Quick Reference

HP 71450B/1B/2B Optical Spectrum Analyzers

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Menu Maps
Menu Maps

The menu maps that are in this guide graphically represent the softkey menus that are located under the [MENU] and the [USER] keys. Maps for each left-side softkey are shown in alphabetical order. Menu maps contain the following features:
Menu Maps

Amptd Menu

1. Softkey displayed only in OSA and POWER METER instrument modes.
2. Softkey displayed only in OSA instrument mode.
BW, Swp Menu

RES BW, AutoMan
VID BW, AutoMan
SWPTIME, AutoMan
CONT, SWEEP
SINGLE, SWEEP
VID AVG, On Off
MORE, 1 of 3

TRIGGER, FREE
LINE
EXT
VIDEO
VIDEO, LEVEL
HYS, LEVEL
MORE, 2 of 3

RE/SPAN, RATIO
adc, trigger
GATESWP, On Off
SWEEP, On Off
VID LIN, On Off
MORE, 3 of 3

ADCTRIG, FREE
ADCTRIG, POEDGE
ADCTRIG, NEGEDGE
ADCTRIG, AC
ADCTRIG, DELAY
prev, menu

1-4 Menu Maps
Marker Menu

1. Softkey appears only if delta markers are on.
Misc Menu

1 Use of this softkey is not recommended. Run DLPs through the USER menu.

1.6 Menu Maps
State menu (cont'd)

MORE 1 of 4

NO. OF, STATES
P STATE, On/Off

MORE, 2 of 4

ORDER, AutoMan
poweron, menu

show, states
MORE, 3 of 4

PARTIAL, ERASE
STARTUP, AutoMan
MORE, 4 of 4

POWERON, IP
POWERON, LAST
POWERON, RECALL

prev, menu

STATE
EXTEND, STATE
CONFIG

NEXT, PAGE
prev, menu

CONFIRM, ERASE
CANCEL

prev, menu
Traces Menu

**Traces**

- CLEAR, WRT A
- MAX, HOLD A
- MIN, HOLD A
- STORE, A or VIEW A, BLANK A
- Trace, A B C
- MORE, 1 of 4

**trace, logmath**
- trace, limitmath
- oneshot, math
- MORE, 2 of 4

**VD AVG, On Off**
- DSP LIN, On Off
- TRACE, PRESET
- TRACE, LENGTH
- recall
- save
- MORE, 3 of 4

**PERSIST, On/Off**
- 3-DIMEN, On/Off
- HORZ, OFFSET
- VERT, OFFSET
- LINES, On Off
- MORE, 4 of 4

*A <-> A-B
A <-> A-C
A <-> A+B+DL
A <-> A+C+DL
A <-> A+B+C+DL
prev menu

A <-> A+DL/B
A <-> A+DL/C
A <-> DL*, (A+B)/C
A <-> A/DL/, (A+B)
A <-> A/DL/, (A+B+C)
DSP LIN, On Off
prev menu

A <-> A+B
B <-> B-DL
A XCH B
A XCH C
B XCH C
C <-> B
prev menu

To State menu

---

1-10  Menu Maps

---

* This softkey appears when "3-DIMEN On Off" is turned on.
Waveln Menu

1. Softkey displayed only in OSA and POWER METER instrument modes.

2. Softkey displayed only in OSA instrument mode.
Menu’s DFB Advanced Measurement Program

USER, DFB

VERSION
CALC, On/Off
STP BND, On/Off
MSR, On/Off
OPTIMIZ
HELP, On/Off
EXIT

SINGLE, SWEEP
CONT, SWEEP
CENTER
SPAN
MKR BW, On/Off
PEAK, EXCURSION
Menu's FP Advanced Measurement Program

1. Softkey displayed only when envelope distribution is selected.
**USER** Menu's LED Advanced Measurement Program

- **USER**
- **LED**
  - VERSION
  - CALC, On Off
  - INT WIN, On Off
  - DISTRIB, On Off
  - distib, menu
  - HELP, On Off
  - EXIT

- **SINGLE, SWEEP**
  - CONT, SWEEP CENTER
  - SPAN
  - LOG, dB/DIV
  - LINEAR
  - Intregt, menu

- **INTEGRIT, FROM PK**
  - INTEGRIT, STRT WL
  - INTEGRIT, STOP WL

- **prev, menu**

- **GAUSIAN**
- **LORENZ**

- **prev, menu**

1-14 Menu Maps
Menu’s PDL Advanced Measurement Program

This program is available on HP 71451B (HP 70951B) instruments as Option 003.
Optical Spectrum Analyzer Functions

This chapter contains an alphabetical listing of all optical spectrum analyzer softkeys, hardkeys, front-panel indicator lights, and front- and rear-panel input and output connectors. A brief description has been provided for each item listed. If applicable, the related programming command that performs the same (or nearly the same) function has also been provided.

For more detailed information on softkeys or hardkeys, refer to the HP 71450B/1B/2B Optical Spectrum Analyzer Reference.

- Backspaces the cursor while entering text or displays previous softkey menus.
- Increases or decreases active parameter values.
- (custom-keypad key) Activates the Marker menu’s DELTA function.
- Configures marker readouts to show marker position as the inverse of the marker sweep-time position.
- Views the 3-dimensional display. Related command: THREE
- Subtracts trace B from trace A point by point, then stores the results in trace A. Related command: AMB
- Adds trace A and trace B point by point, then stores the results in trace A. Related command: APB
- Subtracts both trace B and trace C from trace A, then stores the results in trace A. Related command: AMBMC
\[ A \leftarrow A = B \oplus D \] Subtracts trace B from trace A point by point, adds the value of the display line, then stores the results in trace A. Related command: AMBPL

\[ A \leftarrow A = C \] Subtracts trace C from trace A point by point, then stores the results in trace A. Related command: AMC

\[ A \leftarrow A = C \oplus D \] Subtracts trace C from trace A point by point, adds the value of the display line, then stores the results in trace A. Related command: AMCPL

\[ A \leftarrow A = (A + B + C) \] Divides the display line by the sum of traces A and B and then multiplies the result by trace A. Related command: ADAPBTL

\[ A \leftarrow A = (A + B + C) \oplus D \] Divides the display line by the sum of traces A, B, and C and then multiplies the result by trace A. Related command: ADAPBCTL

\[ A \leftarrow A = B \div C \] Multiplies trace A by the display line value, then divides the result by trace B. The results are stored in trace A. Related command: ADBTL

\[ A \leftarrow A = (A + C + B) \div D \] Subtracts both trace B and trace C from trace A, then adds the display line. The results are stored in trace A. Related command: AMBMCPL

\[ A \leftarrow A = C \div B \] Multiplies trace A by the display line value, then divides the result by trace C. The results are stored in trace A. Related command: ADCTL

\[ A \leftarrow D \div (A + B + C) \] Multiplies the sum of traces A and B by the display line. Then, this result is divided by trace C. The final results are stored in trace A. Related command: APBDCCTL

\[ \text{METER on/off} \] Displays the power level of the trace point currently being measured at the optical spectrum analyzer’s input. Related command: AMETER

\[ \text{UNITS: Auto/Man} \] Selects the display units for the amplitude scale. Related command: AUNITS

\[ \text{XCH}\cdot B \] Exchanges the contents of trace A and trace B registers. Related command: AXB

\[ \text{XCH}\cdot C \] Exchanges the contents of trace A and trace C registers. Related command: AXC

### 2.2 Optical Spectrum Analyzer Functions
ACT  Front-panel indicator light that turns on whenever the optical spectrum analyzer is being displayed.

ACTIVE MARKER  Selects the active marker.

ADC SYNC  Presents a menu for synchronizing an external signal with pulse modulation capability with the optical spectrum analyzer's analog-to-digital converter.

ADC SYNC OUT  Rear-panel output connector that allows the user to synchronize an event, external to the instrument to the instrument data acquisition.

ADC TRIGGER  Presents a menu for synchronizing the optical spectrum analyzer to a pulsed light source. Related command: ADCTRIG

ADCTRIG AC  Selects external ADC triggering. The amplitudes measured on opposite edges are subtracted and the absolute value of the result becomes the trace amplitude value. Related command: ADCTRIG AC

ADCTRIG DELAY  Delays external triggering of the analog-to-digital converter (ADC) after the trigger edge. Related command: ADCTRIG DELAY

ADCTRIG FREE  Selects internal triggering of the ADC. Related command: ADCTRIG FREE

ADCTRIG NEGEDE  Selects external ADC triggering. Related command: ADCTRIG NEGEDE

ADCTRIG POSEDGE  Selects external ADC triggering. Related command: ADCTRIG POSEDGE

ALIGN PRESET  Returns alignment to factory default settings. Related command: ALIGN PRESET

AMP REF OFFSET  Adjusts the displayed amplitude level, using a relative-amplitude offset value. Related command: ROFFSET

AMP COR LOWER  Copies amplitude-correction values into a lower limit-line table. Related command: COR LIMIT

AMP COR UPPER  Copies amplitude-correction values into an upper limit-line table. Related command: COR LIMIT
AMP COR: on/off  Turns on and off the use of amplitude corrections. Related command: AMP COR

AMP TD: VALUE  Enters the beginning amplitude value of the currently selected limit-line segment. Related command: LIMI AMP

ANALOG OUT  Rear-panel output connector that provides a voltage equal to the photocurrent in the diode multiplied by the transimpedance value.

ANALYZR: TEST  Initiates a self-test routine. Related command: TEST

ANNOTATION: on/off  Turns the displayed annotation on and off.

ANYCHR  Enters any ASCII character as part of a programming command.

AUTOMKR: on/off  Allows the automatic measurement routine to execute on a unique signal in a multiple signal environment. Related command: AUTOMMKR

AUTOMER: state  Presents a menu which allows you to modify the automatic measurement routine.

AUTO  Determines the values measured by the marker.

[AUTO ALIGN]  (custom-keypad key) Initiates an automatic alignment routine to ensure amplitude accuracy. Related command: AUTOALIGN

AUTO ALIGN  Initiates an automatic alignment routine to ensure amplitude accuracy. Related command: AUTOALIGN

[AUTO MEASURE]  Initiates an automatic measurement routine that searches for a signal and then centers and narrows the span around it. Related command: AUTOMEAS

AUTO MEASURE  Initiates an automatic measurement routine that searches for a signal and then centers and narrows the span around it. Related command: AUTOMEAS

AUTO SCALE  HP 71451B Option 003 only Automatically scales the amplitude of the displayed signal during a polarization dependent loss (PDL) measurement. Related command: PDLSCALE

2.4  Optical Spectrum Analyzer Functions
AUTOPTS: ALIGN  Runs an automatic alignment routine for the fiber positioner’s tracking table. Related command: ALIGN

AUTORNG: on/off  Turns automatic ranging on and off. Related command: AUTORNG

AUTZERO: on/off  Turns off zeroing between traces. Related command: AUTZERO

BARBSDL  Subtracts the value of the display line from trace B, then stores the result in trace B. Related command: BML

BUXCH: C  Exchanges the contents of trace B and trace C registers. Related command: BXC

BEEPER: on/off  Turns on and off an alarm for alerting you that a signal has crossed a displayed limit line. Related command: LIMIBEPEP

BLANK:A  Prevents trace A data from being displayed. Related command: BLANK

BLANK:B  Prevents trace B data from being displayed. Related command: BLANK

BLANK:C  Prevents trace C data from being displayed. Related command: BLANK

BLANK:TRACES  Prevents the display of trace A, B, and C during creation or editing of limit lines. Related command: BLANK

BWS: Sup  Presents a menu for controlling instrument sweep, bandwidth, and triggering.

CucchB  Places contents of trace B into trace C.

cal: menu  Presents a menu for performing user calibrations at a set wavelength and power level.

CAL:POWER  Performs a power calibration at a set wavelength.

cal: setup  Presents a menu for specifying the power and wavelength for user calibrations.

CAL:WAVELEN  Performs a wavelength calibration at a set wavelength and amplitude.

CAL:WVL:AT:PIT  Performs a wavelength calibration at a signal pit. Related command: CAL
CALC: DISPLAY HP 7151B Option 003 only* Calculates and displays the peak-to-peak polarization-dependent loss. Related command: PDL:CALC

CALC: [on|off] Turns the calculation of advanced-measurement program results on and off.

CANCEL Cancels the various memory-erase operations.

catalog & MSI Displays the contents of the currently selected user memory. Related command: CATALOG, DSPMODE CAT, and MEM

(CENTER) Specifies the wavelength displayed at center screen. Related command: CENTERWL

CENTER Specifies the wavelength displayed at center screen. Related command: CENTERWL

CHANGE:PREFIX Changes the prefix attached to files when they are stored in memory. Related command: PREFIX

CHOP: [on|off] Turns “chop” mode on and off. Related command: CHOP

CLEAR:TO-END Deletes all characters from the cursor to the end of the data line.

CLEAR:WRT:A Continuously updates trace A with new data obtained from scanning the input spectra. Related command: CLR:WRT

CLEAR:WRT:B Continuously updates trace B with new data obtained from scanning the input spectra. Related command: CLR:WRT

CLEAR:WRT:C Continuously updates trace C with new data obtained from scanning the input spectra. Related command: CLR:WRT

CLOSEST:PEAK Moves the active marker to the closest signal peak. Related command: MKPK CP

CLOSEST:PIT Moves the active marker to the closest signal pit. Related command: MKPK CPTT

COMMAND Accesses a menu for entering, editing, and executing short programming routines.

CONFIG Shows the configuration of the optical spectrum analyzer module in the modular measurement system (MMS). Related command: CONFIG and DSPMODE CONFIG

2.6 Optical Spectrum Analyzer Functions
CONFIRM DELETE Erases the contents of the limit-line table after DELETE ALL has been pressed.

CONFIRM ERASE Erases memory.

CONT Resumes operation of a halted program.

CONT SWEEP Sweeps the measurement range when the trigger conditions are met. Related command: CONTS

current source Option 001 only Presents a menu for controlling the pulsed current source.

CURRENT SOURCE Rear-panel connector that utilizes the same capability as the ADC SYNC OUT connector.

CWL Sets the center wavelength equal to the marker wavelength. Related Command: MKCWL

ΔCWL STEP Sets the center-wavelength step size equal to the difference between the reference and active marker wavelengths. Related command: MKSS

DB DIV AUTOMAN Changes the amplitude scale used by the automatic measurement routine. Related command: AUTOMDB

dB Selects amplitude units in decibels relative to 1 mW.

ddebug Accesses the program-debugging softkey functions.

DEBUG FAST Starts debugging the current DLP at a fast rate. Related command: DEBUG FAST

DEBUG ON OFF Activates debugging of DLPs. Related command: DEBUG

DEBUG SLOW Starts debugging the current DLP at a slow rate. Related command: DEBUG SLOW

DEFINE USR KEY Places softkeys in the user menu. Related command: KEYDEF

DELETE ALL Erases any currently loaded limit lines. Related command: LIMDEL

DELETE CHAR Deletes the character at the displayed cursor.

DELETE CHAR Displays the DELETE CHAR softkey for deleting characters from the text.
DELETE SEGMENT  Erases the selected limit-line segment. Related command: LIMISDEL

DELTA  Displays a delta marker relative to a reference marker. Related command: MKD

DETECTR Ext Int  Specifies the receive device to be either optical or electrical thus selecting optical-to-optical testing or optical-to-electrical testing. Related command: PDLDEV and PDL_DEV?

DFB  Turns on the DFB advanced-measurement program. Related command: DFB_

(DISPLAY)  Presents a menu for controlling system-level functions such as: HP-MSIB addressing, communication, and configuration.

DISPOSE USER  Erases a file containing user-menu softkeys from memory.

distrib menu  Displays a menu for selecting statistical distributions.

DISTRIBUTION  Displays a power distribution trace.

DSP LIN ON OFF  Positions a horizontal line on the display. Related command: DL

DSP B ON OFF  Turns on and off the display of trace B.

DUTY CYCLE  Changes the duty cycle of the signal available at the rear-panel RDC_SYNC OUT and CURRENT SOURCE connectors. Related command: IGENDTSY

EDIT FUNCDEF  Displays a user-defined function for editing.

ENTER COMMAND  Allows commands to be executed from the front panel.

ENTER LIMIT  Displays the limit-line table for creating limit lines. Related command: LIMEDIT, LIMILINE, and LIMISEG

ENTER LINE  Enters a title created by the user on the display.

ENVELOPE  Selects an envelope statistical distribution for the power distribution trace. Related command: FP_

ENVELOPE MKB W  Sets the Fabry-Perot laser envelope bandwidth amplitude. Related command: FP_MKBW

2-8 Optical Spectrum Analyzer Functions
ERASE ALL  Erases all internal user memory.
erase restart  Presents a menu for erasing internal memory.

ERR  Front-panel indicator light that turns on whenever the optical spectrum analyzer has a problem.
execute DLP  Lists all DLPs stored in internal memory alphabetically.

EXIT  Turns off an advanced-measurement program. Related command: DFB, FP, LED, and PDEXIT

EXT  Selects external triggering. Related command: TM EXT

EXT TRIG IN  Rear-panel input connector that selects either external trigger mode or the gated sweep mode.

