).

1. HP 8757D only

Status byte

The HP 8757D/E responds to a serial poll by sending the status byte (#1). Both the status byte (#1) and the extended status byte (#2) are obtained by sending the OUTPUT STATUS (OS) command and by immediately reading both byte values, respectively. The status bytes of the analyzer are described in table 7.

When bit 6 (request service) of the status byte (#1) is true (one), an SRQ has occurred. See "Service Request" for the conditions causing a service request. Bit number 2 of the status byte (#1) indicates whether a change has occurred in the extended status byte (#2). If bit number 2 is true, then the extended status byte (#2) should be accessed via the OUTPUT STATUS (OS) command to determine the cause of the status change. All other bits (7, 5, 4, 3, 1, 0) of the status byte (#1) indicate the present status of the noted function. The bits are true (one) only if the associated function or condition is true.

Parallel poll

The HP 8757D/E does not respond to a parallel poll.

Controller capabilities

The HP 8757D/E does not have the ability to take or pass control.

Abort

The HP 8757D/E responds to the ABORT message (interface clear line, IFC true) by stopping all listener or talker functions.

Self–test

A self–test is performed at power–up and whenever the instrument PRESET (IP) command is received by the analyzer. This self–test routine includes a brief but thorough check that key parts of the instrument are functioning. At the conclusion of the self–test, the analyzer will be placed in its PRESET condition. The operator can check the outcome of the self–test by reading bit 0 of the extended status byte (#2) or by checking the front panel of the analyzer. For details on checking the front panel after the self–test, refer to the *Operating Reference*.

Address assignment information

The HP–IB address for the analyzer is set at the factory to decimal 16. The current address may be determined by pressing the **[LOCAL]** key on the front panel, then selecting the *[8757]* softkey, and observing the active entry area of the CRT. It may be changed, if desired, by entering the digits, range 00 to 29 decimal, followed by **[ENT]**, using the keypad. Avoid the use of address 21 (most HP–IB controllers use this address) and any address used on the 8757 SYSTEM INTERFACE (analyzer CRT, source, plotter, printer, disk drive).

The new address is retained in non–volatile memory until changed by the operator. However, should battery power to the non–volatile memory be interrupted, the HP–IB address will default to 16 decimal.

The default addresses associated with the analyzer are listed in "Passthrough".

Secure frequency mode

The BL1 programming code blanks the frequency labels of the analyzer and source, and places the HP 8757D/E in secure frequency mode. Once in secure frequency mode, you cannot restore frequency labels for the existing configuration. Frequency labels can be restored with a PRESET (IP) command, however your frequency settings will be reset. Do not confuse this programming code with the BL5 programming code which blanks the entire screen and may be restored.

Table 1. Function Select Commands (1 of 7)

Action	HP-IB Command	Syntax	Description
Channel Selection	C1	1	Channel 1 on and the active channel.
	C2	1	Channel 2 on and the active channel.
	C3	1	Channel 3 on and the active channel.[1]
	C4	1	Channel 4 on and the active channel.[1]
	C0	1	Turns the currently active channel off.
Measure Power/ Voltage	IA	1	Input A absolute power measurement.
	IB	1	Input B absolute power measurement.
	IC	1	Input C absolute power measurement.[2]
	IR	1	Input R absolute power measurement.
	IX	1	External ADC Input ("AUX") voltage measurement.
Measure Ratio	AB	1	A/B ratio measurement.
	AC	1	A/C ratio measurement.[2]
	AR	1	A/R ratio measurement.
	BA	1	B/A ratio measurement.
	BC	1	B/C ratio measurement.[2]
	BR	1	B/R ratio measurement.
	CA	1	C/A ratio measurement.[2]
	CB	1	C/B ratio measurement.[2]
	CR	1	C/R ratio measurement.[2]
	R1	1	R/A ratio measurement.
	R2	1	R/B ratio measurement.
	R3	1	R/C ratio measurement.[2]
Display Trace Data	ME	1	Display measurement data.
	MY	1	Display memory data.
	M− or MN	1	Display normalized data (measurement − memory).
	DHm	2	Display hold on/off of the active trace.
	SM	1	Store measurement data into memory.
	SN	1	Store normalized data (measurement − memory) into memory.
	DS0	1	Display trace data in a log magnitude format.
	DS1	1	Display trace data in a Standing Wave Ratio (SWR) format.
Scale	AS	1	Autoscale the trace on the CRT.
	SDd	3	Set scale per division to d; where d is[4] for dB, dBm: 20, 10, 5, 2, 1, 0.5, 0.2, or 0.1 for SWR: 10, 4, 2, 1, 0.4, 0.2, 0.1, 0.04, or 0.02 for Volts: 5, 2.5, 1, 0.5, 0.25, 0.1, 0.05, or 0.025
Reference Level	MR	1	Marker = Reference Level. Moves the cursor (or active marker if no cursor) and trace to the reference line.
	RLd	3	Set Reference Level to d; d must be in the range of: ratio measurement[3]: +90 to −90 dB normalized measurement[3]: +90 to −90 dB power measurement[3]: +20 to −70 dBm SWR measurement: 1.0 to 37.0 SWR voltage measurement: +10 to −10V normalized voltage measurement: +20 to −20V
	STd	3	Set Reference Level Step size to d; where d is for dB, dBm: 0 to 60 dB for SWR: 1 to 37 SWR for Volts: 0 to 10V
Reference Position	RPq	2	Set Reference Position; q has a value from 0 to 8 corresponding to the major horizontal graticule lines: 8 = top graticule line 4 = center graticule line 0 = bottom graticule line

1. HP 8757D only.
2. HP 8757D Option 001 only (C detector).
3. When utilizing a detector offset, the reference level range is offset by the offset amount. HP 8757D only.
4. For HP 8757D, scale per division is variable.

Table 1. Function Select Commands (2 of 7)