EXTEND STATE  Lists module-level operating values for each module of the instrument. Related command: DSPMODE EXTEND

extend align  Presents a menu for adjusting the fiber-positioner's tracking table.

FLAT  Determines limit-line interpolation.

FORMAT  Erases, then initializes the currently selected memory. Related command: FORMAT

FP  Turns on the Fabry-Perot (FP) advanced-measurement program. Related command: FP

FREQ  Configures marker readouts in frequency.

FULL:SPAN  Sets the measurement span to the limits of the optical spectrum analyzer. Related command: FS

GATESWP on/off  Allows the gating of measurement data via the rear-panel EXT TRIG IN connector. Related command: GATESWP

GAUSIAN  Selects Gaussian statistical distribution for the power distribution trace.

grat control  Presents a menu for controlling the displayed graticule.

GRAT on/off  Turns the displayed graticule on and off. Related command: GRAT
GRATSCR\_ON\_OFF Controls the positioning of the horizontal graticule lines. Related command: GRATSCR\_L

HELP\_ON\_OFF Displays on-line definitions.

HIGHEST\_PEAK Moves a trace marker to the highest detected signal peak. Related command: MKPK H

HOLD Deactivates an active function to prevent accidental setting changes. Related command: HD

HOLD Deactivates an active function to prevent accidental setting changes. Related command: HD

HORIZ\_OFFSET Sets the horizontal offset of 3-dimensional trace displays. Related command: THREEDH

HP\_MSIB\_CARD Accesses memory on cards and other HP-MSIB devices. Related command: MSI

HP\_IB\_DISK Accesses an HP-IB external memory device connected via HP-IB to the system. Related command: MSI

HSWP IN OUT Rear-panel input and output connector for the high sweep (HSWP) signal.

HYS\_LEVEL Defines the change in video-signal level required for video triggering. Related command: VTH

IGEN\_LIMIT Option 001 only Controls current limiting of the current source. Related command: IGEN\_LIMIT

IGEN\_ON\_OFF Option 001 only Turns on or off and sets the value of the current source. Related command: IGEN

INIT\_PDL HP 71451B Option 003 only Initializes the polarization dependent loss (PDL) measurement procedure. Related command: PDL\_INIT

INSERT or... Displays the SELECT\_CHAR softkey for inserting characters into text.

INSTR Assigns the HP 70004A display’s front-panel keys to selected master modules.

INST\_MODES Selects the type of instrument operations performed by HP 71451A instruments. Related command: INST\_MODE

2-10 Optical Spectrum Analyzer Functions
INSTR PRESET  Resets the optical spectrum analyzer to a known preset state. Related command: IP

INTRAON·OFF  Displays the trace points used to calculate FWHM and power.

INTEGFT·FROM·PK  Selects integration points based on amplitude level from peak response.

INTEGFT·MENU  Accesses a menu that selects the trace points for calculating FWHM and power.

INTEGFT·STOP·WL  Sets the upper limit of integration points based on the ending wavelength.

INTEGFT·START·WL  Sets the lower limit of integration points based on the starting wavelength.

INTRNL·MEMORY  Selects the optical spectrum analyzer’s internal memory for memory operations. Related command: MEM and MSI

KEY·CONTROL  Accesses a menu for creating, saving, and recalling user-defined menus.

LAST·SEGMENT  Enters a limit-line segment at the end of the limit-line table. Related command: LIMIBOT

LED  Returns local front-panel control.

LED  Turns on the LED advanced-measurement program. Related command: LED_

LEFT·PEAK  Moves a marker left on the display to the next signal peak. Related command: MKPK NL

LEFT·PIT  Moves a marker left on the display to the next signal pit. Related command: MKPK NLPI

LIMIT·AMP·COR  Accesses a menu for loading and editing amplitude-correction values to and from limit-line tables.

LIMIT·LINES  Displays a menu for creating, editing, and displaying limit lines.

LIMITS·ON·OFF  Turns on and off limit-line testing. Related command: LIMITEST

LIGHT·SOURCE  Option 002 only Presents a softkey for controlling built-in white-light source.
LINE Triggers the sweep using the ac power-line voltage. Related command: TM LINE
LINERR Selects a linear amplitude scale. Related command: LN
LINES on/off Turns on or off the interpolation of data between trace measurement points. Related command: LINES
LOAD FILE Recalls a file stored in memory. Related command: LIMIRCL, LOAD, RCLD, RCLS, RCLT, and RCLU
LOCKOUT ANNOTATION Prevents the display of annotation. Related command: ANNOFF
LOG dB/DIV Selects a logarithmic amplitude scale. Related command: LG
LORENZ Selects a Lorenzian statistical distribution for the power distribution trace.
LOWER-LIMIT COR Stores a lower-limit line as amplitude-correction values for a specific wavelength range. Related command: LIMTOCOR
ISN Front-panel indicator light that turns on when the optical spectrum analyzer is receiving data or instructions over HP-IB.
MANUAL ALIGN Performs an AUTO ALIGN at specified wavelengths.
Marker Presents a menu for accessing and controlling trace markers.
Marker menu Presents a menu for defining peak and pit excursion.
Marker readout Selects the measurement parameter indicated by the marker. Related command: MKREAD
MARKER TUNE Tunes the wavelength of the preselector. Related command: MKTUNE
MAX HOLD A Updates trace A with the maximum values from each successive sweep. Related command: MXMH
MEAS Front-panel indicator light that turns on when the optical spectrum analyzer sweeps the wavelength range and blanks during retrace.

2.12 Optical Spectrum Analyzer Functions
**MENU** Displays the optical spectrum analyzer’s softkeys.

MINHOLD: A Updates trace A with the minimum values from each successive sweep. Related command: MINH

MINIMUM PEAK Moves a marker to the smallest displayed signal peak. Related command: MKPK MI

MINIMUM PIT Moves a marker to the smallest displayed signal pit. Related command: MKPK MIPT

MINIMUM POINT Moves a marker to the lowest detected level on the trace. Related command: MKMIN

MKSTOP:ON:OFF Stops the sweep at the marker. Related command: MKCONT

MKNOISE:ON:OFF Displays the rms noise level at the marker. Related command: MKNOISE

MKPAUSE:ON:OFF Pauses the sweep at the marker position. Related command: MKPAUSE

MKRBW:ON:OFF Measures the bandwidth of a signal. In the DFB advanced-measurement program, sets the amplitude at which the bandwidth value is measured. Related command: MKBWA

MKRBW:ZM:BU Accesses the marker bandwidth and zoom bandwidth softkeys.

MKR:RM:ON:OFF Displays an active marker on a trace. Related command: MKN and MKOFF

MKR:TRACE:A, B, C Positions the active marker on trace A, B, or C. Related command: MKTRACE

MONO:INPUT Selects the front-panel MONOCHROMATOR INPUT connector for stimulus-response measurements. Related command: SRINPUT NORMAL

**MONOCHROMATOR INPUT** Front-panel input connector that receives the input light for the HP 71451B optical spectrum analyzer. On an HP 71450B/2B, this connector is labeled OPTICAL INPUT.

**MONOCHROMATOR OUTPUT** Front-panel output connector serving as the external output of the monochromator on the HP 71451B optical spectrum analyzer.

NEXT PAGE Displays another page of screen data.
NEXT PEAK Moves a displayed marker to the next-highest signal peak.

NEXT PEAK Moves a displayed marker to the next-highest signal peak. Related command: MKPK NH

NEXT PIT Moves displayed marker to the next-deepest signal pit. Related command: MKPK NHPIT

NEXT SEGMENT Selects the next row in the limit-line table for data entry. Related command: LIMINEXT

NORTH STATES Reserves a number of instrument-state files for saving instrument states. Related command: NSTATE

NORM ON/OFF Turns trace normalization on or off. Related command: NORM

NORMAL ON/OFF Places an active marker on the trace.

ONESHOT MATH Displays a menu of trace-math functions that are performed once per key press.

OPTICAL INPUT Front-panel input connector that receives the input light for the HP 71450B/2B optical spectrum analyzer. On an HP 71451B, this connector is labeled MONOCHROMATOR INPUT.

OPTIMIZE Ensures the DFB advanced-measurement program locates the laser’s side modes.

OPTSENSE ON/OFF Optimizes the automatic measurement routine for sensitivity.

ORDER AUTOMATIC Allows second-order use of the diffraction grating modes or limits operation to the first order. Related command: GRATORDER

OSA Selects normal optical spectrum analysis.

OSA PULSE Places the optical spectrum analyzer in an operation mode that is optimized for making accurate fast pulse measurements. Related command: INSTMODE

P STATE ON/OFF Protects the contents of instrument-state files. Related command: PSTATE

PARTIAL ERASE Erases all volatile contents of internal memory. Related command: PERASE

2-14 Optical Spectrum Analyzer Functions
PAUSE  Pauses execution of a DLP during debugging. Related command: PAUSE

PF INPUT  Selects the front-panel PHOTODETECTOR INPUT connector for stimulus-response measurements. Related command: SRINPUT DIODE

PDMEAS on/off  Displays the power distribution of a photo diode. Related command: PDMEAS

PDL  HP 71451B Option 003 only  Runs the polarization dependent loss measurement program. Related command: PDL_

PEAK EXCURS N  Defines a peak for marker peak-search functions. Related command: MKPX

PEAK SEARCH  Places an active marker on the highest amplitude trace point.

PEAK THRESH  Selects an amplitude window for measurement data when using the Fabry-Perot (FP) advanced-measurement program.

PEAKS on/off  Displays which response peaks are used in measurement calculations.

PERIOD  Configures marker readouts in period.

PERSIST on/off  Simulates analog displays. Related command: PERSIST

PHOTO DIODE  Selects instrument operation for testing photo-diode detectors.

PHOTODETECTOR INPUT  Front-panel external input connector for the photodetector on the HP 71451B optical spectrum analyzer.

PIT EXCURS N  Defines a pit for marker pit-search functions. Related command: MKPTX

pit, min markers  Presents a menu of functions for locating signal pits and the minimum trace point.

PLOT  Plots the display on a Hewlett-Packard plotter.

POINT  Determines limit-line interpolation.

POWER FORCAL  Enters the light source’s power level for user calibrations. Related command: CALPWR

POWER METER  Selects instrument operation as a power meter.
POWERON IP  Specifies that the instrument be placed in its preset state whenever it is turned on. Related command: POWERON

POWERON LAST  Specifies the instrument’s state immediately after being turned on. Related command: POWERON

poweron menu  Presents a menu for selecting the instrument’s state after it is turned on.

POWERON RECALL  Restores a specified state-register file each time the instrument is turned on. Related command: RCLS

PRESEL  Selects instrument operation as a preselector.

PRESET USER  Restores the default user-menu softkeys. Related command: KEYPST

prev menu  Returns to the previously displayed softkeys.

PRINT  Prints the display on a Hewlett-Packard graphics printer.

PULSE WIDTH  Adjusts the pulse width of the rear-panel RDC SYNC OUT or CURRENT SOURCE connectors. Related command: IGENPW

PURGE FILE  Erases files from default memory. Related command: DISPU

PURCAL on/off  Turns on and off the use of any user-calibration derived power correction offset. Related command: CALCOR

RBR/SPAN RATIO  Specifies the ratio between the resolution-bandwidth and span settings. Related command: RBR

recall  Accesses a menu for recalling files from memory.

recall from...  Presents a menu for cataloging and changing default memory.

RECALL LIMIT  Loads a stored limit-line file into the limit-line table. Related command: LIMIRCL

RECALL MEMORY  Loads non-ASCII DLP program data to internal memory. Related command: RCLD

RECALL STATE  Sets the instrument state to the settings saved in a state file. Related command: RCLS

RECALL TRACE A  Loads trace data from a file into trace A. Related command: RCLT

2-16  Optical Spectrum Analyzer Functions
RECALL USER: Loads a set of user-defined softkeys into the USER menu. Related command: RCLU

RECALL USERKEY: Loads a set of user-defined softkeys into the USER menu.

REFREF: Sets the reference level equal to the marker amplitude. Related command: MKRL

REF LEVEL: Sets the reference level.

REF LVL: Specifies the reference level value at the reference-level position. Related command: RL

REF LVL POSN: Changes the reference-level position. Related command: RLPOS

REL LEFT: Positions the left-side marker for measuring the bandwidth of a signal. Related command: MKAL

REL RIGHT: Positions the right-side marker for measuring the bandwidth of a signal. Related command: MKAR

RELATION ON OFF: Specifies relative or absolute limit-line values. Related command: LIMREL

REPLACE or...: Displays the SELECT CHAR softkey for replacing characters.

RES BW: Manually sets the resolution bandwidth filtering.

RES BW Auto: Manually sets the resolution bandwidth filtering. Related command: RB and RBR

RESTART: Performs an automatic MMS configuration routine. Related command: STARTUP

RIGHT PEAK: Moves a marker right on the display to the next signal peak. Related command: MKPK NR

RIGHT PIT: Moves a marker right on the display to the next signal pit. Related command: MKPK NRPIT

RMT: Front-panel indicator light that turns on when the optical spectrum analyzer is being controlled by a computer over the HP-IB.

ROM VERSION: Displays the date code of the read-only memory (ROM). Related command: REV
save  Accesses a menu for saving traces, instrument states, limit-lines, and user menu files to memory.

SAVE LIMIT  Stores the contents of the limit-line table in a limit-line file. Related command: LIMISAV and STOR

SAVE MEMORY  Stores all non-ASCII, internal-memory, files to external memory. Related command: SAVED and STOR

SAVE STATE  Saves the current instrument state in a file. Related command: SAVES and STOR

SAVES TO  Presents a menu for cataloging or changing default memory. Related command: STOR

SAVE TRACE A  Stores trace A in a file. Related command: SAVET and STOR

SAVE USER  Stores the current menu of user softkeys in a file.

SAVE USERKEY  Stores the current menu of user-defined softkeys in a file. Related command: SAVEU and STOR

SELECT CHAR  Places selected characters at the displayed cursor.

SELECT SEGMENT  Movers the limit-line editing field to the next limit-line segment.

SEINS  Sets the sensitivity.

SEINS Automa  Sets the sensitivity. Related command: SENS

SERVICE  Presents a menu for obtaining knowledge about system parameters, module level parameters, and module HP-MSIB addresses.

SERVICE REQUEST  Enables the service request mode.

SHOW STATES  Displays a menu for obtaining current instrument-state information.

SIG TRK LIMIT  Sets the amplitude variation tolerated by the signal-tracking functions. Related command: MKTV

SIG TRK ON OFF  Keeps a marked signal at the center of the display. Related command: MKTRACK

SINGLE SWEEP  Initiates one sweep of the measurement range. Related command: SNGLS

SLOPE  Determines limit-line interpolation.
SMR on/off  Displays a trace showing the DFB laser’s side mode used to calculate SMR.

SOURCE on/off  HP 71451B Option 003 only  Turns on or off the internal white light source. Related command: PDLSRC and PDL_SRC?

SPACE  Enters a space character.

Δ→SPAN  Sets the measurement span equal to the wavelength separation of delta markers. Related command: MKSP

SPAN  Sets the wavelength span. Related command: SP

SPAN autoMan  Changes the wavelength span set by the automatic measurement routine. Related command: AUTOMSP

SRQ  Front-panel indicator light that turns on when the optical spectrum analyzer has requested service from a computer over HP-IB.

START  Sets the start wavelength.

START  Sets the start wavelength. Related command: STARTWI.

STARTup autoMan  Controls the automatic MMS configuration that occurs when the instrument is turned on. Related command: STARTUP

STATE  Presents a menu for instrument configuration and the saving and recalling of files.

STATE  Lists the state of current measurement settings under operator control. Related command: DSPMODE STATE

STEP  Executes DLP commands one at a time.

STM resp  Selects instrument operation for performing stimulus-response measurements. Related command: MEASURE

STOP  Sets the stop wavelength. Related command: STOPWI.

STOP  Sets the stop wavelength. Related command: STOPWI

STORE  Stores the trace in temporary memory.

STORE THRU E  Stores the calibration response into trace E. Related command: STORREF
STR-BND ON-OFF Displays a trace showing the DFB laser’s stop bandwidth.

Sweep ON-OFF Turns the sweep on and off. Related command: SWEEP

SWPTIME Configures marker readouts in sweep time.

SWPTIME AutoMan Sets the sweep time. Related command: ST Snc-out

TakE SWEEP Updates the displayed trace in preselector mode.

Threshold ON-OFF Blanks traces below an amplitude threshold level. Related command: TH

TITLE Displays a menu used for writing messages on the display. Related command: TITLE

TLK Front-panel indicator light that turns on when the optical spectrum analyzer is sending data or instructions over HP-IB.

to Center Moves the wavelength at the marker to center screen.

TO REF LEVEL Moves the amplitude at the marker to the reference level.

trace A, B, C Selects the active trace for writing, processing, or storing.

TRACE LENGTH Changes the number of trace points measured for traces A, B, and C. Related command: TRDEF

trace linInATH Displays a menu of linear trace-math functions that are for use when the optical spectrum analyzer’s amplitude scale is set to linear units.

trace logINATH Displays a menu of logarithmic trace-math functions that are for use when the optical spectrum analyzer’s amplitude scale is set to logarithmic units.

Trace PRESET Resets trace functions to their default state. Related command: TRPST

Traces Presents a menu for controlling traces.

TRANS-Z IN Rear-panel input connector used in the photodetector instrument mode.

2-20 Optical Spectrum Analyzer Functions
**TRIGGER:FREE**  Selects free-run triggering. Related command: TM
FREE

**TRNSZLK:On/off**  Locks the optical spectrum analyzer’s internal
transimpedance amplifier. Related command: TRNSZLOCK

**type**  Selects the type of lines used for limit lines. Related command:
LIMITYPE

**units:menu**  Selects the amplitude scale’s units.

**UPPER:AMP:COR**  Stores an upper limit line as amplitude-
correction values for a specific wavelength range. Related command:
LIMITOCOR

**UPPER:LOWER**  Specifies whether the limit-line data is for upper or
lower limit lines. Related command: LIMIHALF

**[USER]**  Presents the [USER] menu.

**USERCAL:PRESET**  Erases all user calibration data. Related
command: CAL

**VERSION**  Displays an advanced-measurement program’s version
number.

**VERT:OFFSET**  Sets the vertical offset of 3-dimensional trace
displays. Related command: THREEDV

**VID:AVG:On/off**  Turns on video averaging. Related command:
VAVG

**VID:BW:Auto/Man**  Manually sets the video bandwidth filtering.
Related command: VB

**VID:LIN:On/off**  Displays or hides video-trigger lines. Related
command: VTDL

**VIDEO**  Triggers zero-span sweeps using the input signal. Related
command: TM VID

**VIDEO:LEVEL**  Specifies the trigger level for the video triggering.
Related command: VTL

**VIEW:A**  Displays trace data that has been temporarily stored.
Related command: VIEW

**VIEW:B**  Displays trace data that has been temporarily stored.
Related command: VIEW
VIEW C  Displays trace data that has been temporarily stored. Related command: VIEW

W-LIGHT ALIGN  Runs an automatic alignment for the fiber positioner’s tracing table using a broad spectra light source (600 nm to 1700 nm). Related command: ALIGN

WARNING on/off  Displays or hides warning messages. Related command: WARNCTRL

WATT  Selects linear amplitude units in watts.

WAVELEN  Configures marker readouts in wavelength.

WAVELEN FOR CAL  Enters the light source’s wavelength for a user calibration. Related command: CALWL

WAVELEN OFFSET  Offsets the wavelength annotation. Related command: WOFFSET

WAVELEN VALUE  Enters a wavelength value into the limit-line table. Related command: LIMITWL

WaveIn  Displays a menu for changing wavelength settings and for performing automatic measurements.

WHITE on/off  Option 002 only  Turns on or off the internal white light source. Related command: LIGHT

W-LIGHT CAL on/off  Turns on and off the use of any user-calibration derived wavelength correction offset. Related command: CALCOR

W-LIGHT LIMIT on/off  Expands the wavelength range. Related command: LIMIT

W-LIGHT STEP auto/man  Changes the center wavelength in increments. Related command: SS

×  Used for entering values as a multiplier.

ZERO  Increases amplitude accuracy by compensating for temperature drift. Related command: ZERO

ZOOM TO RES BW  Views a signal in a 0 Hz span at the resolution bandwidth specified. Related command: ZOOMRB
Programming Commands

The following pages are a compilation of all current programming commands for the optical spectrum analyzer. More information on each command can be found in the *HP 71450B/IB/2B Optical Spectrum Analyzer Programmer’s Guide.*

This reference is intended for use by the experienced optical spectrum analyzer programmer.

To find a programming command that performs a particular function, refer to the “Functional Index,” which groups the commands according to similar function. The command and a brief definition are shown in this index. Once the desired command is found, refer to the alphabetical listing for further command definition and syntax information.

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Notation Conventions

The following type styles and symbols found in this guide indicate the following:

**BOLD TYPE** All characters appearing in bold type are keywords and must appear exactly as shown.

**CAPITAL LETTERS** All characters which are capital letters are secondary keywords and appear within the keyword syntax. They must appear exactly as shown, and their meanings can be found in the “Secondary Keyword Summary.”

< > Characters appearing in angular brackets are considered to be elements of the language being defined. Their meanings can be found in the section “Syntax Conventions” unless otherwise specified with the keyword definition.

[] Square brackets indicate that whatever occurs within the brackets is optional.

| “or”: Indicates a choice of exactly one element from a list (for example, <a>|<b> indicates <a> or <b> but not both.

( ) Parentheses are used to clarify which elements are to be chosen from.

_ “underscore”: Indicates that a space must be placed at the indicated location (for example, A_<a> indicates that there must be a space between the keyword A and the element <a>.

::= “is defined as” (for example, <a>::= <b><c> indicates that <a> can be replaced by the series of elements <b><c> in any statement where <a> occurs).

{ } Curly brackets indicate that whatever occurs within the brackets can have 0 or more repetitions.

3.2 Programming Commands
Syntax Conventions

<A-block data field> is defined as #A<length><command list> (use when the length of the command list is known).

<A-block data format> is defined as #A<length><command list>.

<amplitude unit> is defined as DB | DBM | DBMV | DBUV | MV | UV | V | MW | UW | W.

<character> is defined as S_p * - < = > @ . \{ \} " ! " # $ % & ' ( ) + . . / 0 1 2 3 4 5 6 7 8 9: ; A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ | a b c d e f g h i j k l m n o p q r s t u v w x y z _

<character string> is defined as a list of characters.

<compatible list> is defined as any optical spectrum analyzer command or list of commands separated by semicolons.

<compatible function> is defined as any optical spectrum analyzer command that operates on other functions, that is, contains predefined function in its syntax.

<data byte> is defined as an 8-bit byte containing numeric or character data.

<delimiter> is defined as ! # $ % & ' ( ) . / = | @ .

<destination> is defined as TRA | TRB | TRC |<user-defined trace> |<user-defined variable> |<predefined variable> |<trace range>.

<digit> is defined as 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9.

<frequency unit> is defined as HZ | KHZ | MHZ | GHZ.

<I-block data field> is defined as #I<command list>END; (use when the length of the command list is not known).

<integer> is defined as a positive or negative integer in the range of -32768 through +32767.

<key label> is defined as 2 to 11 characters long that is defined by the FUNCDEF command. Choice of characters A through Z and the underscore (_). The underscore should be used as the second or third character of the label. It is not recommended to omit the underscore.
Note: The underscore used as the last character in a FUNCDEF label causes the optical spectrum analyzer to automatically use the <key label> as the title for a user-defined key.

<key number> is defined as <integer> from 1 to 14, <trace element>, <predefined function>, <predefined variable>, <user-defined variable>.

<lsb length> is defined as <data byte> representing the least significant byte of a two-byte word that describes the number of bytes returned or transmitted.

<mshb length> is defined as <data byte> representing the most significant byte of a two-byte word that describes the number of bytes returned or transmitted.

<number> is defined as <integer> | <real>.

<power unit> is defined as W | MW | UW | NW | PW.

<predefined function> is defined as an optical spectrum analyzer command that returns a number that can be operated on by other commands called compatible functions.

<predefined variable> is defined as the values of the following variables change depending on the current instrument settings. Each variable represents the value of the command function that has the same names as the variable.

CALPWR, DL, LG, MKA, MKACT, MKAL, MKAR, MKN, MKP, MKPAUSE, MKPX, MTK, MKTV, NSTATE, RB, RBR, RL, RLFOS, ROFFSET, SP, SS, ST, TH, VB, VTL.

<real> is defined as positive or negative real number.

<source>, <source 1>, and <source 2> are defined as TRA|TRB|TRC |<user-defined trace>|<user-defined variable>|<trace range>|<number>|<units>.

<time unit> is defined as S | MS | US.

<trace element> is defined as a value contained in one trace point of trace A, trace B, trace C, or user-defined trace. Values in <trace element> are defined by <trace range>.

<trace range> is defined as values contained in any trace data of trace A, trace B, trace C, or user-defined trace. The range is defined by TRDEF. The range of the element can be -32768 to +32767.

3.4 Programming Commands
measurement units for logarithmic trace data; 0 to 10000 measurement units for linear trace data.

<user-defined function> is defined as 1 to 12 characters defined by the FUNCDEF or ACTDEF command. Choice of characters is A through Z, 0 through 9, and underscore (_); first character must be a letter and numbers must be preceded by the underscore. Using an underscore as the last character causes the label to be used as a key label in the USER menu.

<user-defined trace> is defined as 1 to 12 characters defined by the TRDEF command. Choice of characters is A through Z, 0 through 9, and underscore (_); first character must be a letter and numbers must be preceded by the underscore.

<user-defined variable> is defined as 1 to 12 characters defined by the VARDEF or ACTDEF command. Choice of characters is A through Z, 0 through 9, and underscore (_); first character must be a letter and numbers must be preceded by the underscore.

<wavelength unit> is defined as M | MM | UM | NM | PM | ANG.
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<td>Display Marker</td>
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<td>Display Variable</td>
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<td>Dispose User Menu</td>
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<td>Graph Trace</td>
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<td>Identify Item</td>
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<td>Lines</td>
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<td>Lock Annotations Off</td>
<td>ANNOFF</td>
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<td>Origin</td>
<td>OR</td>
</tr>
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<td>Output Instrument-Window Params</td>
<td>OP</td>
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<tr>
<td>Pen Down</td>
<td>PD</td>
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<tr>
<td>Pen Up</td>
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<td>Persistence Display</td>
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<tr>
<td>Plot Absolute</td>
<td>PA</td>
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<tr>
<td>Plot Relative</td>
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<td>Pointer</td>
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<td>Sound a beep</td>
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<td>Scale Graphics</td>
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<td>Select Pen</td>
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<td>Text</td>
<td>TEXT</td>
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<tr>
<td>Title Entry</td>
<td>TITLE</td>
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<tr>
<td>Trace Conditions</td>
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<td>View Item</td>
<td>VW</td>
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### Information Functions

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<tr>
<td>Catalog</td>
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<tr>
<td>Configuration</td>
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<td>Display Mode</td>
<td>DSPMODE</td>
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<tr>
<td>Error</td>
<td>ERR</td>
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<tr>
<td>Extended Error Query</td>
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<td>Identification</td>
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### Information Functions (continued)

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<tr>
<td>Instrument State</td>
<td>STATE</td>
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<tr>
<td>Limit Line</td>
<td>LIMLINE</td>
</tr>
<tr>
<td>Limit Line: Beep</td>
<td>LIMBEEP</td>
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<tr>
<td>Limit Line: Fail</td>
<td>LIMFAIL</td>
</tr>
<tr>
<td>Limit Line: Test</td>
<td>LIMITEST</td>
</tr>
<tr>
<td>Memory</td>
<td>MEM</td>
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<tr>
<td>Message</td>
<td>MSG</td>
</tr>
<tr>
<td>Module Address</td>
<td>MODADD</td>
</tr>
<tr>
<td>Module Identification</td>
<td>MODID</td>
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<tr>
<td>Plot</td>
<td>PLOT</td>
</tr>
<tr>
<td>Return Display-Mode Text</td>
<td>DSPTEXT</td>
</tr>
<tr>
<td>Return Reported Warnings</td>
<td>WARN?, XWARN?</td>
</tr>
<tr>
<td>Revision</td>
<td>REV</td>
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<tr>
<td>Self Test</td>
<td>TEST</td>
</tr>
<tr>
<td>Serial Number</td>
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<tr>
<td>Status Byte</td>
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<tr>
<td>Sweep Mode</td>
<td>SWPMODE?</td>
</tr>
<tr>
<td>Trace Status</td>
<td>TRSTAT</td>
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<tr>
<td>User Error Report</td>
<td>USERERR</td>
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<td>User Message</td>
<td>USERMSG</td>
</tr>
<tr>
<td>User Warning</td>
<td>USERWARN</td>
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<tr>
<td>Warning Control</td>
<td>WARNCTRL</td>
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### Instrument-State Functions

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<tr>
<td>Activate Transimpedance Input</td>
<td>XAMPSW</td>
</tr>
<tr>
<td>Align to Preset Values</td>
<td>ALIGNPRST</td>
</tr>
<tr>
<td>Chop Mode</td>
<td>CHOP</td>
</tr>
<tr>
<td>Erase Memory</td>
<td>ERASE</td>
</tr>
<tr>
<td>Instrument Mode</td>
<td>INSTMODE</td>
</tr>
<tr>
<td>Instrument Preset</td>
<td>IP</td>
</tr>
<tr>
<td>Instrument State</td>
<td>STATE</td>
</tr>
<tr>
<td>Limit Line: Recall</td>
<td>LIMIRCL</td>
</tr>
<tr>
<td>Load</td>
<td>LOAD</td>
</tr>
<tr>
<td>Measure Photodiode</td>
<td>PDMEAS</td>
</tr>
<tr>
<td>Number of State Registers</td>
<td>NSTATE</td>
</tr>
<tr>
<td>Optical Switch</td>
<td>OPTSW</td>
</tr>
<tr>
<td>Partial Erase</td>
<td>PERASE</td>
</tr>
<tr>
<td>Power-On State</td>
<td>POWERON</td>
</tr>
</tbody>
</table>

### 3.10 Programming Commands
**Instrument-State Functions (continued)**

- Preset User-Defined Keys: KEYPST
- Protect State: PSTATE
- Recall State: RCLS
- Startup Configuration: STARTUP
- Save State: SAVES
- Sweep Control: SWEEP
- Trace Preset: TRPST
- User-Key Lock: USRLCK
- White Light Source: LIGHT

**Limit-Line Functions**

- Limit Line: LIMILINE
- Limit Line: Amplitude: LIMIAMP
- Limit Line: Beep: LIMIPEEP
- Limit Line: Delete: LIMIDEL
- Limit Line: Editing Done: LIMIDONE
- Limit Line: Editor: LIMEDIT
- Limit Line: Half: LIMIH alf
- Limit Line: Recall: LIMIRCL
- Limit Line: Relative: LIMIREL
- Limit Line: Save: LIMISAV
- Limit Line: Segment: LIMISEG
- Limit Line: Segment Delete: LIMISDEL
- Limit Line: Test: LIMITEST
- Limit Line: Type: LIMITYPE
- Limit Line: Wavelength: LIMIWL
- Next Limit Line Segment: LIMINEXT
- Scroll Limit Line Segments: LIMISCRIL
- Select Bottom Limit Line Segment: LIMIBOT

**Marker Functions**

- Display Marker: MK
- Marker Active: MKACT
- Marker Amplitude: MKA
- Marker Amplitude Left: MKAL
- Marker Amplitude Right: MKAR
- Marker Bandwidth: MKBW
- Marker Bandwidth Amplitude: MKBWA

---

**Programming Commands 3-11**
Marker Functions (continued)

Marker Continue MKCONT
Marker Delta MKD
Marker Minimum MKMIN
Report active delta marker MKDACT?
Set reference marker frequency MKDREFF
Set reference marker amplitude MKDREA
Set reference marker bucket MKFABS
Marker Noise MKNOISE
Marker Normal MKN
Marker Off MKOFF
Marker Position MKP
Marker Pause MKPAUSE
Marker Peak MKPK
Marker Peak Excursion MKPX
Marker Pkt Excursion MKPITX
Marker Readout MKREAD
Marker Span MKSP
Marker Stop MKSTOP
Marker to Center Wavelength Step Size MKSS
Marker to Center Wavelength MKCWL
Marker to Reference Level MKRL
Marker Time MKT
Marker Trace MKTRACE
Marker Tracking MKTRACK
Marker Tracking Variance MKTV
Marker Tune MKTUNE
Marker Type MKTYPE
Marker Wavelength MKWL
Zoom to Resolution Bandwidth ZOOMRB

Math and Move Functions

A - B → A AMB
A - C → A AMC
A - B + DL → A AMBPL
(A - B) - C → A AMBMC
(A - B) - C + DL → A AMBMCP
A - C + DL → A AMCPL
A + B → A APB
A + C → A AMC
A × DL / B → A ADRTL
A × DL / C → A ADCTL
A × DL / (A + B) → A ADAPBTL
A × DL / (A + B + C) → A ADAPBPCTL
(A + B) × DL / C - A ADAPBPCTL

3-12 Programming Commands
Math and Move Functions (continued)