Action	HP–IB Command	Syntax	Description
Cursor	CUm	2	Cursor on/off.
	CDm	2	Cursor Delta on/off.
	CX	1	Cursor to maximum for the active channel.
	CN	1	Cursor to minimum for the active channel.
	SSd[1]	3	Set cursor search value to amplitude value of d; d must be in the range of: ratio measurement: +60 to −60 dB normalized measurement: +60 to −60 dB power measurement: +60 to −60 dBm[4] Maximum resolution of d is 0.01 dB(m). Cursor search functions are not allowed in SWR or Voltage display modes.
	SL[1]	1	Cursor Search Left for the search value. Cursor will search left to the first frequency point (or interpolated point which equals the search value). If the value cannot be found, the message "SEARCH VALUE NOT FOUND" will appear in the ACTIVE ENTRY AREA.
	SR[1]	1	Cursor Search Right for the search value. Cursor will search right to the first frequency point (or interpolated point which equals the search value). If the value cannot be found, the message "SEARCH VALUE NOT FOUND" will appear in the ACTIVE ENTRY AREA.
	BW[1]	1	Cursor search for bandwidth representing the search value. If the value cannot be found, the message "BANDWIDTH VALUE NOT FOUND" will appear in the ACTIVE ENTRY AREA.
Cursor Format	FR0	1	Cursor format logarithmic (dB or dBm).[2]
	FR1	1	Cursor format SWR.
Averaging	A0	1	Averaging off.
	AFd	3	Averaging on and factor set to d; d is 0 (enables previous factor), 1, 2, 4, 8, 16, 32, 64, 128, or 256.
	RS	1	Restart averaging process on the next sweep.
DC Detector Zero	MZ	1	Manual zero of the DC detectors. The operator must turn the source RF power off before sending this command.
	AZm	2	Auto Zero Repeat on/off of the DC detectors. The source RF power is automatically turned off at an interval determined by the Repeat Auto Zero Timer and the DC zero is performed each time.[3]
	AZ2	1	Auto Zero of the DC detectors. The source RF power is automaticaly turned off and the DC zero is performed once.[3]
	ZTd	3	Repeat Auto Zero Timer interval set to d; d is a decimal integer from 1 to 60 minutes.
Smoothing	SOd	3	Set Smoothing to d % of span; d must be in the range of 0.0 to 20.0%, with a maximum resolution of 0.1%. When d is set to 0, smoothing is off.
Step	UP	1	Step up; increment the active parameter.
	DN	1	Step down; decrement the active parameter.

1. HP 8757D only.
2. Available only if display trace data is in log magnitude format (see DS0).
3. This command is valid only when the operator is using a source which is connected to the 8757 SYSTEM INTERFACE.
4. When utilizing a detector offset, the search range is offset by the offset amount. HP 8757D only.

Table 1. Function Select Commands (3 of 7)

Action	HP-IB Command	Syntax	Description
Plot	BFm	2	Plotter buffer on/off.
	PA	1	Plot All; plots entire display (except user graphics) on an external plotter.
	P1	1	Plot channel 1 trace.
	P2	1	Plot channel 2 trace.
	P3	1	Plot channel 3 trace.[1]
	P4	1	Plot channel 4 trace.[1]
	PC	1	Plot only labels on a external plotter.
	PG	1	Plot only the grid on an external plotter.
	SUd	3	Specify custom plot; d is a decimal integer from 0 to 255 representing one byte. Each bit of this byte specifies what is to be plotted. If a bit is set to 1, that item will be plotted, else it will not be plotted.
	PD	1	Plot custom plot on an external plotter
Print	PR1	1	Print entire graphics display (except user graphics) on external graphics printer.
	PR2	1	Print tabular display data in monochrome.
	PR3	1	Print tabular marker/cursor data on external printer.
	PR4	1	Print all to color printer, except softkeys and CRT graphics.
Limit Lines[2]	LE	1	Erase limit lines for active channel.
	LPs	4	Limit is single point specified by s. The string s includes the segment number (1 to 12), the x-axis value, the upper limit value, and the lower limit value in the following format: "LP [seg. no.], [x-value] [x-units], [upper limit] [y-units], [lower limit] [y-units];" where [x-value] is a frequency or value determined by the start/stop labels. [x-units] is "GZ" for GHz, "MZ" for MHz, "KZ" for kHz, "HZ" for Hz, or blank for no units. [y-units] is "DB" for dB/dbm, "SWR" for SWR, or "V" for volts. Entering no value for an upper or lower limit value means do not test this limit. An example: "LP 1, 2.5 GZ, 1.5 DB, -1 DB;"
	LFs	4	Limit is a flat line specified by s. The string s includes the segment number (1 to 12), the start x-axis value, upper limit value, lower limit value, and stop x-axis value in the following format: "LF [seg. no.], [x-start] [x-units], [upper limit] [y-units], [lower limit] [y-units], [x-stop] [x-units];" where [x-value], [x-units], and [y-units], are described above. An example: "LF 2, 750 MZ, -30 DB, -32 DB, 850 MZ;"
	LSs	4	Limit is sloped line specified by s. The string s includes the segment number (1 to 12), the start x-axis value, start upper limit value, start lower limit value, the stop x-axis value, the stop upper limit value and the stop lower limit value in the following format: "LS [seg. no.], [x-start] [x-units], [upper limit] [y-units], [lower limit] [y-units], [x-stop] [x-units], [upper limit] [y-units], [lower limit] [y-units];" where [x-value], [x-units], and [y-units] are described above. An example: "LS 4, 2 GZ, -3 DB, -4 DB, 3 GZ, 0 DB, -1 DB;"
	LTm	2	Limit line test on/off. If on, limit test status is designated by the CRT PASS/FAIL message and status bytes.
	LL	1	Store lower limit line into memory.
	LU	1	Store upper limit line into memory.

SUd bit / decimal value / action:

bit	decimal value	action
0 (LSB)	1	Scale Trace (P1 and P2 define grid size)
1	2	Trace 1
2	4	Trace 2
3	8	Trace 3[1]
4	16	Trace 4[1]
5	32	Grid
6	64	Mode Labels
7 (MSB)	128	Frequency Labels

1. HP 8757D only.
2. Limit line functions valid only for channels 1 or 2. 8757D only.

Table 1. Function Select Commands (4 of 7)

Action	HP–IB Command	Syntax	Description
Graticule Start/Stop Labels	FAs	4	Start value for labeling x–axis graticule and entry of limit lines when System Interface control is off or no source is connected to the 8757 SYSTEM INTERFACE. s is a string in the following format: "FA [value] [x–units];" where [x–units] is "GZ" for GHz, "MZ" for MHz, "KZ" for kHz, "HZ" for Hz, or blank for no units. An example: "FA 6.55 GZ;"
	FBs	4	Stop value for labeling x–axis graticule and entry of limit lines when System Interface control is off or no source is connected to the 8757 SYSTEM INTERFACE. s is a string in the following format: "FB [value] [x–units];" where [x–units] is described above.
Number of Trace Points	SPd	3	Set the Number of Points displayed on the horizontal axis to d; d is 101, 201, 401, 801[1], or 1601[1]. If source is connected to the 8757 SYSTEM INTERFACE, the sweep time may change.
Power Calibration[3,4]	PWRA	1	Execute a detector A power calibration.
	PWRB	1	Execute a detector B power calibration.
	PWRC[2]	1	Execute a detector C power calibration.
	PWRR	1	Execute a detector R power calibration.
Measure Detector Offset[3,4]	DOAd	3	Measure detector A amplitude offset. Power calibrator output power set to d. d must be in the range of +20 to −50 dBm (1 dB resolution). For example: "DOA −10 DB;"
	DOBd	3	Measure detector B amplitude offset. Power calibrator output power set to d. d must be in the range of +20 to −50 dBm (1 dB resolution).
	DOCd[2]	3	Measure detector C amplitude offset. Power calibrator output power set to d. d must be in the range of +20 to −50 dBm (1 dB resolution).
	DORd	3	Measure detector R amplitude offset. Power calibrator output power set to d. d must be in the range of +20 to −50 dBm (1 dB resolution).
	EO	1	Enter the measured detector offset into the analyzer's detector offset memory. This command must immediately follow the DOxd or OPDO command.
	OPDO	1	Output the measured detector offset. Output data format: [±D.DDDDDE±DD][lf]. This command must immediately follow the DOxd or EO command.
Detector Amplitude Offsets	DAd	3	Set Detector A offset to d; d must be in the range of +60 to −60 dB with a maximum resolution of 0.001 dB.[5]
	DBd	3	Set Detector B offset to d; d must be in the range of +60 to −60 dB with a maximum resolution of 0.001 dB.[5]
	DCd	3	Set Detector C offset to d; d must be in the range of +60 to −60 dB with a maximum resolution of 0.001 dB.[2,5]
	DRd	3	Set Detector R offset to d; d must be in the range of +60 to −60 dB with a maximum resolution of 0.001 dB.[5]
External Detector Calibration	XAd	3	Enter external cal value for the specific detector input. d is the code number in the format of [DDDDDD;], read from the front panel after performing a calibration.
	XBd	3	
	XCd[2]	3	
	XRd	3	
Detector Mode	DM0	1	Set Detector mode of all inputs for DC detection.
	DM1	1	Set Detector mode for all inputs for AC detection.

1. HP 8757D only.
2. HP 8757D Option 001 only (C detector).
3. HP 8757D Option 002 only.
4. The appropriate detector must be connected to the HP 8757D Option 002 power calibrator before executing this command.
5. Resolution for HP 8757E is 0.01 dB.

Table 1. Function Select Commands (5 of 7)

Action	HP–IB Command	Syntax	Description
Detector Frequency[5]	DTSTRAs	4	Enters start frequency for detector A. s is a string in the following format: "DTSTRA [value] [x–units];" where [x–units] is "GZ" for GHz, "MZ" for MHz, "KZ" for kHz, or "HZ" for Hz. An example: "DTSTRA 19.65 GZ;".
	DTSTRBs	4	Enters start frequency for detector B. See definition for s above.
	DTSTRCs[2]	4	Enters start frequency for detector C. See definition for s above.
	DTSTRRs	4	Enters start frequency for detector R. See definition for s above.
	DTSTPAs	4	Enters stop frequency for detector A. s is a string in the following format: "DTSTRA [value] [x–units];" where [x–units] is "GZ" for GHz, "MZ" for MHz, "KZ" for kHz, or "HZ" for Hz. An example: "DTSTRA 10.25 GZ;".
	DTSTPBs	4	Enters stop frequency for detector B. See definition for s above.
	DTSTPCs[2]	4	Enters stop frequency for detector C. See definition for s above.
	DTSTPRs	4	Enters stop frequency for detector R. See definition for s above.
	FTAm	2	Detector A frequency on/off.
	FTBm	2	Detector B frequency on/off.
	FTCm[2]	2	Detector C frequency on/off.
	FTRm	2	Detector R frequency on/off.
	OPDTSTRA	1	Outputs detector A start frequency.
	OPDTSTRB	1	Outputs detector B start frequency.
	OPDTSTRC[2]	1	Outputs detector C start frequency.
	OPDTSTRR	1	Outputs detector R start frequency.
	OPDTSTPA	1	Outputs detector A stop frequency.
	OPDTSTPB	1	Outputs detector B stop frequency.
	OPDTSTPC[2]	1	Outputs detector C stop frequency.
	OPDTSTPR	1	Outputs detector R stop frequency.
Adaptive Normalization	ANm	2	Adaptive Normalization on/off[1].
System Calibration	CL	1	Perform system configuration calibration of the detectors and channels.
	TCm	2	Continuous temperature compensation on/off.
	CTm	2	Auto System Calibration on/off. Performs a system calibration at an interval of every five minutes.
Sweep Mode	NSm	2	Non–standard sweep on/off. Allows the HP 8757D/E to track any sweep ramp in the range of 0 to 10 V, increasing in sweep voltage.
	CWm	2	CW mode (single point) on/off.[3]
	MSm	2	Manual sweep mode on/off.[3]
	PBm	2	System Interface control on/off.
	FSm	2	Step sweep mode on/off.[3,4]
Modulation	MDm	2	Rear panel square–wave modulation output on/off.

1. HP 8757D only.
2. HP 8757D Option 001 only (C detector).
3. If source is connected to the 8757 SYSTEM INTERFACE and the interface control is on, the source is also set to this mode.
4. HP 8340, HP 8341, and HP 8360 only with 8757 SYSTEM INTERFACE connected and active.
5. HP 8757D with HP 85037 series precision detector only.

Table 1. Function Select Commands (6 of 7)

Action	HP-IB Command	Syntax	Description
Save/Recall Registers	SVn	2	Save front panel settings in register n; n from 1 to 9. Note that registers 1 to 4 also retain title, channels 1 and 2 limit line information, and channels 1 and 2 trace memories.
	RCn	2	Recall front panel settings from register n; n from 1 to 9.
	ER0	1	Erase all save/recall registers.
Instrument Preset	IP	1	Presets the HP 8757D/E and the instruments connected to the 8757 SYSTEM INTERFACE.
Front Panel Menus/ Softkeys	MU0	1	Display the Measurement Menu.
	MU1	1	Display the Display Menu.
	MU2	1	Display the Scale Menu.
	MU3	1	Display the Reference Menu.
	MU4	1	Display the Cursor Menu.
	MU5	1	Display the Average Menu.
	MU6	1	Display the Calibration Menu.
	MU7	1	Display the Special Menu.
	MU8	1	Display the System Menu.
	SKq	1 2	Select Softkey q; q is from 1 to 8. Equivalent to manually pressing the softkey.
Display/ Color Control[1]	BTNd	3	Adjust the overall display brightness. Values for d can be defined by the user. See the Operating Reference for more information.
	DEC	1	Set default colors.
	MOC	1	Set monochrome mode.
	CCq	2	Selects channel q as the feature affected by color selection commands found under CLx. Valid values for q are 1 to 4.
	CGL	1	Set labels color.
	CGN	1	Selects background as the feature affected by color selections. For example: "CGN; CLB;" sets the background to black. Note: Select the feature to be changed before selecting the color. Define custom colors with COT, COB, and COC. These commands are used like the color list commands. For example: "CGN; COB100;COC75;COT100" defines all three parameters of a feature's color.
	CGR	1	Set grid color.
	CGW	1	Set warning label color.
	CLx	1	Selects a color from the color list for the feature previously selected. x represents colors from the color list. Valid values for x are: W – White Y – Yellow S – Salmon B – Black L – Blue R – Red G – Green
	COBd	3	Custom color brightness, affects the feature last selected. d ranges from 0 to 100.
	COCd	3	Custom color adjust, affects the feature last selected. d ranges from 0 to 100.
	COTd	3	Custom tint adjust, affects the feature last selected. d ranges from 0 to 100.