<table>
<thead>
<tr>
<th>Absolute</th>
<th>ABS</th>
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<tr>
<td>Amplitude Units</td>
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<td>Average</td>
<td>AVG</td>
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<tr>
<td>B → C</td>
<td>BTC</td>
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<tr>
<td>B → DL → B</td>
<td>BML</td>
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<tr>
<td>Bit</td>
<td>BTR</td>
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<tr>
<td>Compress</td>
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<tr>
<td>Concatenate</td>
<td>CONCAT</td>
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<tr>
<td>Convert to Position Units</td>
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<tr>
<td>Divide</td>
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<tr>
<td>Exchange</td>
<td>XCH</td>
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<tr>
<td>Exchange Traces B and C</td>
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<tr>
<td>Exponent</td>
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<td>Fast Fourier Transform</td>
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<td>Logarithm</td>
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<td>Mean</td>
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<td>MIN</td>
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<td>Modulo</td>
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<td>Move</td>
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<td>Multiply</td>
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<td>Peaks</td>
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<td>Root Mean Square</td>
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<td>Smooth Trace</td>
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<td>Square Root</td>
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<td>Standard Deviation of Trace Amplitudes</td>
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<td>Sum of Square</td>
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<td>Trace A Exchange Trace B</td>
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<tr>
<td>Trace A Exchange Trace C</td>
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<tr>
<td>Trace Data Input and Output</td>
<td>TRA/TRB/TRC</td>
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<td>Trace Window</td>
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<tr>
<td>Variance</td>
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<td>Video Average</td>
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Memory Utility Functions

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<tr>
<td>Catalog</td>
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<tr>
<td>Display Mode</td>
<td>DSPMODE</td>
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<td>Dispose</td>
<td>DISPOSE</td>
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<td>Erase Memory</td>
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<td>Format</td>
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<td>Limit Line: Recall</td>
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<td>Limit Line: Save</td>
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<tr>
<td>Load</td>
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<tr>
<td>Mass Storage Interface</td>
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<td>MEM</td>
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<tr>
<td>Number of State Registers</td>
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<td>Partial Erase</td>
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<td>Protect</td>
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<td>Protect State</td>
<td>PSTATE</td>
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<tr>
<td>Purge File</td>
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<tr>
<td>Recall &quot;Down-Loadable&quot; Programs</td>
<td>RCLD</td>
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<tr>
<td>Recall State</td>
<td>RCLS</td>
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<tr>
<td>Recall Trace</td>
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<tr>
<td>Recall User Keys</td>
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<tr>
<td>Return Display-Mode Text</td>
<td>DSPTEXT</td>
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<tr>
<td>Save “Down-Loadable” Programs</td>
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<tr>
<td>Save State</td>
<td>SAVES</td>
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<tr>
<td>Save User Keys</td>
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<td>Store File</td>
<td>STORE</td>
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<tr>
<td>Store Trace</td>
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Polarization Dependent Loss (PDL) Functions (Option 003 only)

<table>
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<tbody>
<tr>
<td>PDL: Auto-scale During Measurement</td>
<td>PDLSCALE</td>
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<tr>
<td>PDL: Calculate and Display PDL</td>
<td>PDLCALC</td>
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<tr>
<td>PDL: Display Revision Number</td>
<td>PDLREV</td>
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<tr>
<td>PDL: Initialize Measurement</td>
<td>PDLINT</td>
</tr>
<tr>
<td>PDL: Light Source On/Off</td>
<td>PDSLRC</td>
</tr>
<tr>
<td>PDL: Query Detector Type</td>
<td>PDL_DEV</td>
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<tr>
<td>PDL: Return Light Source Status</td>
<td>PDL_SRC</td>
</tr>
<tr>
<td>PDL: Return Revision Number</td>
<td>PDL_REV</td>
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<tr>
<td>PDL: Select Detector Type</td>
<td>PDLDEV</td>
</tr>
<tr>
<td>PDL: Start Measurement</td>
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<tr>
<td>PDL: Terminate PDL Program</td>
<td>PDLEXIT</td>
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3.14 Programming Commands
**Program-Control and Interrupt Functions**

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<tr>
<td>Abort</td>
<td>ABORT</td>
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<tr>
<td>Clear Status Byte</td>
<td>CLS</td>
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<tr>
<td>Debug</td>
<td>DEBUG</td>
</tr>
<tr>
<td>Done</td>
<td>DONE</td>
</tr>
<tr>
<td>Enter Via HP-IB</td>
<td>ENTER</td>
</tr>
<tr>
<td>If/Then/Else/Else/Endif</td>
<td>IF/THEN</td>
</tr>
<tr>
<td>On Marker Pause</td>
<td>ONMKR</td>
</tr>
<tr>
<td>On Menu Keypress</td>
<td>OMMENU</td>
</tr>
<tr>
<td>On User Keypress</td>
<td>ONUSER</td>
</tr>
<tr>
<td>On Window Recreation</td>
<td>OWIN</td>
</tr>
<tr>
<td>Output Via HP-IB</td>
<td>OUTPUT</td>
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<tr>
<td>Pause</td>
<td>PAUSE</td>
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<tr>
<td>Release HP-IB</td>
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<tr>
<td>Repeat/Until</td>
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<tr>
<td>Request Service Conditions</td>
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<td>Return</td>
<td>RETURN</td>
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<td>Service Request</td>
<td>SRQ</td>
</tr>
<tr>
<td>Status Byte</td>
<td>STB</td>
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<tr>
<td>Take Sweep</td>
<td>TS</td>
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<tr>
<td>Time Stamp</td>
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<td>Wait</td>
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**Signal-Path Functions**

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<tbody>
<tr>
<td>Activate Transimpedance Input</td>
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<tr>
<td>Continuous Sweep</td>
<td>CONTS</td>
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<tr>
<td>Optical Switch</td>
<td>OPTSW</td>
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**Sweep and Trigger Functions**

<table>
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<tbody>
<tr>
<td>Select ADC trigger</td>
<td>ADCTR</td>
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<tr>
<td>Delays ADC trigger</td>
<td>ADCTRGLY</td>
</tr>
<tr>
<td>Sets ADC SYNC OUT status</td>
<td>ADCTRGSY</td>
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<tr>
<td>Fetch</td>
<td>FETCH</td>
</tr>
<tr>
<td>Single Sweep</td>
<td>SNGLS</td>
</tr>
<tr>
<td>Sweep Control</td>
<td>SWEEP</td>
</tr>
<tr>
<td>Sweep Time</td>
<td>ST</td>
</tr>
<tr>
<td>Take Sweep</td>
<td>TS</td>
</tr>
<tr>
<td>Time-Gated Measurements</td>
<td>GATESW</td>
</tr>
<tr>
<td>Trigger Mode</td>
<td>TM</td>
</tr>
<tr>
<td>Video Trigger Hysteresis</td>
<td>VTH</td>
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<tr>
<td>Video Trigger Level</td>
<td>VTL</td>
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**Stimulus Response Measurements**

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<thead>
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<tr>
<td>Normalization</td>
<td>NORM</td>
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<tr>
<td>Select optical input</td>
<td>SINPUT</td>
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</table>
### Trace Data Input and Output

<table>
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<tr>
<td>Fetch</td>
<td>FETCH</td>
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<tr>
<td>Load</td>
<td>LOAD</td>
</tr>
<tr>
<td>Measurement Data Size</td>
<td>MDS</td>
</tr>
<tr>
<td>Recall Trace</td>
<td>RCLT</td>
</tr>
<tr>
<td>Store File</td>
<td>STOR</td>
</tr>
<tr>
<td>Store Trace</td>
<td>SAVET</td>
</tr>
<tr>
<td>Take Sweep</td>
<td>TS</td>
</tr>
<tr>
<td>Trace Data Format</td>
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<td>Trace Data Input and Output</td>
<td>TRA/TRB/TRC</td>
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### Stimulus Response and Source Functions

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<tr>
<td>A → B → A</td>
<td>AMB</td>
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<tr>
<td>A → C → A</td>
<td>AMC</td>
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<tr>
<td>Measure Mode</td>
<td>MEASURE</td>
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<tr>
<td>Store Reference</td>
<td>STORE</td>
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### User-Definition Functions

<table>
<thead>
<tr>
<th>Operation</th>
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<tr>
<td>Active Function</td>
<td>ACTDEF</td>
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<tr>
<td>Active Parameter</td>
<td>ACTParm</td>
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<tr>
<td>Clear User-Defined Keys</td>
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<tr>
<td>Define Function</td>
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<tr>
<td>Define User-Defined Key</td>
<td>KEYDEF</td>
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<tr>
<td>Define User-Defined Variable</td>
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<tr>
<td>Define User Key Menus</td>
<td>USERKEY</td>
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<tr>
<td>Display Mode</td>
<td>DSPMODE</td>
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<tr>
<td>Load</td>
<td>LOAD</td>
</tr>
<tr>
<td>Memory</td>
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3.16 Programming Commands
Wavelength Functions

- Automatic Measurement
- Automatic Measurement of Final Span
- Automatic Measurement sensitivity control
- Center Wavelength
- Center-Wavelength Step Size
- Convert Trace Position to Wavelength
- Diffraction Grating Order
- Full Span
- Limit Line: Wavelength
- Marker Bandwidth
- Marker Bandwidth Amplitude
- Marker to Center Wavelength
- Marker Tune
- Marker Wavelength
- Start Wavelength
- Stop Wavelength
- Wavelength Offset
- Wavelength Span
- Wavelength Limit Range

- AUTOMEAS
- AUTOMSP
- AUTOMOPT
- CENTERWL
- SS
- WLUNITS
- GRAORDER
- FS
- LIMWL
- MKBW
- MKBWA
- MKCW
- MKTUNE
- MKWL
- STARTWL
- STOPWL
- WLOFFSET
- SP
- WLLIMIT
Programming Commands

ABORT;
   Stops execution of a user-defined function and returns control to the normal command input level.

ABS_<destination>,<source>;
   Does a point-by-point absolute value of the source variable or trace and stores the result in the destination variable or trace.

ACTDEF_<function name>,<delimiter><text for active function readout> <delimiter>,<initial value>,(<wavelength unit>|ABSM|DBM|W|INT|STEP|<units>)<delimiter><user-defined function routine> {<user-defined function routine>}] <delimiter>,<number>;
   Stores a user-defined function, in internal memory, that operates like an active function.

ACTPARM(_(1|0))[<line number>];
   Turns the display of the active parameter area on or off.
   <line number> ::= 0, 1, 2, 3, 4
   Query response: <character string>

ADAPBTI(_(OFF|ON[0|1])?;
   Divide the display line by the sum of traces A and B and then multiply the result by trace A (A * DL / (A + B)).

ADAPBPTI(_(OFF|ON[0|1])?;
   Divide the display line by the sum of traces A, B, and C and then multiply the result by trace A (A * DL / (A + B + C)).

ADBTL(_(OFF|ON[0|1])?;
   Multiply trace A by the display line value, then divide by trace B.

ADCTL(_(OFF|ON[0|1])?;
   Multiply trace A by the display line value, then divide by trace C.

ADCTRG (_(FREE|POEDGE|NEGEDGE|AC))?;
   Selects the source of the ADC trigger.
   Query response: FREE|POEDGE|NEGEDGE|AC
ADCTRQDIY(_(<number>[<seconds>]|(EP|OA|DN|UP|AUTO|MAN))??
  Delays ADC triggering.
  Query response: <number>

ADCTRGSYN(_(AUTO|ON|OFF))?;
  Sets status of ADC SYNC OUT during active (non-free) ADC
  trigger modes.
  Query response: AUTO | ON | OFF

ADD_<destination>,<source 1>,<source 2>;
  Adds the sources and sends their sum to the destination.

ALIGN (_(AUTOPTS|MANUAL|WHITE))?;
  Adjusts fiber-positioner tracking table.
  Query response: AUTOPTS|MANUAL|WHITE

ALIGNPRST;
  Sets the monochromator’s alignment to the factory calibration
  values.

AMB(_(OFF|ON|0|1))?;
  Subtract trace B from trace A with each sweep.
  Query response: 0||

AMBM C(_(OFF|ON|0|1))?;
  Subtract both trace B and trace C from trace A ( A-(B+C) ) .

AMBM CPL(_(OFF|ON|0|1))?;
  Subtract both trace B and trace C from trace A, then add the
  display line ( (A-(B+C))+DL ).

AMBPL(_(OFF|ON|0|1))?;
  Subtracts trace B from trace A, adds the display line value to the
  difference, and sends the result to trace A.
  Query response: 0||

AMC(_(OFF|ON|0|1))?;
  Subtracts trace C from trace A and sends the result to trace A.
  Query response: 0||
**AMCPU**(_(OFF|ON|0|1))_?;
Subtract trace C from trace A, then add the display line (A-C)+DL.

**AMETER**(_(OFF|ON|0|1))_?;
Enables a readout of the amplitude of the blank-ahead marker in the display's message area.
Query response: <number>

**AMPCOR**(_(<wavelength>[<wavelength unit>]],[<amplitude>[DB] [,<wavelength>[<wavelength unit>]],[<amplitude>[DB]](OFF|ON)))_?;
Applies amplitude-correction data at specified wavelengths.
Query response: <wavelength>,<amplitude> {L_F,<wavelength>,<amplitude>}

**AMPMKR**_<number>(X|DB);
Positions the left and right power integration points to the value specified on either side of the peak.
May only be used with the LED_<downloadable command>.

**AMPU**_<source>[,<reference trace>]]_?;
Converts source value from measurement units to amplitude units based on the trace condition of the reference trace.
<source> ::= <number>[<amplitude unit>][<predefined variable>][<user-defined variable>][<predefined function>][<trace element>]
<reference trace> ::= TRA|TRB|TRC|<user-defined trace>
Query response: <number>

**ANNOFF**;
Turns off all display annotation.

**ANNOT**(_(OFF|ON|0|1))_?;
Turns the display annotation on or off. IP turns on the annotation.
Query response: 0|1

**APB**;
Adds traces A and B, then sends the result to trace A.
APBDCTL(_(OFF|ON[0|1]))?;
(A+B) * DL / C

AUNITs(_(AUTO|MAN[DBM|W]))?;
Specifies the amplitude units for input, output, and display.
Query response: DBM|W

AUTOALIGN:
Automatically realigns the output fiber of the optical spectrum analyzer's monochromator with the output beam.

AUTOMDB(_(<number>[DB|DN|UP|EP|AUTO|MAN]))?;
Sets vertical scale after the automatic measurement procedure.
Query response: <number>

AUTOMEAS:
Automatically zoom in on largest signal at optical spectrum analyzer's input.

AUTOMMKR(_(OFF|ON[0|1]))?;
Causes the automatic measurement routine to locate the closest signal to the current marker.
Query response: 0|1

AUTOMOPT(_(OFF|ON[0|1]))?;
Control sensitivity optimization during the automeasure routine.

AUTOMSP(_(<number>[_<wavelength unit>][|DN|UP|EP|AUTO|MAN]))?;
Determines the final wavelength span set by the automatic measurement routine.
Query response: <number>

AUTORNG(_(OFF|ON[0|1]))?;
Determines whether automatic ranging is enabled (1) or disabled (0).
Query response: 0|1
AVG_<destination>,<source>,<average ratio>:
Computes the average value of the source and the destination
and places the value in the destination using the following:

\[
\text{new destination} = \frac{(\text{average ratio} - 1) (\text{old destination} + \text{source})}{\text{average ratio}}
\]

<average ratio> ::= <number>|<predefined variable>|<user-
defined variable>|<predefined function>|<trace
element>

AXB:
Exchanges contents of trace A and trace B.

AXC:
Exchange contents of trace A and trace C.

BIT_<destination>,<source>,<bit number>:
Returns the specified bit of the source as a 0 or 1 in the
destination.
<bit number> ::= <source>

BLANK_(TRA|TRB|TRC):
Stores and blanks the specified trace.

BML:
Subtracts the display line from trace B and sends the result to
trace B.

BP:
Send the “beep” command to the display.

BTC:
Transfers contents of trace B to trace C.

BXC:
Exchanges contents of trace B and trace C.

CAL_(ALL|WL|PWR):
Executes error-correction routines which calculate and apply
offset values that compensate for instrument anomalies.
CALCOR_((ALL|WL|PWR).(0||OFF|ON)?);  
Enables or disables correction factors computed by the CAL command.  
Query response: 0||

CALDATA_((FIRST|SECOND)?;  
Queries the optical spectrum analyzer for the factory supplied calibration data for the first or second grating order. The calibration data returned is determined by the INSTMODE setting.  
Query response: <wavelength>,<amplitude>

CALPWR_((<number>[DBM]<power unit>[|DN|UP|EP])?;  
Specifies the power of the calibration reference used by the CAL command.  
Query response: <number>

CALWLI_((<number>[<wavelength unit>|DN|UP|EP])?;  
Specifies wavelength used by calibration routine.  
Query response: <number>

CATALOG?;  
Returns the catalog in a condensed format.  
Query response: <character string>{L<T character string>}

CENTERWLI_((<number>[<wavelength unit>|DN|UP|EP])?;  
Sets the center wavelength of measurement range.  
Query response: <number>

CHHEIGHT?;  
Computes and returns the character height as a percentage of the window height.  
Query response: <number>

CHOP_((OFF|ON)|0|1)?;  
The CHOP command enables the chop mode for sweeps greater than 40 seconds.  
Query response: 0||
CLRDSP;
    Removes all optical spectrum analyzer graphics from the display and its memory.

CLRW_(TRA[TRB]TRC);
    Clear-writes the specified trace.

CLS;
    Sets all bits in the status-byte register to 0.