1. HP 8757D only.

Table 1. Function Select Commands (7 of 7)

Action	HP–IB Command	Syntax	Description
Disk Save/Recall[1]	DFA	1	The data sent after this command is stored in ASCII format. This is important for retrieving the data for use in another program.
	DFB	1	The data sent after this command is stored in fast binary format allowing quicker file access times.
	DFE	1	The data sent after this command is stored in extended binary format. This format provides a wider display range than the binary format. Refer to Format Data on page 15.
	DIAd	3	Sets the HP–IB address for the disk drive on the bus. The valid range for d is 0 to 29.
	DIUd	3	Selects active disk unit. For example: With an HP 9122, select unit 0 or unit 1. The valid range for d is 0 to 15.
	DIVd	3	For hard drives with multiple partitions. The valid range for d is 0 to 15.
	DLF	1	Deletes the last file selected from the disk or, if no filename was selected, the default file, FILE1, is deleted (if FILE1 existed on the disk).
	IND	1	Formats the disk in the disk unit last selected.
	LFx	1	Loads from disk the items selected by x. All information is recalled from the last file specified by the "TIFs" command. If no filename was selected, then the default file, FILE1, is recalled from disk (if FILE1 exists). Valid selections for x are: A – Load all information files from disk C – CRT graphics only I – Instrument state only H – Load all information files from disk, hold display F – Measurement trace only M – Memory trace only D – Data trace only N – Display trace only
	SFx	1	Stores to disk the items selected by x. All information is stored into the last file selected by the "TIFs" command. If no filename was selected, then the default file, FILE1, is overwritten. Valid selections for x are: A – Store all information files to disk C – CRT graphics only I – Instrument state only F – Measurement trace only M – Memory trace only D – Data trace only N – Display trace only
	TIFs	4	Defines the current active title for an existing or a new file. The string s can be up to eight characters in length and include only letters or numbers. For example: Select a file named SAMPLE with "TIFSAMPLE". Before storing to, loading from, or deleting files from disk, select a title.

1. HP 8757D only.

Table 2. HP–IB Only Functions (1 of 2)

Action	HP–IB Command	Syntax	Description
Display Blanking	BL0	1	No blanking; restore CRT to normal mode.
	BL1	1	Blank only the frequency labels (see *Secure frequency mode,* page 7).
	BL2	1	Blank all labels on the CRT.
	BL3	1	Blank only the active channel trace.
	BL4	1	Blank only the softkey labels.
	BL5	1	Blank all of the CRT except user graphics.
	BL6	1	Blank only the user title.
	BL7	1	Blank only the mode labels.
	BL8	1	Blank only the active entry area.
	BL9	1	Blank only the limit lines.[1]
	BLA	1	Blank all of the CRT except user graphics and softkeys.
	BLB	1	Blank only the user CRT, graphics.
Status Bytes	CS	1	Clear Status bytes #1 and #2.
	RMd	3	Set Request Mask of status byte #1 to d; d is decimal integer from 0 to 255.
Format Data	FD0	1	Format Data ASCII; all successive data transfers are made in ASCII format. Data is transferred in [±DD.DDD] format where D is an ASCII digit.
	FD2	1	Format Data Extended ASCII; all successive data transfers are made in an extended ASCII format. Data is transferred in [±DDD.DDD] format where D is an ASCII digit.
	FD1	1	Format Data Binary; all successive data transfers are made in a binary format. FD1 is for HP BASIC (MSB first); FD3 is for PC format files (LSB first). Two bytes are transferred, the value of which is scaled by the limits shown below in Table 2a.
	FD3	1	
	FD4[1]	1	Format Data Extended Binary; all successive data transfers are made in an extended binary format. Extended binary format extends the range limits beyond the binary format (for ratio, normalized ratio, power and normalized power measurements only). The range extension is a function of the analyzer's detector amplitude offset settings. FD4 is for HP BASIC (MSB first); FD5 is for PC format files (LSB first). Two bytes are transferred, the value of which is scaled and offset as shown below.
	FD5[1]	1	

Table 2a. Display Range Limits and Scale Factor, Binary Data Transfer

Display Range	Decimal Value of Binary Data	Ratio Meas	Normalized Ratio Meas	Power Meas	Normalized Power Meas	SWR Meas	Voltage Meas	Normalized Voltage Meas
Lower Limit (V0)	0	−90 dB	−180 dB	−70 dBm	−90 dB	1.0	−11.25 V	−22.5 V
Upper Limit (V1)	32767	+90 dB	+180 dB	+20 dBm	+90 dB	37.0	+11.25 V	+22.5 V
Scale Factor (V1−V0)/32767		5.493E−3	1.099E−2	2.747E−3	5.493E−3	1.099E−3	6.867E−4	1.373E−3

Binary Data Transfer (FD1, FD3)

Binary data can be unscaled using the following equation:

real value = (Decimal Value of Binary Data X Scale Factor) + V0

Binary data transfer example: Absolute power measurement, decimal value transferred for one data point = 21842. dBm value is calculated as follows:

dBm = [21842 X 2.747E−3] + (−70) = −10.00 dBm

Extended Binary Data Transfer (FD4, FD5)[1]

Extended binary data can be unscaled using the following equation:

real value = (Decimal Value of Binary Data X Scale Factor) + Offset

Based on the data which is transferred, the scale factor and offset value that is inserted into the above equation is obtained using HP–IB commands shown in Table 2B. The data which is transferred is a number in the following format: [±D.DDDDDE±DD] [lf]

Table 2b. HP–IB Commands to Extract Scale Factor and Offset from the HP 8757D

Data Transferred via HP–IB	HP–IB Command to Extract Scale Factor	HP–IB Command to Extract Offset
Normalized data (measurement − memory) transferred via the *ON* command.	OPNS	OPON
Measurement data transferred via the *OD* command.	OPDS	OPOD
Memory data transferred via the *OM* command.	OPDS	OPOM

1. HP 8757D only.

Table 2. HP–IB Only Functions (2 of 2)

Action	HP–IB Command	Syntax	Description
Pass Through Address	PTd	3	Set the Pass Through address of an instrument connected to the 8757 SYSTEM INTERFACE; d is a two digit ASCII integer which represents the HP–IB address of the instrument to be programmed.
Cursor Position	SCd	3	Set Cursor position to d; d is a decimal integer which represents a horizontal position on the CRT with a range of values shown below: No. of trace points — range of d 101 — 0 to 100 201 — 0 to 200 401 — 0 to 400 801[1] — 0 to 800 1601[1] — 0 to 1600
Control Outputs	OT1m OT2m	2 2	Rear panel control output #1 on/off. Rear panel control output #2 on/off.
Sweep Mode	SW0	1	Non–swept mode. Sweep off; hold data on the CRT.
	SW1	1	Swept mode. Sweep on; continuously track sweep ramp voltage and update trace data on the CRT.
	SW2	1	Sweep Hold mode. Sweep off; hold HP–IB bus activity until completion of TSd number of sweeps.
	TSd	3	Take d Sweeps, then hold trace data on the CRT. The HP 8757D/E must be in the Non–Swept (SW0) or Sweep Hold (SW2) modes before executing. d is a decimal integer from 1 to 255. For certain operating modes, such as SWR trace mode, Alternate Sweep on, Averaging on, or Smoothing on, it is recommended that 2 successive sweeps be taken for accurate data.
Learn String	ILs	4	Input learn string; s is string of 300 binary bytes (150 bytes for the HP 8757E) that were output by the output learn string command.
Write Softkey Label	WKs	4	Write softkey label for a particular softkey. s is an ASCII string; the first character is the softkey number (range 1 to 8) followed by the label. The label can be sent in the following forms: one word label: "[ASCII label] [term]" two word label: "[ASCII label], [ASCII label] [term]" where [ASCII label] is $\leq$7 characters and [term] is a valid terminator.
Write Title	WTs	4	Write Title to the CRT; s is an ASCII string of up to 50 characters.
Write To Trace Memory	WMs	4	Write to the channel memory. Data is transferred from the computer to the channel memory of the analyzer. Several parameters must be properly set before the transfer is made: • data format must be set using the FDx command • the desired channel memory is selected by making that channel the active channel. • the number of points transferred must equal the present number of points/trace.

1. HP 8757D only.

Table 3. Output Modes (1 of 2)

Action	HP–IB Command	Description	Format
Output Learn String	OL	Outputs binary data string 300 bytes long (150 bytes for the HP 8757E) which completely describes the instrument state. Can be stored in an ASCII character string and later input to restore that instrument state.	HP 8757D: 300 [B] [EOI] HP 8757E: 150 [B] [EOI]
Output Interrogated Parameter Value	OPx	Outputs the present numeric value of the function selected. x is the function code to interrogate (AF, BW, DA, DB, DC, DR, DS, NS, OD, OM, ON, RL, RP, SD, SL, SO, SP, SR, SS, ST, DTSTRA, DTSTRB, DTSTRC[1], DTSTRR, DTSTPA, DTSTPB, DTSTPC, DTSTPR)	[±D.DDDDDE±DD] [lf]
Output Cursor Value	OC	Outputs cursor or cursor Δ amplitude and horizontal position. Format set by the FDx, FRx, and DSx commands.	ASCII Data: [±DD.DDD,] [DDDD] [lf] Extended ASCII: [±DDD.DDD,] [DDDD] [lf] Binary and Extended Binary Data [BB] [BB] [EOI]
Output Measurement Data	OD	Output measurement data; no. of data points is the same as the no. of points/trace. Format set by "FDx" command. With the OD command, data is returned in units of dB or dBm unless in SWR trace format (units are SWR). In general, whenever a measurement is defined (dBm, dB, SWR), one or more sweeps must be taken before the data is valid. Not valid for SWR trace mode.	ASCII Data: (n—1) [±DD.DDD,] [±DD.DDD] [lf] Extended ASCII: (n—1) [±DDD.DDD,] [±DDD.DDD] [lf] Binary and Extended Binary Data: n [BB] [EOI] n = no. of points per trace.
Output Memory Data	OM	Output memory data; no. of data points is the same as the no. of points/trace. Format set by "FDx" command.	ASCII Data: (n—1) [±DD.DDD,] [±DD.DDD] [lf] Extended ASCII: (n—1) [±DDD.DDD,] [±DDD.DDD] [lf] Binary and Extended Binary Data: n[BB] [EOI] n = no. of points per trace.
Output Normalized Data	ON	Output normalized data; (measurement—memory); no. of data points is the same as the no. of points/trace. Format set by "FDx" command.	ASCII Data: (n—1) [±DD.DDD,] [±DD.DDD] [lf] Extended ASCII: (n—1) [±DDD.DDD,] [±DDD.DDD] [lf] Binary Data: n[BB] [EOI] n = no. of points per trace.
Output CW Value	OV	Output CW value; Non–swept mode (SW0 or SW2) must be set. Format set by "FDx" command. Data is returned in dBm or dB, even if SWR trace format is used.	ASCII Data: [±DD.DDD] [lf] Extended ASCII: [±DDD.DDD] [lf] Binary and Extended Binary Data: n[BB] [EOI]

Table 3. Output Modes (2 of 2)

<table>
<tr><th>Action</th><th>HP–IB Command</th><th>Description</th><th>Format</th></tr>
<tr><td>Output Error Status</td><td>OE1
OE2</td><td>Outputs error status of display channel 1 or 2.
One byte is output, where each bit indicates:
<table>
<tr><th>Bit#</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><th>Decimal Value</th><th>128</th><th>64</th><th>32</th><th>16</th><th>8</th><th>4</th><th>2</th><th>1</th></tr>
<tr><th>Function</th><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>Out of Limits</td></tr>
</table></td><td>[B] [EOI]</td></tr>
<tr><td>Output Keycode</td><td>OK</td><td>Output keycode for the last front panel key pressed. Refer to table 8 for keycodes</td><td>[DD] [lf]</td></tr>
<tr><td>Output Knob Value</td><td>OR</td><td>Output Knob value; the value is between —32768 and +32767. It is reset to 0 after value output. Negative value = counterclockwise rotation, positive value = clockwise rotation.</td><td>[BB] [EOI]</td></tr>
<tr><td>Output Status Bytes</td><td>OS</td><td>Output 2 bytes, the Status Byte (#1) and the Extended Status Byte (#2). Both bytes are then cleared.</td><td>[BB] [EOI]</td></tr>
<tr><td>Output Identity</td><td>OI</td><td>Outputs the HP 8757D/E identity string and the firmware revision number xx.x (i.e., 05.0 for revision 5.0)</td><td>"8757D REVxx.x" [cr] [lf] or "8757E REVxx.x" [cr] [lf]</td></tr>
<tr><td colspan="4">NOTES: D = ASCII digit
B = 8–bit byte
, = comma
EOI = End or Identity HP–IB line true
cr = carriage return
lf = line feed</td></tr>
</table>

Table 4. CRT Graphics Commands (1 of 2)