COMPRESS_<trace destination>,<trace source>.(AVG|POS|SMP);
    Stores a compressed copy of the source trace in a smaller destination trace according to the specified compression algorithm.
    <trace destination> := <trace source> :=
    TRA[TRB]TRC|<user-defined trace>|<trace range>

CONCAT_<trace destination>,<source 1>,<source 2>;
    Concatenates source 2 to the end of source 1, then stores the new array in the destination.
    <trace destination> := TRA[TRB]TRC|<user-defined trace>|<trace range>

CONFIG?;
    Returns a series of ASCII strings, separated by carriage returns, indicating module model numbers and their corresponding MSIB addresses.
    Query response: <character string>

CONTS;
    Selects continuous sweep mode. Selected with IP.

3-24  Programming Commands
CORSEL(_(0|1|2|3))?;
Selects which flatness correction table will be applied to the measurement data.
0 := Applies both diode and grating flatness correction tables.
1 := Applies only diode flatness correction table.
2 := Applies only grating flatness correction table.
3 := Applies no flatness correction tables.
Query response: 0|1|2|3

CORTOLIM_(UPPER|LOWER);
Transfers AMPCOR data to the specified limit line.

CWIDTH?;
Computes and returns the character width as a percentage of the window width.
Query response: <number>

DEBUG(_(OFF|ON|FAST|SLOW|0|1))?;
Is a troubleshooting aid for locating faulty syntax in optical spectrum analyzer programs.
Query response: OFF|FAST|SLOW

DELETE;
Deletes currently selected graphics item from display and memory.
DFB_ (B[C]Q[Z]);
Starts the DFB_ (distributed-feedback) laser characterization
measurement downloadable program.
Query response: <peak wavelength>,<wavelength offset>,<stop
band>,<center offset>,<side mode suppression ratio
(SMRR),<peak amplitude>,<bandwidth>,<bandwidth
amplitude>

**Note**
When using the DFB_ command, the first underscore
(underscore) must be inserted as an underscore. The first
underscore does not represent a space when using
this command. The underscore is followed by either
a space and your choice from the list of elements or
by just a semicolon (;) if you do not make a choice
from the list of elements.

DISPOSE_ (user-defined function>|user-defined
variable>|ONEOS|AMP_COR|number>|delimiter>|character
string>|delimiter>|character string>|ALL);
Clears all or part of internal memory, which is reserved for
operator use.

DISPU_ <number>;
Disposes of user menus.

DIV_ <destination>,<source 1>,<source 2>;
Divides source 1 by source 2, then sends the result to the
destination.

DL_ (<number>[DBM|DB|W|MW|US|NW|PW][DN|UP|OFF|ON|EP])?
Controls the display and level of the display line. Default units
are dBM.
Query response: <number>

DONE?;
Returns a 1 to the controller when all commands encountered
before the DONE command have executed.
Query response: <number>

3-26 Programming Commands
**DSPLY** <display variable>,<field width>,<decimal places>;<br>
Displays the current value of a variable on the CRT at the<br>current position of the graphics pen.<br><display variable> ::= <field width> ::= <decimal places> ::=<br><number>|<predefined variable>|<user-defined variable>|<br><predefined function>|<trace element><br><br>**DSPMODE** _(CAT|CONFIG|EXTEND|NORMAL|PAGE|STATE))?;<br>Displays catalog of user-memory contents by listing descriptions<br>of system or module configurations on the display.<br>Query response: CAT|CONFIG|EXTEND|NORMAL|STATE<br><br>**DSPTXT** _(CAT|CONFIG|EXTEND|STATE)?;<br>Returns system-level or module-level information according to the<br>display mode specified.<br>Query response: <character string><br><br>**DWINDOW** _(_ON|OFF_)|(_x length>,<y length>,(_x min>,<x max>,<y min>,<y max>)_)<reference trace>_;<br>Defines an alternate scale for graphics that repositions, magnifies,<br>or reduces graphics on the analyzer display.<br>_x length> ::= _y length> ::= _x min> ::= _x max> ::=<br>_y min> ::= _y max> ::= _number>[_predefined variable]>|<br><user-defined variable>|[_predefined function>|<trace element><br>_reference trace> ::= _TRA|TRB|TRC|<user-defined trace><br><br>**ENTER** _(_HP-IB address>,(_K|B|W),<destination>_);<br>Establishes the analyzer as a controller on HP-IB.<br>_HP-IB address>_ ::= _<number>_[_predefined<br>variable>_[_user-defined variable>_[_predefined function]>[_trace<br>element>_<br>_destination>_ ::= _<trace element>_[_predefined variable>_|<br><user-defined variable>_<br><br>**ERASE**;<br>Erases all memory including any items protected by the PSTATE<br>or PROTECT command.
ERR?;
   Returns numeric codes that describe the nature of any reported errors.
   Query response: <number>|<number>

EXPI<destination>,<source>,<scaling factor>;
   Divides source by scaling factor, raises this quotient by a power of 10, then sends the result to the destination.
   <scaling factor> ::= <number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>

FETCH?;
   Returns the contents of trace data to the controller.
   Query response: <data byte>

FFTX<destination>,<source>,<window>;
   Performs a discrete fast fourier transform on the source trace and stores the log of the magnitude of the result in the destination trace. Before executing FFT, a trace window must be defined with the TWINDOW command.
   <destination> ::= <source> ::= <window> ::= TRA|TRB|TRC
                 <user-defined trace>

FFTKNL<real trace>,<imaginary trace>;
   Performs a 16-bit discrete fourier transform on two traces of equal length, overlaying them with the results. The resulting traces represent the real and imaginary components of one complex trace. Scaling, clipping, and so on, must be done by user.
   <real trace> ::= <imaginary trace> ::= TRA|TRB|TRC
                 <user-defined trace>

FORMAT;
   Formats and erases the currently selected memory device.
\textbf{FP\_LC\_GK\_LQ};
Starts the FP\_L (Fabry-Perot) laser characterization measurement
downloadable program.
Query response: \textless peak wavelength\textgreater , \textless mean
wavelength\textgreater , \textless mode spacing (M)\textgreater , \textless mode spacing
(Hz)\textgreater , \textless full-width, half-maximum (FWHM)\textgreater , \textless peak
amplitude\textgreater , \textless total power\textgreater , \textless sigma\textgreater 

\begin{center}
\textbf{Note}
When using the FP\_L command, the first underscore
(_) must be inserted as an underscore. The first
underscore does not represent a space when using
this command. The underscore is followed by either
a space and your choice from the list of elements or
by just a semicolon (;) if you do not make a choice
from the list of elements.
\end{center}

\textbf{FP\_MKBW(\textless\textless number\textgreater\textgreater [DF[XY][DN[UP[EP]])\textgreater\textgreater;}
Sets the Fabry-Perot laser envelope bandwidth amplitude.
Query response: \textless number\textgreater 

\textbf{FP\_TH(\textless\textless number\textgreater\textgreater [DF[XY][DN[UP[EP]])\textgreater\textgreater;}
Sets or queries the Fabry-Perot laser threshold amplitude. All
signals above the threshold are used in the calculations.
May only be used with the FP\_L downloadable command.
Query response: \textless number\textgreater 

\begin{center}
\textbf{Note}
When using the FP\_TH command, the underscore
(_) between FP and TH must be inserted as an
underscore. The underscore does not represent
a space when using this command. The FP\_TH
command is followed by either a space and your
choice from the list of elements, a question mark (?),
or by just a semicolon (;) if you do not make a choice
from the list of elements.
\end{center}

\textbf{FS;}
Activates the widest measurement range allowed by hardware,
setting start and stop wavelengths to their minimum and
maximum values.
**FUNCDEF.(user-defined function name),((<string data field>|<A-block data field>|<I-block data field>)
Defines a list of analyzer commands that are executed whenever a user-defined function is encountered. Query: <user-defined function name>?
Query response: #A<msb length><lsb length><data byte[s]>

**GATESWP._((OFF|ON|0|1))]
Enables time-gated measurements.
Query response: 0|1

**GRAPH._(TRA|TRB|TRC|<user-defined trace>);
Displays stored trace data, resized to a different scale.

**GRAT._((OFF|ON|0|1))]
Turns the graticule on or off. IP turns on the graticule.
Query response: 0|1

**GRATORDER._((AUTO|MAN))]
Selects reflection order of optical spectrum analyzer’s internal diffraction grating. MAN mode locks the optical spectrum analyzer into first-order diffraction grating. AUTO mode allows either first-order or second-order diffraction grating. Query returns a response indication of whether the optical spectrum analyzer is using first-order or second-order diffraction grating.
Query response: 1|2

**GRATSCRL._((OFF|ON|0|1))]
Controls the positioning of the displayed horizontal graticule lines.

**GRID._(<x dimension>,<y dimension>,<#x boxes>,<#y boxes>);
Draws a grid with the dimensions and # of boxes as indicated and has its origin placed as specified by the OFT command.
<x dimension> ::= <y dimension> ::= <#x boxes> ::= <#y boxes> ::= <number>[<predefined variable>|<user-defined variable>|<user-defined function>|<trace element>

3-30 Programming Commands
HD:
Blanks the active function readout and disables data entry.
Selected with IP

ID?:
Returns the model number of the system master (control module).
Query response: HP70950B|HP70951B|HP70952B

IF_<operand 1>,(<LT|GT|LE|GE|EQ|NE),<operand 2>;
THEN: [<command list>
[ELSE:[<command list>]|ELSEIF <IF/THEN syntax>)]|ENDIF;
       Compares operand 1 to operand 2. If the condition is true, the
       command list is executed. Otherwise, commands following the
       next ELSE or ENDIF statements are executed.
<operand 1> := <operand 2> := <number>|<predefined
       variable>|<user-defined variable>|<predefined function>|<trace
element>
<IF/THEN syntax> := (,<operand
1>,(<LT|GT|LE|GE|EQ|NE),
<operand 2>;THEN:[<command list>]

IGEN(_(<number>[A|MA|UA]|OFF|ON|DN|UP)]?;
       Turns on and sets the current source. This command is valid only
       if the current-generator, option 001 is installed.
       The current source range is limited to the ±200 mA or the value
       set by the command IGENLIMIT, which ever absolute value is
       less.
       Query response: <number>

IGENDTYCY(_(DN|UP|[percentage])?;
       Sets the duty cycle of the current generator’s pulse mode. This
       command is valid only if the current-generator, option 001 is
       installed.
       Query response: <number>

IGENLIMIT(_(<number>[A|MA|UA]|DN|UP])?;
       Sets safety limit on current source’s output. This command is
       valid only if the current-generator, option 001 is installed.
       Query response: <number>
IGENPW(_(<number>)[S][MS][US][DN][UP][EP])?;
Sets the pulse width of the current generator’s pulse mode. This
command is valid only if the current-generator, option 001 is
installed.
Query response: <number>

INSTMODE(_([OSA][PWRMTR][PRESEL][SR][PD][PULSE]))?;
Selects an optical spectrum analyzer measurement mode.
Query response: OSA|PWRMTR|PRESEL|SR|PD|PULSE

INT_ <destination>,<source>;
Calculates the largest integer which is less than the source in the
destination.

IP;
Perform an instrument preset which sets all functions to their
preset state.

IT_(_(<item number>))?;
Assigns a number to a series of graphics commands for future
recall or modification.
<item number> ::= <number>|<predefined variable>|<user-
defined variable>|<predefined function>|<trace
element>
Query response: <number>

IWINDOW_<x length>,<y length>;
Varies the size of the graticule and measurement results on the
display. Size is specified in the current scale units (SCALE).
<x length> ::= <y length> ::= <number>|<predefined
variable>|<user-defined variable>|<predefined function>|<trace
element>

KEY CLR;
Blanks the user-defined ([USER]) keys.

3-32 Programming Commands
KEYDEF_ <key number>, <key function> (<delimiter> <character string> <delimiter> | )?
Assigns a label and user-defined function to a USER key.
<key number> := <number>|<trace element>|<operand>|<predefined variable>|<user-defined variable>
<key function> := <user-defined function>|<analyzer command>
Query response: <user-defined function>

KEYPST;
Presets the user-defined keys to their initial command set.

LED_ (B|C|K|L|O|Q);
Start the LED_ (light-emitting diode) laser characterization measurement downloadable program.
Query response: <mean wavelength>, <peak wavelength from -3 dB points>, <peak wavelength>, <sigma>, <full-width, half-maximum (FWHM)>, <width at -3 dB points>, <total power>, <peak spectral purity>

Note When using the LED_ command, the first underscore (_) must be inserted as an underscore. The first underscore does not represent a space when using this command. The underscore is followed by either a space and your choice from the list of elements or by just a semicolon (;) if you do not make a choice from the list of elements.

LG_[<number>[DB][EP][DN][UP]]
Specifies the vertical graticule divisions as logarithmic units without changing the reference level. Default units are dB. 10 dB per division is selected with IP.
Query response: <number>

LIGHT_WHITEx_[OFF][ON][0][1]];
Turns on or off the internal white light source.
Query response: 0[1]
**LIMIAMP**(_(number>[DBM]<power unit>|[EP|DN|UP])?):
Sets the limit-line segment amplitude.
Query response: _<number>_

**LIMIBEEP**(_(OFF|ON)[0][1])?;
Sounds a beep when trace data exceeds limit-line test limits.
Query response: _0|1_

**LIMIBOT**?;
Activates the last segment of the limit-line table.
Query response: _<number>_

**LIMIDEL**;
Erases the entire contents of the limit-line table.

**LIMIDONE**;
Turns off the limit-line editor which removes the limit-line table and editing softkeys from the display.

**LIMIEDIT**;
Turns on the limit-line editor.

**LIMIFAIL**?;
Returns the limit-line test results as numbers.
Query response: _0|1|2|3_
  0 :: Does not exceed test limits.
  1 :: Exceeds the lower test limit.
  2 :: Exceeds the upper test limit.
  3 :: Exceeds both upper and lower test limits.

**LIMIHAF**(._(UPPER|LOWER))?;
Selects either the upper or lower limit line for modification or creation.
Query response: _UPPER|LOWER_

3-34 Programming Commands
**LIMILINE (_<number>_)?;**
Returns the current limit-line parameters for future recall or build a new limit line.
Query response: <character string> consisting of LIMILINE, LIMIREL, LIMIHAF, and LIMISEG commands, which restore the limit-line table.

**LIMINEXT:**
Activates the next limit-line segment.

**LIMIRCL (_<number>_|<predefined variable>|<user-defined variable>|<predefined function>|trace element>);**
Recalls limit lines that have been previously stored by LIMISAV.

**LIMIREL (_(OFF|ON)[01])?;**
Determines whether limit line values are absolute or relative referenced to the reference-level and center-wavelength settings.
Query response: 0

**LIMISAV (_<number>_|<predefined variable>|<user-defined variable>|<predefined function>|trace element>);**
Saves the contents of a limit-line table in user memory.

**LIMISCR(_<number>_)?;**
Scrolls the active limit-line segment from the current active segment.
Query response: <number>

**LIMISDEL:**
Deletes the currently active limit-line segment.

**LIMISEG _<wavelength>,<amplitude>,(SLOPE|FLAT|POINT);**
Specifies the characteristics of a limit line that is stored in the limit-line table.

<wavelength> ::= <amplitude> ::= <number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>

**Programming Commands 3-35**
**LIMITTEST** (ON | OFF | 0 | 1)
- Compares active trace data to limit-line parameters.
  - Query response: 0 | 1

**LIMITYPE** (SLOPE | FLAT | POINT)
- Specifies the limit-line segment type.
  - Query response: SLOPE | FLAT | POINT | NA

**LIMWVL** (<number> <wavelength unit> | DN | UP)
- Sets the wavelength of the currently active limit-line segment.
  - Query response: <number>

**LIMTOCOR** (UPPER | LOWER)
- Transfers limit-line data to amplitude-correction data.

**LINES** (ON | OFF | 0 | 1)
- Connects lines between displayed trace points.
  - Query response: 0 | 1

**LINET** (<number> | <predefined variable> | <user-defined variable> | <predefined function> | <trace element>)
- Sets the line type used for plots, traces, and graticules. If the parameter is omitted, the line type is set to continuous.

**LN** (V | W)
- Activates the linear display mode.
  - Query response: V | W

**LOAD** <delimiter><character string><delimiter> [.TRA .TRB .TRC | <user-defined trace>]
- Loads into internal memory any ASCII file that consists of optical spectrum analyzer commands.
LOG_<destination>,<source>,<scaling factor>;<
Computes the logarithm of the source, multiplies it by the scaling
factor, then stores the result in the destination.
<scaling factor> ::= <number>|<predefined variable>|user-
defined variable>|<predefined function>|<trace element>

MDS(_{(B_<scaling factor>)|W})|?;
Sets the measurement data size for binary output trace data
(TDF B, I, or A) to either BYTE (B) or WORD (W).
<scaling factor> ::= <number>|<predefined variable>|<user-
defined variable>|<predefined function>|<trace
element>
Query response: <number>

MEAN(TRA|TRB|TRC|<user-defined trace>|<trace range>)|?;
Calculates the mean value of the source.
Query response: <number>

MEASU_<source trace>,<reference trace>|;:
Converts parameter-unit values to measurement-unit values based
on the trace conditions of the reference trace.
<source trace> ::= <number>|DBM|DB|<power unit>||
<predefined variable>|<user-defined variable>|<predefined
function>|<trace element>
<reference trace> ::= TRA|TRB|TRC|<user-defined trace>
Query response: <number>

MEASURE(_{(SA|SR|SRMLCPL)})|?;
Selects the measurement mode of either spectrum analysis or
stimulus response.
Query response: SA|SR|SRMLCPL

MEM|;
Returns the amount of allocatable memory available in bytes.
Query response: <number>

MIN_<destination>,<source 1>,<source 2>;
Compares source 1 and source 2, point by point, and sends the
lesser value of each comparison to the destination.
MINH(TRA|TRB|TRC);
  Updates each trace element with the minimum level detected.

MK_<x coordinate>,<_y coordinate>;
  Places a marker at the specified coordinates which are either in
  the current scaling units or in display window units.
  <x coordinate> := <y coordinate> := <number>|<predefined
  variable>|<user-defined variable>|<predefined function>|1
  <trace element>

MKA(_,<number>[DB|DBM]<power unit>])?;
  Specifies the amplitude of the active marker.
  Query response: <number>

MKACT(_,<number>[EP|DN|UP])?;
  Selects one of five markers as the active marker.
  Query response: <number>

MKAL(_,<number>[X|DB][EP|DN|UP])?;
  Activates marker #2 and positions it on a trace relative to the
  amplitude of marker #1.
  Query response: <number>

MKAR(_,<number>[X|DB][EP|DN|UP])?;
  Activates marker #3 and positions it on a trace relative to the
  amplitude of marker #1.
  Query response: <number>

MKBW(_,<number>[ON|OFF])?;
  Displays the wavelength difference between markers #2 and #3,
  even if the markers are not displayed.
  Query response: <number>

MKBWA(_,<number>[DB|OFF][ON][DN|UP])?;
  Displays a signal's bandwidth at a user-specified amplitude below
  the signal's peak.
  Query response: <number>

MKCONT;
  Enables the sweep to continue past the marker.

3-38 Programming Commands
MKCWL;
Sets center wavelength equal to wavelength at the marker.

MKD[<number>]<wavelength unit>[<time unit>][EP|DN|UP];
Positions a marker relative to the reference marker, according to wavelength.

MKDACT?
Report which marker is the currently active delta marker.

MKDREF[<number>]|(M|MM|UM|NM|PM|ANG|S|MS|US|SC)];
Set the general reference marker to a specific wavelength (or time if in zero span).

MKMIN;
Moves the active marker to the minimum value detected.

MKN[<number>]<wavelength unit>[<time unit>][EP|DN|UP)];
Places the active marker at the specified wavelength.
Query response: <number>

MKNOISE[<off|on>][01]
Displays or returns the noise level at the displayed, active marker.
Query response: 01

MKOFF[ALL];
Turns off all markers, or the active marker.

MKP[<number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>];
Specifies the horizontal position of the active marker, in position units.
Query response: <number>
MKPABS_<number>;
Sets the current active delta marker to the bucket requested.

MKPAUSE(_(<number>[<time unit>]|EP|DN|UP|ON|OFF]));
Pauses the sweep at the active marker for the specified length of time.
Query response: <number>

MKPTTX(_(<number>[DB]|(EP|OA|DN|UP))]);
Control the excursion value for marker pit operations.

MKPK[CP|CPTIT|HIP|HIP|MI|MPIT|NH|NHPTT|NL|NLPIT]
NM|NMPIT|NR|NRPTT];
Position active marker at a peak (or pit) on the trace.

MKPX(_(<number>[DB]|EP|DN|UP))];
Specifies the minimum signal excursion for signal identification and the marker-peak functions.
Query response: <number>

MKREAD(_(FRQ|WLN|PER|SWT|IST|AUTO)];
Selects the type of active trace information displayed by the marker readout and queried with the MKWL?, the MKT?, and the MKA? queries.
Query response: WLN|PER|SWT|IST

MKRL;
Sets the reference level equal to the absolute amplitude of the displayed active marker.

MKSP;
Sets the span equal to the wavelength difference of the markers.

MKSS;
Sets the center-wavelength step size equal to the wavelength difference between the delta markers.

MKSTOP;
Ends the sweep at the current active marker.
MKT(_(<number>[<time unit>]|<pre-defined variable>|<user-defined variable>|<pre-defined function>|<trace element>))?
  Positions marker in units of time.
  Query response: <number>

MKTRACE(_(TRA[TRB[TRC]]))?
  Moves the displayed, active marker to a corresponding position
  on the specified trace.
  Query response: TRA|TRB|TRC

MKTRACK(_(OFF|ON[0][1]))?
  Maintains the marked signal at center wavelength during changes
  in wavelength span.
  Query response: 0|1

MKTUNE(_(<number>[<wavelength unit>|DN[UP]]))?
  Fix tunes the optical spectrum analyzer to a specified
  wavelength. If INSTMODE is not set to PRESEL, MKTUNE
  generates an error message. This command is valid only for the
  HP 71451B (or the HP 70951B).
  Query response: <number>

MKT(_(<number>[DB][EP|DN[UP]]))?
  Specifies the amplitude variance monitored by the
  marker-tracking function.
  Query response: <number>

MKTYPE?
  Returns the current type of active marker.
  Query response: AMPR|AMPL|DELTA|PSN

MKWL(_(<number>[<wavelength unit>|DN[UP]]))?
  Positions active marker to the specified wavelength, or return the
  marker wavelength.
  Query response: <number>

MOD_<destination>,<source 1>,<source 2>;
  Divides source 1 by source 2 and places the remainder in the
  destination.
MODADD [<module reference number>.<ROW.<COLUMN>]?;
    Returns the HP-MSIB address of the specified module.
    <module reference number> ::= <number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>
    Query response: <number> or <row>,<column>

MODID <row>,<column>?;
    Identifies the module or instrument located at the specified HP-MSIB address.
    <row> ::= <column> ::= <number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>
    Query response: <number>

MOV _<destination>,<source>;
    Moves the contents of the source to the destination.

MPY _<destination>,<source 1>,<source 2>;
    Multiplies source 1 and source 2, point by point, then stores the result in the destination.

MSG?;
    Returns the characters shown in the message area on the optical spectrum analyzer display, including the UNCAL and UNCOR messages if they are displayed.
    Query response: (0|1).,(0|1).A<msb length><lsb length><data byte[s]>

MSI(_[INT|HPIB],[<HP-IB address>]|<drive unit>[<volume>]]))?
    Selects the user-memory location for storing files.
    <HP-IB address> ::= <drive unit> ::= <volume> ::= <digit>
    Query response: INT|MSIB,<number>|HPIB,<number>

MXM _<destination>,<source 1>,<source 2>;
    Compares source 1 and source 2, point by point, and sends the greater value of each comparison to the destination.
**MXMH**(TRA|FRA|FRB|TRC);

Updates each trace element with the maximum level detected.

**NORM**(_(OFF|ON|0|1))?

Controls trace normalization for stimulus-response measurement.

**NSTATE**(_(<number>|EP|DN|UP))?

Sets the number of state register files available for information storage.

Query response: **<number>**

**ONES**(_(OFF|ON|0|1))|<string data field>|<A-block data field>|

<i-block data field>

Executes the specified command(s) at the end of every sweep.

Query response: **<A-block data format>**

**ONMENU**(_(OFF|ON|0|1))|<string data field>|<A-block data field>|

<i-block data field>

Defines the list of functions executed when the **MENU** key is pressed.

Query response: **<A-block data format>**

**ONMKR**(_(OFF|ON|0|1))|<string data field>|<A-block data field>|

<i-block data field>

Defines the list of functions executed when the sweep reaches the pause marker.

Query response: **<A-block data format>**

**ONUSER**(_(OFF|ON|0|1))|<string data field>|<A-block data field>|

<i-block data field>

Defines the list of functions executed when the **USER** key is pressed.

Query response: **<A-block data format>**
ONWINDOW(_(OFF|ON[0|1]))|<string data field>|<A-block data field>|?

A-block data field
Defines the list of functions executed when the display window is recreated.
Query response: <A-block data format>

OP?;
Returns the values of P1 and P2 for the current instrument window scale.
Query response: <p1x>,<p1y>,<p2x>,<p2y>

OPTSW(_(INT|EXT))?
Activates (EXT) or deactivates (INT) the HP 70951A’s front panel MONOCHROMATOR OUTPUT and PHOTODETECTOR INPUT ports. This command is valid only for the HP 71451B (or the HP 70951B).
Query response: INT|EXT

OR_<x offset>,<y offset>;
Offsets the position of graphics on the display relative to P1, in the current scale units set.
<x offset> ::= <y offset> ::= <number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>

OUTPUT_<HP-IB address>,(K|[K|C][K|C]<number>),((<string data field>|<A-block data field>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>);)<I-block data field>
Establishes the optical spectrum analyzer as a controller on HP-IB. RELHPIB releases this capability. The data is output according to the specified format options (K, KC, KL, F).

OVRW_(TRA|TRB|TRC);
Enable clear-write mode, but skip the initial clear.

3-44 Programming Commands
**PA**[_(PD|PU)_]<x coordinate>,<y coordinate>[_[PD|PU]_<x coordinate>,<y coordinate>];

Moves the graphics pen from its current position to the position specified. If the pen is down, a line is drawn on the display.

<x coordinate> ::= <y coordinate> ::= <number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>

**PAUSE:**

Stops all processing of remote commands and activates the debug mode. Program operation resumes when the CONT softkey is pressed, the [INSTR PRESET] key is pressed, or the input buffer is cleared.

**PD:**

Places the graphics pen down.

**PDA**<destination>,<source>,<resolution>;

Finds the probability density in amplitude of the specified source and sends the result to the destination.

<destination> ::= <source> ::= TRA|TRB|TRC|<user-defined trace>

<resolution> ::= <number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>

**PDL:**

Starts the PDL downloadable program and loads the related commands.

**PDL CALC:**

Performs calculation and displays polarization dependent loss.

**PDL DEV:**

Toggles between an optical or electrical receive device.

**PDL DEV?**:

Returns the current status value of the receive device to be either internal (0) or external (1).

Query response: 0
**PDLEXT**;
Terminates the polarization dependent loss (PDL) measurement program.

**PDLINIT**;
Initializes the polarization dependent loss (PDL) measurement procedure.

**PDLREV**;
Displays the polarization dependent loss (PDL) measurement program revision number.

**PDL_REV?**;
Returns the polarization dependent loss (PDL) measurement program revision number.
Query response: <number>

**PDLSCALE**;
Automatically scales the displayed signal during a polarization dependent loss (PDL) measurement.

**PDL_SRC**;
Toggles the internal white light source on and off.

**PDL_SRC?**;
Returns the light source status; 0 indicates off and 1 indicates on.
Query response: 0|1

**PDMEA5(_(OFF|ON))(_(PD|PU))**;
Measures the flatness of a photo diode under test. This command is only valid for the HP 71451A (or the HP 70951A).

**PDWL(_(<destination trace>),(<source trace>))**;
Analyzes the distribution of detected signals according to wavelength.
PEAKS_<destination>,<source>,(AMP|WLN)?;
Sorts signal peaks by wavelength or amplitude, stores the
horizontal position of each peak in the destination, then
computes the number of peaks found.
<destination> ::= <source> ::= TRA|TRB|TRC|<user-defined
trace>|<trace range>
Query response: <number>

PEN_<number>_<predefined variable>_<user-defined variable>_<
predefined function>_<trace element>;
Specifies the pen number that corresponds to a color.

PERASE:
Partially erases internal memory and optical spectrum analyzer
settings. Does not erase settings or functions that have been
protected using PROTECT.

PERSIST_<number>EP|DN|UP|OFF|ON)?;
Sets the number of previous traces to be simultaneously displayed
onscreen.
Query response: <number>

PLOT_<P1X>,<P1Y>,<P2X>,<P2Y>;
Plots the optical spectrum analyzer display on a plotter or
printer.
<P1X> ::= <P1Y> ::= <P2X> ::= <P2Y> ::= <number>|
<predefined variable>_<user-defined variable>_<predefined
function>_<trace element>

POSU_<source>_<reference trace>;
Converts wavelength or time values to position units based on the
trace conditions of the reference trace.
<source> ::= <number>[DB|DBM]<predefined
variable>_<user-defined variable>_<predefined function>
<trace element>
<reference trace> ::= TRA|TRB|TRC|<user-defined trace>
Query response: <number>
POWERON(_(IP\LAST\RECALL))

Determine the instrument state of the optical spectrum analyzer when power is applied.
Query response: IP\LAST

PR_\PD\PU_\<x coordinate\>,\<y coordinate\>\{\[PD\PU\]_
\<x coordinate\>,\<y coordinate\>\};

Moves pen to coordinate relative to the current pen position.
\<x coordinate\> := \<y coordinate\> := \<number\>\<predefined variable\>\<user-defined variable\>\<predefined function\>
\<trace element\>

PREFIX\<delimiter\><character string\><delimiter\>;

Changes the file prefix that identifies user-memory entries.

PROTECT\_<user-defined function>\<user-defined trace>\<user-defined variable>\ONEOS\AMP_COR\<number>\<delimiter>\<character string>\<delimiter>\<character string>\ALL\(OFF\ON\0\1\)

Protects entire contents, selected values, or user-defined functions of internal memory against erasure, overwriting, or redefinition.
This command is defeated by ERASE.
Query response: 0\1

PSTATE\_<OFF\ON\0\1\>

Protects state-register files from accidental erasure or overwriting by the STOR, NSTATE, or SAVES command.
Query response: 0\1

PU;

Lifts up the graphics pen.

PURGE\<delimiter>\<character string>\<delimiter>\<A-block data file>\<delimiter>\<I-block data field>;

Erases files from internal or external memory, regardless of protection by the PSTATE and PROTECT commands.
**PWRBW** _<source>, <percentage>_;
Computes the bandwidth that contains a percentage of the total measured power.

<source> ::= TRA|TRB|TRC|<user-defined trace>|<trace range>

<percentage> ::= <number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>

Query response: <number>

**RB** _(_<number>_|<wavelength unit_>|[EP|DN|UP|MAN|AUTO])_;
Sets the resolution bandwidth.

Query response: <number>

**RBR** _(_<number>_|[EP|DN|UP])_;
Sets the ratio between the resolution bandwidth and span settings.

Query response: <number>

**RCLD** _(_<number>_|<predefined variable>_|<user-defined variable>_|<predefined function>_|<trace element>_);
Recalls the contents of a program file from the currently selected mass storage device.

**RCLS** _(_<number>_|<predefined variable>_|<user-defined variable>_|<predefined function>_|<trace element>_);
Recalls the contents of a state-register file from the selected mass storage device.

**RCIT** _(_<number>_|<predefined variable>_|<user-defined variable>_|<predefined function>_|<trace element>_);
Recalls the contents of a trace file from the selected mass storage device.

**RCLU** _(_<number>_|<predefined variable>_|<user-defined variable>_|<predefined function>_|<trace element>_);
Recalls the contents of a (USER) key file from the selected mass storage device, erasing the previous menu.
READ MENU: <user-defined variable>,<key number>,<key label>
{<key number>,<key label>};
    Assigns a series of key labels to form a menu of keys that can be
accessed with the USER key.
    <key number> ::= <number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>
    <key label> ::= <delimiter><character string><delimiter>

RELAX PIB:
    Releases HP-IB control by the optical spectrum analyzer.

REPEAT;<command list>{<command list>}
UNTIL(,<number>[<units>]|<predefined variable>|<user-defined variable>|<trace element>,
        (LT|GT|LE|GE|EQ|NE),(<number>[<units>])
    Repeats a list of commands until the condition specified after the
UNTIL command is satisfied.

RETURN;
    Interrupts operation of the currently operating user-defined
function, then returns to the point where the function was
originally encountered.

REV?;
    Returns the revision number of the local-oscillator firmware.
    Query response: <number> in YYMMDD format

RL(_<number>[DB|DBM]<power unit>][EP|DN|UP])?;
    Sets the absolute amplitude value of the reference level.
    Query response: <number>

RLPOS(_<number>[EP|DN|UP])?;
    Sets the reference level position in terms of graticule units from
top of screen (10 = top; 0 = bottom).
    Query response: <number>

3-50 Programming Commands
RMS_(TRAC[EB]CR | <user-defined trace> | <trace range>)?
Computes the root-mean-square value of a trace, in measurement units.
Query response: <number>

ROFFSET(_(<number>[DB][EP][DN][UP])?)?
Offsets all amplitude readouts on the display without affecting the trace data.
Query response: <number>

RUN(_(<number>|<predefined variable>|<user-defined variable>| <predefined function>|<trace element>)?)?
Defines conditions that interrupt computer operation.
Query response: <number>

SAVED(_(<number>|<predefined variable>|<user-defined variable>| <predefined function>|<trace element>)?)
Stores limit lines and user-defined functions, variables, keys, and traces in a file on the selected mass storage device.