HP–GL Subset	
Note: All Graphics Commands must be terminated with a semicolon ";" or a "[linefeed]" (the character [carriage return] is ignored).	
HP–IB Command	**Command Description**
DF	Default; sets monochrome default values. ("DI 1,0;SI 0.14,0.17;")
DI run, rise	Absolute Character Direction; run rise allowable values are: 1, 0 = 0 degrees (default) 0, 1 = 90 degrees −1, 0 = 180 degrees 0, −1 = 270 degrees
LB [text] [ETX]	Label text. Character set is shown in table 5, HP 8757D/E Modified ASCII Character Set. Before labeling text, move the pen to the appropriate (x,y) coordinate using the PU and PA commands. The text will be plotted with the lower left corner of the first character starting at the existing pen position. The pen stops at the lower left corner of the next character space.
OP	Output the current P1 and P2 positions. (P1 = 0,0; P2 = 2924, 2047). The graphics display units (GDU's) define the plotting area on the CRT. The coordinates of the full plotting are are (0,0) for lower left, (2924,2047) for upper right. The coordinates for the trace graticule are (214, 150) for lower left, (2500, 1814) for upper right.
PA x1, y1 (,x2,y2, ..., ..., xN, yN)	Plot Absolute; x and y are integers and are in Graphics Display Units (GDU's). Moves the pen to the specified (x,y) coordinates. Both the x and y coordinates must be specified. Any number of coordinate pairs can be specified when separated by commas. Use of the PD and PU commands determines whether a line is drawn or the pen is just moved. If an (x,y) coordinate is specified outside of the plotting area, only that portion of the line within the plotting area is drawn.
PD	Pen Down.
PU	Pen Up.
SI, w, h	Absolute Character Size; w = width; h = height. Values allowed are: 0.14, 0.17 Smallest size (Mode labels, softkey labels) 0.21, 0.25 (Active Entry Area) 0.28, 0.34 0.35, 0.42 Largest size
SP n	For monochrome display: select pen; n = 0 to 4; 0 Pen up (Beam off) 1 Bright Green 2 Half–Bright Green 3 Dim Green

Table 4. CRT Graphics Commands (2 of 2)

Non–HP–GL Commands		
The following HP–GL commands will be accepted but their functions are not implemented and no error will be noted: IM (Input SRQ Mask), IP (Input P1 and P2), IW (Input Window), OC (Output Current Position), OE (Output Error), PG (Output Page), SL (Character Slant), and SR (Size Relative for characters).		
	HP–IB Command	**Command Description**
Erase Page	EPn	Erase Page n, where n = 1 to 8; if no n value is given, all pages are erased.
Select Graphics Page On/Off	GPn,m	Turn graphics page n (1 to 8) on/off (m = 1 or 0). Pages 1 through 7 may use up to 500 16 bit words. Page 8 may contain up to 4000 words. GP without parameters selects and turns on page 1. Also resets point to start of page.
Default Colors[1]	DEC	**Pen Number** — **Color** 0 — Black 1 — Bright White 2 — Half–bright White 3 — Dim White 4 — Red 5 — Half–bright White 6 — Dim White 7 — Bright White 8 — Gold 9 — Gold 10 — Blue 11 — Blue 12 — Salmon 13 — Salmon 14 — Green 15 — Green
Select HP BASIC Default Colors[1]	BC	0 — Black 1 — White 2 — Red 3 — Yellow 4 — Green 5 — Cyan 6 — Blue 7 — Magenta 8 — Black 9 — Olive Green 10 — Aqua 11 — Royal Blue 12 — Maroon 13 — Brick Red 14 — Orange 15 — Brown
Default Monochrome[1]	DF	0 — Black 1 — Bright Green 2 — Half–bright Green 3 — Dim Green
1. HP 8757D only.		

Table 5. HP 8757D/E Modified ASCII Character Set

HP 8757D/E MODIFIED ASCII CODE CONVERSION TABLE

Note: These characters are output only when the LB command is used directly.

LEAST SIGNIFICANT CHARACTER	MOST SIGNIFICANT CHARACTER								
	0	0	1	2	3	4	5	6	7
	0	null	centered*	space	0	@	P	‘	p
	1	HP logo	centered o	!	1	A	Q	a	q
	2	β	↑	”	2	B	R	b	r
	3	ETX	←	#	3	C	S	c	s
	4	upper−half tic	↓	$	4	D	T	d	t
	5	lower−half tic	→	%	5	E	U	e	u
	6	left−half tic	√	&	6	F	V	f	v
	7	right−half tic	π	’	7	G	W	g	w
	8	back space	Δ	(	8	H	X	h	x
	9	1/2 shift down	μ	)	9	I	Y	i	y
	A	line feed	° (degree)	*	:	J	Z	j	z
	B	inv. line feed	Ω	+	;	K	[	k	{
	C	1/2 shift up	ϱ	’	<	L	\	l	|
	D	carriage return	Γ	−	=	M	]	m	}
	E	horizontal tic	θ	.	>	N	^	n	□
	F	vertical tic	λ	/	?	O	—	o	▶

EXAMPLES:

HP logo	=	01
A	=	41
i	=	69
√	=	16
▶	=	7F
line feed	=	0A
ETX	=	End of text; use to end labelling

Table 6. HP 8757D File Extensions

Disk files created by the HP 8757D can be read on any HP 9000 Series 200/300 computer. Each file has an extension appended which serves to identify the file type.

File Type	Extension
Instrument State	IS
Measurement Data Channel q	Dq
Memory Data Channel q	Mq
CRT Graphics	CG
Trace Display Data Channel q	Nq

Where q represents a channel number 1 to 4.

File identities are determined by their extensions. For example, a normalized data file for channel 2 named “FILE1” would have “N2” appended resulting in “FILE1N2”.

Table 7. HP 8757D/E Status Byte Descriptions

STATUS BYTE (#1)								
BIT #	7	6	5	4	3	2	1	0
Decimal Value	128	64	32	16	8	4	2	1
Function	N/A	Request Service (SRQ)	SRQ on HP–IB Syntax Error	SRQ on Operation Complete (Sweep, Plot or Print)	SRQ on Softkey Only Pressed	SRQ on Change in Extended Status Byte	SRQ on Numeric Entry Completed (HP–IB or Front Panel)	SRQ on Any Front Panel Key Pressed
EXTENDED STATUS BYTE (#2)								
BIT #	7	6	5	4	3	2	1	0
Decimal Value	128	64	32	16	8	4	2	1
Function	N/A	SRQ on Detector Uncal	SRQ on Front Panel Preset or Power–on	SRQ on Limit Test Failed[1]	SRQ on Action Requested not possible	SRQ on Knob Activity	SRQ on Operation Failure[1]	SRQ on Self Test Failure

1. HP 8757D only

Table 8. Front Panel Keycodes (values are in decimal)

SOFTKEYS
Softkey 1 (top) = 32
Softkey 2 = 8
Softkey 3 = 0
Softkey 4 = 16
Softkey 5 = 14
Softkey 6 = 38
Softkey 7 = 40
Softkey 8 (bottom) = 41