SAVES(_(<number>|<predefined variable>|<user-defined variable>| <predefined function>|<trace element>)?)
Saves the current optical spectrum analyzer state in the specified state-register file on the selected mass storage device.

SAVET(_(<number>|<predefined variable>|<user-defined variable>| <predefined function>|<trace element>)?)
Stores the contents of trace A in a user-memory file on the selected mass storage device.

SAVEU(_(<number>|<predefined variable>|<user-defined variable>| <predefined function>|<trace element>)?)
Stores the user-defined keys in a file on the selected mass storage device.

SCALE,<x min>,<x max>,<y min>,<y max>?
Scales the optical spectrum analyzer display for drawing graphics.
<x min> := <x max> := <y min> := <y max>
:= <number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>
SENS(_(<number>)[<power unit>]|DN|UP|EP|AUTO|MAN));
    Selects the input sensitivity level.
    Query response: <number>

SER(<delimiter><character string><delimiter>|<A-block data field>); |<I-block data field>
    Returns or stores the serial number of the HP 70950A or the HP 70951A.
    Query response: <A-block data format>

SMOOTH_<source>,<number of points>;
    Smooths the amplitude level of a trace.
    <source> ::= TRA|TRB|TRC|<user-defined trace>|<trace range>
    <number of points> ::= <number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>

SNGLS;
    Selects single sweep mode.

SP(_(<number>)[<wavelength unit>]|EP|DN|UP));
    Specifies the wavelength span. Default units are meters.
    Query response: <number>

SQR_<destination>,<source>;
    Computes the square root of the source and stores the result in the destination.

SRINPUT (_(DIODE|NORMAL));
    Select input for stimulus-response measurements.
    Query response: DIODE|NORMAL

SRQ(_(<number>|<predefined variable>_<user-defined variable>|<predefined function>|<trace element>);
    Sets bit(s) in the status-byte register to simulate a service request.

SS(_(<number>)[<wavelength unit>]|EP|DN|UP|MAN|AUTO));
    Sets the center wavelength step size. Default units are meters.
    Query response: <number>

3-52 Programming Commands
ST(\(<number>[\<time\ unit>]\[EP|DN|UP|MAN\mid AUTO]\))\?;
  Specifies the rate that the optical spectrum analyzer sweeps the
current measurement range. Default units are seconds.
Query response: \(<number>\)

STARTUP(\(_\langle AUTO\mid MAN\rangle\))\?;
  Controls the start up configuration operation of the optical
spectrum analyzer.
Query response: AUTO\mid MAN\mid ONCE

STARTWL(_\(<number>[\<wavelength\ unit>]\[DN\mid UP\mid EP]\))\?;
  Sets the start wavelength of the measurement range.
Query response: \(<number>\)

STATE(#A<msb length><lsb length><data byte[s]>)?
  Transmit all instrument-state information to or from a computer.
Query response: #A<msb length><lsb length>STATE _#A
<msb length><lsb length><data byte[s]>)

STB\?;
  Returns the value of the status-byte register.
Query response: \(<number>\)

STDEV_(TRA\mid TRB\mid TRC\mid user-defined trace\rangle\[\langle trace\ range\rangle\))\?;
  Returns the standard deviation of the specified trace amplitude
in measurement units.
Query response: \(<number>\)

STOPWL(_\(<number>[\<wavelength\ unit>]\[DN\mid UP\mid EP]\))\?;
  Sets the stop wavelength of the measurement range.
Query response: \(<number>\)

STOR_{(S|U|L),\<file name>\mid D,\<file name>\mid (ONEOS\langle user-
defined function\rangle\mid \langle user-defined variable\rangle\mid \langle user-defined
trace\rangle\mid \langle character\ string\rangle)\mid T,\<file name>,\(TRA\mid TRB\mid TRC\mid user-
defined\ trace\rangle)};

  \(<file name> ::= (delimiter\<character string>\langle delimiter\rangle |
  \langle character string\rangle)\)
STORREF_THRU;
Store through references for stimulus-response measurements.
This command is valid only for the HP 71451B (or the HP 70951B).

SUB_<destination>,<source 1>,<source 2>;
Subtracts source 2 from source 1, point by point, then stores the result in the destination.

SUM_(TRA|TRB|TRC|<user-defined trace>|<trace range>)?;
Returns the sum of the trace amplitudes in measurement units.
Query response: <number>

SUMSQR_(TRA|TRB|TRC|<user-defined trace>|<trace range>)?;
Returns the sum of the square of the trace-point amplitudes in measurement units.
Query response: <number>

Sweep(_(OFF|ON|0|1))?;
 Stops the optical spectrum analyzer from sweeping, immediately.
Query response: 0|1

SWPMODE?;
Return the current sweep mode.
Query response: CONTS|SNGLS

TDF(_(A|B|I|M|P))?;
Formats trace information for return to the controller.
A represents an absolute block data field.
B represents binary values in measurement units.
I represents an indefinite block data field.
M represents ASCII-decimal values in measurement units.
P represents ASCII-decimal values in absolute units (for example, dBm, volts, and so on).
Query response: A|B|I|M|P

TEST;
Executes a self test of the instrument.

3-54 Programming Commands
TEXT(<delimiter><data byte[s]><delimiter>|<A-block data field>); | <I-block data field>
  Writes text on the optical spectrum analyzer display.

TH(_,(<number>|[DB|DBM]<wavelength unit>]|[EP|DN|UP|OFF|ON])?)
  Blanks signal responses below the specified threshold level.
  Default units are dBm.
  Query response: <number>

THREED(_,(<number>|[OFF|ON]|DN|UP|EP))?)
  Turns the three-dimensional trace display on or off.
  Query response: <number>

THREEDH(_,(<number>|[DN|UP|EP]))?)
  Select the horizontal offset of the three-dimensional trace display.
  Query response: <number>

THREEDV(_,(<number>|[DN|UP|EP]))?)
  Select the number of traces used in the three-dimensional trace display.
  Query response: <number>

TIME(_,(<number>|[time unit]>)))?)
  Sets the clock that measures operating time.
  Query response: <number>

TITLE(<delimiter><data byte[s]><delimiter>|<A-block data field>); | <I-block data field>
  Displays text in the title line on the optical spectrum analyzer display.

TM(_,([EXT|FREE|LINE|VID]))?)
  Selects the trigger mode that determines how the sweep is triggered.
  Query response: EXT|FREE|LINE|VID

TP(_,(<number>|[predefined variable]|<user-defined variable>|<trace element>);)
  Modifies the shape of stored, graphics items.
(TRA|TRB|TRC)\(<\text{number}>[<\text{amplitude unit}>]\); <\text{number}>[<\text{amplitude unit}>]
\text{A-block data field}>?; <\text{I-block data field}>
 Sends or receives trace-amplitude information for traces A, B, or C.
 Query response: <\text{trace}>[<\text{element position}>][(<\text{amplitude}>)?]
 #A<\text{nsb length}><\text{dsh length}><\text{data byte}>[<\text{data byte}>]|
 #I<\text{data byte}>[<\text{data byte}>][<\text{data byte}>]

TRCOND_: <\text{reference trace}>,<\text{start}>,<\text{stop}>,<\text{sweep}>,
<\text{top of screen}>,<\text{bottom of screen}>,<\text{trace length}>,
<\text{reference level}>, (LIN|LOG|RLOG)?
 Scales trace data displayed in a graphics window.
 Query response: <\text{start}>,<\text{stop}>,<\text{sweep}>,<\text{top of screen}>,
<\text{bottom of screen}>,<\text{trace length}>,<\text{reference}
<\text{level}>, (LIN|LOG|RLOG)

TRDEF_: (TRA|TRB|TRC)<\text{user-defined trace name}>),(<\text{trace}
<\text{length}>)?
 Changes the trace length or creates new trace arrays.
 Query response: <\text{number}>

TRDSP_: (TRA|TRB|TRC), (ON|OFF)[0|1]?;
 Blanks display of active trace(s) without clearing the trace data
 or interrupting measurements.
 Query response: 0|1

TRNSZLOCK; _ON|OFF|L(0|1));
 Locks transimpedance amplifier for fast pulse measurements.
 Query response: 0|1

TRPST;
 Sets trace operations to their preset values.

3-56 Programming Commands
TRSTAT?
Returns the current status of the active trace.
Query response:
(\text{MAX|MIN|WRITE|OFF}, (\text{OFF|ON}) \cdot \text{L_F}(\text{MAX|MIN|WRITE|OFF}, (\text{OFF|ON}))

TS:
Initiates and takes a sweep.

TWINDOW\langle \text{destination} \rangle, (\text{FLATTOP|HANNING|UNIFORM|HAMMING});
Formats a trace array with real values for use with the fast Fourier transform function (FFT).
\langle \text{destination} \rangle := \text{TRA}[\text{TRB}][\text{TRC}][\text{user-defined trace}][\text{trace range}]

USERERR\langle \text{error number} \rangle, (\text{delimiter} \langle \text{error text} \rangle \langle \text{delimiter} \rangle)[\langle \text{A-block data field} \rangle][\langle \text{I-block data field} \rangle];
Returns an error message of your design and assigns the error a number.
\langle \text{error number} \rangle := \langle \text{number} \rangle | \langle \text{predefined variable} \rangle | \langle \text{user-defined variable} \rangle | \langle \text{predefined function} \rangle | \langle \text{trace element} \rangle
\langle \text{error text} \rangle := \langle \text{character string} \rangle

USERKEY(\langle \text{A-block data field} \rangle)?;
Return or receive data that configures \text{(USER) keys}. Query response:
\#A<msb\ length><\text{lsb\ length}>USTATE_\#A<msb\ length><\text{lsb\ length}><\text{data\ byte}[i]>

USERLOCK(\langle \text{OFF|ON} [0\|1] \rangle)?;
Restricts front-panel operation to the \text{(USER) keys only. Must be reset remotely. Query response: 0\|1}

USERMSG(\langle \text{delimiter} \langle \text{data\ byte}[i] \rangle <\text{delimiter} \rangle | \langle \text{A-block\ data\ field} \rangle)[| \langle \text{I-block\ data\ field} \rangle];
Writes a message of 39 characters or less in the message area on the display.
USERWARN_(<number>|<predefined variable>|<user-defined variable>|<predefined function>|<trace element>),((<delimiter>|<character>|<delimiter>|#A<msb length>|<lsb length>|<character>))#I{<character>};
  Display a user defined warning message.

USTATE(<A-block data field>|?);
  Transmits all information that is stored in internal memory by the user.
  Query response: #A<msb length>|<lsb length>USTATE_#A
  <msb length>|<lsb length>|<data byte[s]>

VARDEF_([<delimiter>|<character
string>][<delimiter>].(<number> [<units>]|<predefined variable>|<user-defined variable>)
  <predefined function>|<trace element>);
  Creates a user-defined variable and assigns it a value.

VARIANCE_(TRA|TRB|TRC|<user-defined trace>|<trace range>|?);
  Computes the amplitude variance of the specified trace.
  Query response: <number>

VAVG_((<number>|EP|DN|UP|OFF|ON))?
  Reduces amplitude variation of trace using digital averaging.
  Query response: <number>

VB_((<number>|<frequency unit>|EP|DN|UP|MAN|AUTO))?
  Specifies the video bandwidth filter value to reduce the noise floor
  of trace data. Default units are Hz.
  Query response: <number>

VIEW_(TRA|TRB|TRC);
  Stops sweeping the specified trace and displays it.

VTDL_((OFF|ON|0|1))?;
  Control the video trigger display lines.
VTH(\(<\text{number}>[\text{DB}][\text{EP}][\text{DN}][\text{UP}]\)>?;  
Determines the direction and magnitude of change in the 
detected video-signal level that triggers a sweep.  
Query response:  \(<\text{number}>\)

VTL(\(<\text{number}>[\text{DBM}][\text{DB}][\text{power unit}]>[\text{EP}][\text{DN}][\text{UP}]\)>?;  
Specifies the video trigger amplitude level.  
Query response:  \(<\text{number}>\)

VW(\(<\text{OFF}>[\text{ON}][0][1]\>);  
Blanks or displays graphic items that have been created with the 
IT command.

WAIT(\(<\text{number}>[\text{S}][\text{TIME}][\text{US}]>[\text{predefined variable}]>[\text{user-defined} \text{ variable}]>[\text{predefined function}]>[\text{trace element}]\)>;  
Suspends program operation for the specified length of time.

WARN?;  
Return a listing of all reported warning codes.

WARNCTRL(\(<\text{OFF}>[\text{ON}][0][1]\)>?;  
Enable or disable warning messages.

WLIMIT(\(<\text{OFF}>[\text{ON}][0][1]\)>?;  
Extends the wavelength measurement range.  
Query response:  \(0|1\)

WLMKRL(\(<\text{number}>[\text{wavelength unit}]\>);  
Positions the left power integration point.  
May only be used with the LED download command.

WLMKRR(\(<\text{number}>[\text{wavelength unit}]\>);  
Positions the right power integration point.  
May only be used with the LED download command.

WLOFFSET(\(<\text{number}>[\text{wavelength unit}]>[\text{DN}][\text{UP}][\text{EP}]\)>?;  
Offsets the wavelength scale for all absolute wavelength readouts, 
inputs, and outputs.  
Query response:  \(<\text{number}>\)
**WLU**<sub>N</sub>ITS_<sub>source trace</sub>[<sub>reference trace</sub>];
Converts trace position units to wavelength.
Query response:  <number>

**XAMP**SW{(_OFF|ON)};
Activates the rear-panel TRANS-Z INPUT connector. This command is valid only in the HP 71451B (or the HP 70951B).
The maximum current allowed at the rear-panel TRANS-Z INPUT connector is ±10 mA and the maximum input voltage is ±10 V.
Query response:  OFF|ON

**XCH**_<sub>source 1</sub>,<sub>source 2</sub>;
Exchanges the contents of source 1 and source 2.
<source 1> ::= TRA|TRB|TRC|<user-defined trace>|<trace range>|
<predefined variable>|<user-defined variable>
<source 2> ::= TRA|TRB|TRC|<user-defined trace>|<trace range>|
<predefined variable>|<user-defined variable>|<predefined function>| <number>{<units>}

**XERR**?;
Returns error information when an instrument in a system encounters an error.
Query response:  <error #>,<model #>,<row>,<column>,<error text>

**XWARN**?;
Return an extended listing of all reported warnings.
Query response:
{<number>,{<character>},{<number>,<number>,{<character>}}}

**ZERO**{(_AUTO|M|AN|ONEC)}?;
Zeroes the photodiode's dark current.
Query response:  AUTO|M|AN

**ZOOM**RB{(_<number>[<wavelength unit>]|UP|DN)}?;
Measures a signal in zero span with a desired resolution bandwidth.
Query response:  <number>

3-60  Programming Commands
Error Messages

This chapter defines all possible error messages displayed on the optical spectrum analyzer’s screen. These error messages can be the result of incorrect operating procedures, illegal programming commands, or hardware failures. Normally, the optical spectrum analyzer removes error messages from the screen as soon as the error conditions are corrected. If you have a computer, error messages can also be retrieved via HP-IB by executing the ERR? programming command. Refer to the Programmer’s Guide for information on the ERR? command and programming.

In addition, this chapter lists the default warning messages that appear on the display.

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- Operating Errors (2000—2999) .............................. 4-3
- Hardware-Warning Errors (6000—6999) .................... 4-12
- Hardware-Broken Errors (7000—7999) ...................... 4-13
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- Factory-Use Only Errors (9000—9999) ..................... 4-17
- Warning Messages (10001—16012) ......................... 4-18
User Application Errors
(0001 – 0999)

The optical spectrum analyzer reports these errors when it cannot decipher a command in a user-application program. User-application programs consists of remote programming messages that are loaded into RAM. Refer to the Programmer’s Guide for information on programming.
Operating Errors (2000 – 2999)

Operating errors occur when the spectrum analyzer is operated incorrectly.

2000 No errors
This message is returned from querying the system when no error is present in the system.

2001 Illegal command
The remote command sent over the bus or executed as part of a DLP was not a legal remote command. This error could also occur if a User Variable (VARDEF), which did not exist, was used as a parameter in a remote command. To solve this problem, check for missing terminators, and the proper number of parameters. Also verify that delimited strings are properly ended. Use the debug softkey or the DEBUG command to locate the programming error. Refer to the debug softkey description in the User’s Guide and the DEBUG command description in the Programmer’s Guide.

2002 Illegal parameter
This is a user-generated system protocol error.

2003 Missing parameter
The command being executed requires more parameters than were provided, or a user variable VARDEF used as a parameter for a function was not found. To solve this problem, use the debug softkey or the DEBUG command to locate the programming error. Refer to the debug softkey description in the User’s Guide and the DEBUG command description in the Programmer’s Guide.