CHANNEL
Channel 1 = 42
Channel 2 = 43
Channel 3 = 24
Channel 4 = 25

FUNCTION
Measurement = 44
Display = 45
Scale = 52
Reference = 46
Cursor = 47
Averaging = 48
Calibration = 49
Special = 50

ENTRY
Step down = 22
Step up = 6
0 Key = 20
1 Key = 4
2 Key = 3
3 Key = 7
4 Key = 12
5 Key = 11
6 Key = 15
7 Key = 36
8 Key = 35
9 Key = 39
. Key = 19
– Key = 23
Entry off = 9
Enter = 1
dBm/dB = 33
Backspace = 17

INSTRUMENT STATE
System = 51
Save = 28
Recall = 26
Local = 29

Table 9. Alphabetical Listing of HP 8757D/E Programming Codes (1 of 3)

Code	Action	Page
A0	Averaging off	9
AB	A/B ratio measurement	8
AC	A/C ratio measurement[2]	8
AFd	Averaging on and factor d	9
ANm	Adaptive Normalization on/off[1]	12
AR	A/R ratio measurement	8
AS	Autoscale	8
AZ2	Autozero the DC detectors once	9
AZm	Autozero repeat on/off of the DC detectors	9
BA	B/A ratio measurement	8
BC	B/C ratio measurement[2]	8
BFm	Plotter buffer on/off[1]	10
BL0	Restore CRT to normal mode	15
BL1	Blank frequency labels (secure frequency mode, frequency labels cannot be restored)	15
BL2	Blank all labels	15
BL3	Blank active channel trace	15
BL4	Blank softkey labels	15
BL5	Blank all (except user CRT graphics)	15
BL6	Blank title	15
BL7	Blank mode labels	15
BL8	Blank the active entry area	15
BL9	Blank the limit lines[1]	15
BLA	Blank all (except user CRT graphics and softkeys)	15
BLB	Blank the user CRT graphics	15
BR	B/R ratio measurement	8
BTNd	Overall display brightness	13
BW	Display the search bandwidth on the CRT[1]	9
C0	Channel off	8
C1	Channel 1 on/active	8
C2	Channel 2 on/active	8
C3	Channel 3 on/active[1]	8
C4	Channel 4 on/active[1]	8
CA	C/A ratio measurement[2]	8
CB	C/B ratio measurement[2]	8
CC1	Set channel 1 color[1]	13
CC2	Set channel 2 color[1]	13
CC3	Set channel 3 color[1]	13
CC4	Set channel 4 color[1]	13
CDm	Cursor delta on/off	9
CGL	Set labels color[1]	13
CGN	Set background color[1]	13
CGR	Set grid color[1]	13
CGW	Set warning label color[1]	13
CL	Perform system configuration of detectors and channels	12
CLB	Color list, black[1]	13
CLG	Color list, green[1]	13
CLR	Color list, red[1]	13
CLS	Color list, salmon[1]	13
CLW	Color list, white[1]	13
CLY	Color list, yellow[1]	13
CN	Cursor to minimum	9
COBd	Brightness adjust, one color[1]	13
COCd	Color adjust, one color[1]	13
COTd	Tint adjust, one color[1]	13
CR	C/R ratio measurement[2]	8
CS	Clear status bytes	15
CTm	Auto system calibration on/off	12
CUm	Cursor on/off	9
CWm	CW mode on/off	12
CX	Cursor to maximum	9
DAd	Detector A amplitude offset set to d	11
DBd	Detector B amplitude offset set to d	11
DCd	Detector C amplitude offset set to d[2]	11
DEC	Set default colors[1]	13
DFA	Set disk format to ASCII[1]	14
DFB	Set disk format to binary[1]	14
DFE	Set Disk format to extended binary[1]	14
DHm	Display Hold on/off of the active channel trace	8
DIAd	Set disk HP-IB address[1]	14
DIUd	Set disk unit number[1]	14
DIVd	Set disk volume number[1]	14
DLF	Delete file from disk[1]	14
DM0	All inputs set to DC detection	11
DM1	All inputs set to AC detection	11
DN	Step down (decrement)	9
DOAd	Measure Detector A amplitude offset[1]	11
DOBd	Measure Detector B amplitude offset[1]	11
DOCd	Measure Detector C amplitude offset[2]	11
DORd	Measure Detector R amplitude offset[1]	11
DRd	Detector R amplitude offset set to d	11
DS0	Display trace data in log magnitude	8
DS1	Display trace data in standing wave ratio (SWR) format	8
DTSTPAs	Enter stop frequency for detector A[3]	12
DTSTPBs	Enter stop frequency for detector B[3]	12
DTSTPCs	Enter stop frequency for detector C[2,3]	12
DTSTPRs	Enter stop frequency for detector R[3]	12
DTSTRAs	Enter start frequency for detector A[3]	12
DTSTRBs	Enter start frequency for detector B[3]	12
DTSTRCs	Enter start frequency for detector C[2,3]	12
DTSTRRs	Enter start frequency for detector R[3]	12
EO	Enter measured detector amplitude offset	11
ER0	Erase all save/recall registers	13
FAs	Start frequency label	11
FBs	Stop frequency label	11
FD0	Format data ASCII	15

1. HP 8757D only.
2. HP 8757D Option 001 only.
3. HP 8757D with HP 85037 series precision detectors only.

Table 9. Alphabetical Listing of HP 8757D/E Programming Codes (2 of 3)

Code	Action	Page
FD1	Format data binary (HP BASIC compatible)	15
FD2	Format data extended ASCII	15
FD3	Format data binary (PC compatible)	15
FD4	Format data extended binary (HP BASIC compatible)	15
FD5	Format data extended binary (PC compatible)	15
FR0	Logarithmic (dB) cursor format	9
FR1	SWR cursor format	9
FSm	Step sweep on/off[3]	12
FTAm	Detector A frequency on/off[5]	12
FTBm	Detector B frequency on/off[5]	12
FTCm	Detector C frequency on/off[2,5]	12
FTRm	Detector R frequency on/off[5]	12
IA	Input A absolute power measurement	8
IB	Input B absolute power measurement	8
IC	Input C absolute power measurement[2]	8
ILs	Input Learn string	16
IND	Initialize disk format[1]	14
IP	Instrument preset	13
IR	Input R absolute power measurement	8
IX	External ADC input (AUX) voltage measurement[3]	8
LE	Erase limit lines for active channel[4]	10
LFA	Load instrument information file from disk[1]	14
LFC	Load CRT graphics file from disk[1]	14
LFD	Load data trace file from disk[1]	14
LFF	Load measurement file from disk.[1]	14
LFH	Load instrument information file from disk and place instrument in hold mode.[1]	14
LFI	Load instrument state file from disk[1]	14
LFM	Load memory trace file from disk[1]	14
LFN	Load display trace file from disk.[1]	14
LFs	Enter limit test flat line data[4]	10
LL	Store lower limit line into memory[4]	10
LPs	Enter limit test point data[4]	10
LSs	Enter limit test sloped line data[4]	10
LTm	Limit line test on/off[4]	10
LU	Store upper limit line into memory[4]	10
M−	Display normalized data (measurement − memory)	8
MDm	Modulation on/off	12
ME	Display measurement data	8
MN	Display normalized data (same as M−)	8
MOC	Monochrome display[1]	13
MR	Marker (or cursor) to reference line	8
MSm	Manual sweep mode on/off	12
MU0	Display the measurement menu	13
MU1	Display the display menu	13
MU2	Display the scale menu	13
MU3	Display the reference menu	13
MU4	Display the cursor menu	13
MU5	Display the average menu	13
MU6	Display the calibration menu	13
MU7	Display the special menu	13
MU8	Display the system menu	13
MY	Display memory data	8
MZ	Manual calibration of DC detectors	9
NSm	Non−standard sweep mode on/off	12
OC	Output cursor value	17
OD	Output trace data	17
OE1	Output error status of display channel 1	18
OE2	Output error status of display channel 2	18
OI	Output identity	18
OK	Output keycode of last key pressed	18
OL	Output learn string	17
OM	Output memory data	17
ON	Output normalized (measurement —memory) data	17
OPDO	Output measured detector amplitude offset	11
OPx	Output interrogated parameter value x = AF, BW, DA, DB, DC, DS, NS, OD, OM, ON, DR, DTSTP, DTSTR, RL, RP, SD, SL, SO, SP, SR, SS, ST	12,17
OR	Output rotary knob value (−32768 ≤ value ≤ +32767)	18
OS	Output status bytes	18
OT1m	Control output #1 on/off	16
OT2m	Control output #2 on/off	16
OV	Output CW value	17
P1	Plot channel 1 trace on external plotter	10
P2	Plot channel 2 trace on external plotter	10
P3	Plot channel 3 trace on external plotter[1]	10
P4	Plot channel 4 trace on external plotter[1]	10
PA	Plot all on external plotter	10
PBm	System interface control on/off	12
PC	Plot labels on external plotter	10
PD	Plot custom plot	10
PG	Plot grid on external plotter	10
PR1	Print all to monochrome printer, except softkeys and CRT graphics	10
PR2	Print tabular display data in monochrome	10
PR3	Print tabular marker/cursor data to external printer	10
PR4	Print all to color printer, except softkeys and CRT graphics[1]	10
PTd	Passthrough address set to d	16
PWRA	Execute a detector A power calibration[1]	11
PWRB	Execute a detector B power calibration[1]	11
PWRC	Execute a detector C power calibration[2]	11
PWRR	Execute a detector R power calibration[1]	11
R1	R/A ratio measurement	8

1. HP 8757D only.
2. HP 8757D Option 001 only.
3. HP 8340, HP 8341, or HP 8360 series synthesized sweeper only with 8757 SYSTEM INTERFACE connected and active.
4. Limit line functions valid only for channels 1 or 2. HP 8757D only.
5. HP 8757D with HP 85037 series precision detectors only.

Table 9. Alphabetical Listing of HP 8757D/E Programming Codes (3 of 3)

Code	Action	Page
R2	R/B ratio measurement	8
R3	R/C ratio measurement[2]	8
RCn	Recall register n	13
RLd	Reference level set to d	8
RMd	Service request mask set to d	15
RPq	Reference position set to vertical division q	8
RS	Restart averaging	9
SCd	Set cursor to horizontal position d	16
SDd	Scale per division set to d	8
SFA	Store all instrument information to disk in file[1]	14
SFC	Store CRT graphics to disk in file[1]	14
SFD	Store data trace to disk in file[1]	14
SFF	Store measurement trace to disk file[1]	14
SFI	Store instrument state to disk in file[1]	14
SFM	Store memory trace to disk in file[1]	14
SFN	Store normalized trace to disk in file[1]	14
SKq	Select softkey q: q =1 to 8	13
SL	Cursor search left[1]	9
SM	Store measurement into memory	8
SN	Store normalized data (measurement − memory) into memory	8
SOd	Smoothing set to d % of frequency span	9
SPd	Number of points set to d: d=101, 201, 401, 801[1], 1601[1]	11 11
SR	Cursor search right[1]	9
SSd	Cursor search value set to d[1]	9
STd	Reference level step size set to d	8
SUd	Specify custom plot according to d	10
SVn	Save register n	13
SW0	Non−swept mode; non−swept operation	16
SW1	Swept mode; normal swept operation	16
SW2	Sweep hold mode; non−swept mode with HP−IB bus hold off until completion of TSd	16
TCm	Continuous Temperature Compensation on/off	12
TIFs	Title for file[1]	14
TSd	Take d sweeps, then hold display	16
UP	Step up (increment)	9
WKs	Write softkey label	16
WMs	Write to channel memory.	16
WTs	Write title, s is an ASCII string of up to 50 characters	16
XAd	External detector cal value for detector A	11
XBd	External detector cal value for detector B	11
XCd	External detector cal value for detector C[2]	11
XRd	External detector cal value for detector R	11
ZTd	Repeat auto zero timer set to d	9

1. HP 8757D only.
2. HP 8757D Option 001 only (detector C).

NOTES: n = decimal integer 1 to 9
d = variable length numeric
m = 0 for off/1 for on
q = unique value
s = ASCII or binary string

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Addendum to HP-IB Programming Note Quick Reference Guide for the HP 8757D/E Scalar Network Analyzer

The following table provides additional codes for Tables 1 and 3 of the HP-IB Programming Note, Quick Reference Guide for the HP 8757D/E Scalar Network Analyzer.

Table 6-1. Function Select Commands

Action	HPIB Command	Syntax	Description
Time/Date Stamp	TDm	2	Time/Date Stamp on/off m = 0 function off m = 1 function on
	TM	4	Set Time Format: HH:MM:SS Where: H = hour, M = minute, S = second format is 24 hours Example: 14:05:02 Example: "TM"& TIME$ (TIMEDATE)
	DT	4	Set Date Format: "DD Mmm YYYY" Where: DD=day, Mmm=month, YYYY=year Example: 02 Mar 1993 Example: "DT"&& DATE$ (TIMEDATE) Note: Mmm is not case sensitive. Allowed values are Jan, Feb, Mar, and so on.

Table 6-3. Output Modes

Action	HPIB Command	Description	Format
Output Time/Date	OPTM	Output Current Time	ASCII String: "HH:MM:SS" H=hour, M=minute, S=second Example: 14:05:02
	OPDT	Output Current Date	ASCII String: "DD Mmm YYYY" Note: Mmm is not case sensitive. Allowed values are Jan, Feb, Mar, and so on.