2004 Illegal character
Refer to chapter 6 for a table of valid character codes.

2005 Illegal character set
Refer to chapter 6 for a table of valid character codes.

2006 Parm out of range
Operating Errors (2000 – 2999)

A change was made to an instrument setting that was beyond the capabilities of the hardware. This could be remote, DLP, or front panel changes.
To solve this problem, use the debug softkey or the DEBUG command to locate the programming error. Refer to the debug softkey description in the User’s Guide and the DEBUG command description in the Programmer’s Guide.

2007 Missing terminator
Many programming commands and decision constructs require the use of termination characters. For example, the TITLE command uses termination characters to delimit the text string. Also, FUNCDEFs require termination characters. This error indicates a missing termination character. Refer to the Programmer’s Guide for more information.

2009 Protocol error
Internal error due to illegal communication. Due to a hardware failure. To solve this problem, please document all details possible that lead up to the error and contact your HP representative.

2010 Cmd out of sequence
Internal error due to process synchronization. Possible hardware failure.
To solve this problem, please document all details possible that lead up to the error and contact your HP representative.

2011 Memory overflow
There is not enough available memory for the operation.
Examples would be adding a VARDEF, FUNCDEF, or ACTDEF sending AMPCOR data adding new modules to a system that was almost out of memory because of FUNCDEF’s, etc.
To solve this problem, some items must be removed from memory. Analyze DLP’s to see if there are extra characters (spaces, etc.) that could be removed.

2013 Item not found or XXXXX not found
The XXXXX will be replaced by the name of the item that was not found. A request was made to operate on an item in memory that was not located.

4.4 Error Messages
Operating Errors (2000 – 2999)

To solve this problem, use the **debug** softkey or the DEBUG command to locate the programming error. Refer to the **debug** softkey description in the *User’s Guide* and the DEBUG command description in the *Programmer’s Guide*.

2014 Duplicate identifier
A variable, trace, or DLP name matches a reserved spectrum analyzer command. To solve this problem, use the **debug** softkey or the DEBUG command to locate the programming error. Refer to the **debug** softkey description in the *User’s Guide* and the DEBUG command description in the *Programmer’s Guide*.

2015 Too many entries
Too many user definitions. More entries have been made in an internal table than was reserved. This often occurs when there are too many entries in a limit line table. To solve this problem, use the LIMILINE command to allocate more space for limit line entries.

2016 Label too long
A user generated key label that has more than 14 characters, or a FUNCDEF, VARDEF, or ACTDEF with more than 12 characters will generate this error. To solve this problem, the system will truncate the text to the correct number of characters and execute the requested function. Use the **debug** softkey or the DEBUG command to locate the programming error. Refer to the **debug** softkey description in the *User’s Guide* and the DEBUG command description in the *Programmer’s Guide*.

2018 State protected
This error occurs if a user stored instrument state that is protected was requested to be removed from memory. The state will not be removed. Also, if the number of user states is reduced using NSTATE, all states above the requested number will be deleted. If any of those states were protected, the NSTATE command will be ignored and this error will occur. To solve this problem, unprotect any states no longer needed.
Operating Errors (2000 – 2999)

2019 Illegal marker type
The command executed does not apply to the marker mode of the markers on the display. For example, if a normal marker is on screen, and the “Marker delta into span” function is activated, the function cannot be executed, and the error will occur. To solve this problem, refer to the programming or operation manual for the function being executed to determine the proper marker type for the operation.

2020 No active marker
This error occurs when Marker Delta is moved to Center Frequency Step Size (MKSS) while no markers are active.

2021 Bad IF/ENDIF nesting
To solve this problem, use the debug softkey or the DEBUG command to locate the programming error. Refer to the debug softkey description in the User’s Guide and the DEBUG command description in the Programmer’s Guide.

2022 REPEAT/UNTIL error
To solve this problem, use the debug softkey or the DEBUG command to locate the programming error. Refer to the debug softkey description in the User’s Guide and the DEBUG command description in the Programmer’s Guide.

2023 Illegal Cal signal
Calibration signal did not match expected limits. Refer to chapter 1 of the User’s Guide.

2024 Illegal HP-MSIB comm
Illegal HP-MSIB communication. An HP-MSIB protocol violation has occurred. To solve this problem, document all steps leading up to the error condition and contact your HP representative.

2025 System error (slave)
HP-MSIB communications with a slave module has created this error. To solve this problem,
Record the error number and the hexadecimal code.
Record all events that led up to the occurrence of the error message.

4.6 Error Messages
Operating Errors (2000 - 2999)

Record the HP model numbers of the modules in the system.
Record the firmware version.
Contact the nearest HP Sales and Service Office for assistance.

2027 Service mode—do IP
This is a user-generated system protocol error. The bandwidth
or reference select is not in their AUTO modes. (For service use
only.)

2029 Command syntax error
This error is generated when MSIB packet syntax is incorrect, or
when a BDLP call does not have the proper syntax.
To solve this problem, please document all the steps that led up
to this error and contact your HP representative.

2030 Scaling overflow
The user has requested a scale factor that is too large in the
DWINDOW command. To solve this problem, refer to the
DWINDOW command description in the Programmer’s Guide.

2031 Too many errors
The error buffer has been filled.

2032 Hardware not present
A function was requested that required hardware not available in
the system. To solve this problem, use the debug softkey or the
DEBUG command to locate the programming error. Refer to the
debug softkey description in the User’s Guide and the DEBUG
command description in the Programmer’s Guide.

2034 Test switch on
The module test switch is in the “test” position. All RAM is
erased at each power cycle. To solve this problem, set the module
test switch to the “normal” position.

2035 Illegal operation
The command cannot be performed as written or does not affect
the current measurement conditions.
To solve this problem, use the debug softkey or the DEBUG
command to determine which command generated the error
message. Refer to the debug softkey description in the
Operating Errors (2000 - 2999)

User’s Guide and the DEBUG command description in the 
Programmer’s Guide.

2036 HP-IB multiple cntr
A DLP used an OUTPUT command or the spectrum analyzer attempted to access the disk when another device had control of the HP-IB. To solve this problem, remove the other device from the HP-IB.

2037 No instr resp
No HP-IB instrument response from an OUTPUT command or mass storage (such as SAVE or RECALL) to an HP-IB disk. To solve this problem, verify that the HP-IB address is correct.

2039 User stack overflow
There is not enough RAM space remaining for the operation requested. Often nested DLPs are calling too deeply. For example, DLP “A” calls DLP “B” which calls DLP “C”, and so forth. To solve this problem, DLP program should be redesigned using fewer nesting levels.

2040 Partial USTATE data
A recalled user state is not complete.

2042 Not stored, A–X–>A
To solve this problem, use the debug softkey or the DEBUG command to locate the programming error. Refer to the debug softkey description in the User’s Guide and the DEBUG command description in the Programmer’s Guide.

2044 Not stored: open 1st
The data for the short is entered before the data for the open when normalizing for swept response. To solve this problem, store the data for the open first. Refer to the STORREF command.

2045 HP-IB bus error
HP-IB protocol violation. To solve this problem, verify cables and computer for proper operation.

2048 Userdef protected

4.8 Error Messages
Operating Errors (2000 – 2999)

User-defined function or [USER] key is protected. To solve this problem, use the [debug] softkey or the DEBUG command to locate the programming error. Refer to the [debug] softkey description in the User’s Guide and the DEBUG command description in the Programmer’s Guide.

2049 Battery failed
The battery backed up RAM was not valid. To solve this problem, return to Hewlett-Packard for servicing.

2050 Amper/span too large
Amplitude-correction data too large

2051 File not found
A user state was not found in memory. To solve this problem, check the state number or name.

2052 File already exists

2053 Storage device
The address of the selected storage device is incorrect. Refer to “Connecting an External HP-IB Drive” in chapter 10 of the User’s Guide for information on addressing external disk drives. If an HP-MSIB card is the selected storage device, make sure the card is in the front-panel card slot and that the card’s address is the same value as the display’s HP-IB address.

2054 Write protect
Mass storage device is write protected.

2055 Bad file
File cannot be read.

2056 Bad revision
A recalled state is from a different firmware revision and cannot be used.

2057 Volume full
The mass storage device is full. To solve this problem, remove some files from the mass storage device.
Operating Errors (2000 – 2999)

2058 bad volume or illegal volume

2059 directory full
   The directory of the mass storage device is full. To solve
   this problem, remove some files from the mass storage device.

2063 Bad cal wavelength
   The wavelength correction required for a wavelength calibration
   was too great. Only small wavelength errors may be corrected
   using the wavelength calibration feature. To solve this problem,
   specify a different wavelength for calibration or use a different
   light source.

2064 Signal not found
   The auto measure or auto-alignment routine did not find a valid
   signal. To solve this problem, connect a light source to the
   front-panel MONOCHROMATOR INPUT connector (OPTICAL
   INPUT on HP 71450A instruments.) Or, use a trace marker to
   specify a signal for the auto measure or auto-alignment routine to
   use.

2066 Illegal mode for cal
   The optical spectrum analyzer only allows power and wavelength
   calibrations in certain instrument modes. This error occurs when
   one of these calibrations is requested in the wrong instrument
   mode. To solve this problem, change the instrument mode to one
   of the selections shown on the screen.

2067 Invalid Traj Corrs
   The slope of the trajectory corrections from one point to another
   is too steep. This error may indicate a problem with the optical
   spectrum analyzer’s monochromator or fiber micro-positioner.
   To solve this problem, do an align preset to remove trajectory
   corrections. If this does not fix the problem, return the optical
   spectrum analyzer for servicing.

2069 Bad Wavelength Range
   Some commands (for example ALIGN AUTOPTS) require start
   and stop wavelength settings for proper operation. This error
   occurs when the valid range is exceeded. To solve this problem,
Operating Errors (2000 – 2999)

change the start and stop wavelengths to be within the valid range of the command.

2070 Sweep too fast
The selected sweep time is too fast to produce accurate data. The frequency of the trigger signal is too low. This error only occurs in non-zero spans. To solve this problem, increase the external trigger frequency or sweep time. Sweep time must be increased if trigger frequency is above 20 kHz to 50 kHz.
Hardware-Warning Errors
(6000 - 6999)

Hardware-warning errors occur when the hardware is faulty. The optical spectrum analyzer can still make measurements, but the accuracy of the measurement cannot be guaranteed.

6000 EAROM unprotected
   The memory-enable write switch is set to the WRITE position. It is not set to the PROTECT position. To solve this problem, set the memory-enable write switch to the PROTECT position.

6001 Confidence test passed

6002 A6 RAM checksum (battery)

6007 MSIB NMAA received
   HP-MSIB “no module at address” received. The module attempted to establish communication with a module at an incorrect address. The system responded with an NMAA (no module at address). To solve this problem, if using MSIB communication, verify the address if the module you are trying to communicate with is correct. Otherwise, document all steps that led to the error condition and contact your HP representative.

6008 Confidence test failed

6009 No module label

6010 Err in MDOC response
   An error in module-output capabilities response has occurred. To solve this problem, return to Hewlett-Packard for servicing.

6014 DSP parm error
   An internal firmware error occurred in the data-acquisition firmware. The 2-digit hexadecimal code listed with the error may assist Hewlett-Packard in diagnosing the problem. To solve this problem, report the error (including the 2-digit hexadecimal code) to your field service representative.
Hardware-Broken Errors
(7000 – 7999)

Hardware-broken errors occur with faulty hardware.

7000 ROM check error
The programmed checksum of the ROM does not agree with the computed checksum. To solve this problem, because this could only be caused by a hardware failure. Return to Hewlett-Packard for servicing.

7009 ROM 2 check error

7033 Power supply error
One or more of the +5 V, -12 V, or -5 V voltages are out of spec.

7036 HP-MSIB error

7047 RAM failure
The RAM self test detected a failure in the system RAM. To solve this problem, return to Hewlett-Packard for servicing.

7051 Slit failed
The slit wheel motor or associated hardware has failed. The 2-digit hexadecimal code indicates the nature of the failure and may assist Hewlett-Packard in diagnosing the problem. To solve this problem, return to Hewlett-Packard for servicing.

7052 Grating failed
The diffraction grating rotation motor or associated hardware has failed. The 2-digit hexadecimal code indicates the nature of the failure and may assist Hewlett-Packard in diagnosing the problem. To solve this problem, return to Hewlett-Packard for servicing.

7053 Bad spect. ROM
The calibration-data ROM for the monochromator has failed. The 2-digit hexadecimal code indicates the nature of the failure.

Error Messages  4-13
Hardware- Broken Errors (7000 – 7999)

and may assist Hewlett-Packard in diagnosing the problem. To solve this problem, return to Hewlett-Packard for servicing.

7054 Bad DSP ROM

The calibration-data ROM for the data acquisition hardware has failed. This is probably due to faulty hardware. The 2-digit hexadecimal code indicates the nature of the failure and may assist Hewlett-Packard in diagnosing the problem. To solve this problem, return to Hewlett-Packard for servicing.

7055 Cal failed

The optical spectrum analyzer could not calibrate the data acquisition hardware. This is probably due to faulty hardware. The 2-digit hexadecimal code indicates the nature of the failure and may assist Hewlett-Packard in diagnosing the problem. If the displayed 2-digit code is not shown in the following list, you will probably need to return the instrument to Hewlett-Packard for servicing. The following 2-digit hexadecimal codes originate from preforming an alignment to adjust the fiber-positioner tracking table. (Refer to the ALIGN programming command.)

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0B</td>
<td>Trajectory Table Overflow: This error indicates an attempt to add a point to an already-full trajectory correction table. Neither the table or the current autoalign data are altered. Trajectory correction table data may be viewed via the extended state display (EXTEND STATE softkey).</td>
</tr>
<tr>
<td>2B</td>
<td>Invalid Trajectory Corrections: The data being added to the correction table would cause the correction curve to become too steep. Neither the table or the current \texttt{AUTO ALIGN} data are altered. This can happen when executing the function after a long period of time has elapsed since the last ALIGN, or after the instrument has received a substantial mechanical shock. It can usually be remedied by executing the ALIGN function.</td>
</tr>
</tbody>
</table>

7056 Bad flatness

The flatness correction data in one of the calibration ROMs is faulty. The 2-digit hexadecimal code indicates the nature of the failure and may assist Hewlett-Packard in diagnosing the
Hardware- Broken Errors (7000 – 7999)

Problem. To solve this problem, return to Hewlett-Packard for servicing.

7057 DSP Error
An internal error occurred in the data acquisition hardware or firmware. The 4-digit hexadecimal code indicates the nature of the failure and may assist Hewlett-Packard in diagnosing the problem. To solve this problem, report this error (including the 4-digit hexadecimal code) to your field-service representative.
Computation Errors
(8000 – 8999)

Computation errors occur during illegal math operations. For all of these computation errors, use the debug menu or the DEBUG command to locate the programming error. Refer to the debug softkey description in Chapter 3. Or, refer to the DEBUG command description in the Programmer’s Guide.

8000 Divide by zero

8001 Float pt overflow
   Floating-point overflow. Absolute value of number exceeds $1.797,693,134,862,315 \times 10^{308}$.

8002 Log of zero

8003 Log of negative

8004 Integer overflow
   Number is less than $-32,768$ or greater than $32,767$.

8005 Square root error

8006 Modulus of zero

8999 Float pt underflow
   Floating-point underflow. Number is between 0 and $\pm 2,225,073,858,507,202 \times 10^{-308}$.
Factory-Use Only Errors
(9000 – 9999)

These errors are for factory use only. If any of the 9000 – 9999 error messages occur, perform the following:

☐ Record the error number and the hexadecimal code.

☐ Record all events that led up to the occurrence of the error message.

☐ Record the HP model number of the optical spectrum analyzer and the display.

☐ Record the firmware version.

☐ Contact the nearest HP Sales and Service Office for assistance.
**Warning Messages (16001 – 16012)**

Warnings indicate that a user might not be performing a task properly.

16001 **Simulated hardware**
System hardware is missing. The instrument attempts to simulate the missing hardware in order to continue operation.

16002 **Trace length changed (due to ADC switch)**
The trace length has been changed to accommodate a change in the analog-to-digital converter (ADC).

16003 **Usable RBW limited**
The range of available resolution bandwidths has been reduced due to instrument settings or conditions.

16004 **Usable VBW limited**
The range of available video bandwidths has been reduced due to instrument settings or conditions.

16005 **Sweep too fast**
The selected sweep time is too fast to produce accurate data.

16006 **No current state 0**
The optical spectrum analyzer attempted to recall a state register that was empty. The POWERON RECALL command or POWERON RECALL softkey has been used and then the instrument's power recycled. This causes the optical spectrum analyzer to attempt to recall state register 0.

16007 **Possible compression**
Instrument settings have resulted in a condition that may result in signal compression.

16008 **No autoalign data**
The display of this warning message results from executing the ALIGN programming command. The MANUAL argument performs an automatic alignment and transfers the resulting X and Y digital-to-analog converter (DAC) offsets to the fiber
Warning Messages (16001 – 16012)

positioner’s trajectory correction table. In rare situations where these offsets are zero, this warning is displayed.

16011 Span too large
The wavelength span has set the start and stop wavelengths outside the tuning range of the optical spectrum analyzer.

16012 PSDAC adjust past RL