## Errata

**Title & Document Type: 8510B Network Analyzer Keyword Dictionary**

**Manual Part Number: 08510-90072**

**Revision Date: April 1988**

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## HP References in this Manual

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

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# KEYWORD DICTIONARY

# HP 8510B
# NETWORK ANALYZER

This manual applies directly to HP 8510B Network Analyzers having an HP 85101B Display/Processor with serial number 2812A04053, and to all HP 8510As that have been upgraded to HP 8510Bs.



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HEWLETT PACKARD

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# INTRODUCTION

This HP 8510 Keyword Dictionary is designed as an extension of the HP 8510 Operating and Programming Manual (HP Part Number 08510-90070), and the two should be used together. Detailed explanation of HP 8510 network analyzer operation and functions appears in the Operating and Programming Manual. The Reference Data section of that manual contains complete pictorial outline of the HP 8510 menu structure together with programming mnemonics for each softkey.

The HP 8510 Keyword Dictionary expands upon the Operating and Programming Manual by providing a complete alphabetical list of HP 8510 front panel hardkeys, menu softkeys, and programming mnemonics. Each entry also includes, as needed, information about each function necessary to use it in programmed operation of the HP 8510 network analyzer system.

To use this dictionary, first study the annotated sample pages in the preliminary section titled Using the Dictionary. These pages explain each heading and the terms used in the actual entries. Terms such as MAIN MENU, PRIOR MENU, NEXT MENU, and PRESET all have special and exact meanings, and are explained in that section.

The following information is included after the alphabetical list of keywords:

- HP 8510B Alphabetical List of Programming Codes
- HP 8510 Query Commands
- User Display
- Circuit Modeling Program
- Commands

- HP-IB Universal Commands
- HP-IB Addressed Commands
- Preset State Values
- HP 8510 Caution/Tell Messages
- Alphabetical Index of Keywords

# USING THE HP 8510 KEYWORD DICTIONARY

This section of the HP 8510 Keyword Dictionary is essential in using the dictionary. It provides sample pages showing actual dictionary entries together with (on the facing page) an item by item explanation of what each entry means.

Not all entries are the same, and the information given depends on the function being described. Therefore, in addition to the annotations based on the sample pages, explanation is also given of the conventions used in entries not shown in the sample pages but appearing elsewhere in the dictionary.

① softkey NAME OF KEY
mnemonic **MNEMONIC**

Entries in this Keyword Dictionary are of three kinds. Softkey entries, for example HOLD, refer to commands that are executed when one of the eight keys immediately to the right of the HP 8510 CRT display is pressed. The name of the softkey given in the entry is the label that appears in the menu area of the HP 8510 CRT display.

Hardkey entries refer to front panel keys on the HP 8510 and give the name of the key as it appears on the front panel. HP-IB only entries give only the programming mnemonic for commands that can be given through the controller but which have no corresponding softkey or hardkey.

Softkey labels and hardkey names are given in capital letters: HOLD. If the function can be executed programmatically, the mnemonic for that function is also given, below the name of the key in bold capital letters: **HOLD**. HP-IB only commands give only the programming mnemonic, in bold capital letters.

② Description of Command.

Below the lines identifying the key and its mnemonic is a phrase or a sentence telling what command is given to the HP 8510 by pressing that softkey or hardkey or using its programming mnemonic. Thus, in the sample entry, when the softkey HOLD is pressed or the mnemonic **HOLD** is used in a program, the Hold mode will be selected for both channels of the HP 8510 network analyzer and the sweep will be stopped.

③ **MAIN MENU**
**PRIOR MENU**
**NEXT MENU**

Menu lines describe where in the overall HP 8510 menu structure the softkey described appears. These lines exist to make it easy to locate the function in the pictorial representation of all of the HP 8510 menus included in the Reference Data section of the HP 8510 Operating and Programming manual.

MAIN MENU gives the name of the first-level (or main) menu which directly or through other menus brings that softkey label onto the HP 8510 CRT display. PRIOR MENU gives the name of the menu on which the softkey actually appears. Continuations of menus, brought onto the CRT by pressing MORE, are treated as part of the menu itself. NEXT MENU gives the name of the menu that will appear after the command described has been executed, if such a menu will appear.

*continued on p. 5* →

-- -- -- SAMPLE -- -- --

HP 8510 Keyword Dictionary HOLD
**HOLD**

① softkey HOLD
mnemonic **HOLD**

② Select Hold Mode for both Channels; Sweep Stopped.

---

**MAIN MENU** STIMULUS ③
**PRIOR MENU** STIMULUS
**NEXT MENU** NONE

**PRESET** CONTINUAL ④
**COUPLED** ALWAYS COUPLED **RECALLED** YES

---

**Manual Sequence**

STIMULUS MENU ⑤
MORE
HOLD

**Program Sequence**

HOLD ; ⑥

---

The raw data array(s) are not updated and the Enhancement Label **H** appears in the enhancement labeled area of the CRT.

Updating of the trace does result from any of the following: FORMAT changes, RESPONSE changes, DOMAIN changes, DISPLAY changes, DOMAIN changes, and completion of INPU<data type> HP-IB operations.

If the CHANNEL or PARAMETER is changed and raw data for the new selection is not available, the trace is zeroed (x,y = 0,0). All basic parameter raw data is available when 2-Port correction is On, and at least one group of sweeps is taken prior to HOLD.

MEASUREMENT RESTART has no effect. ⑦

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-- -- -- SAMPLE -- -- --

HP 8510 Keyword Dictionary HOLD
**HOLD**

① softkey HOLD
mnemonic **HOLD**

② Select Hold Mode for both Channels; Sweep Stopped.

---

**MAIN MENU** STIMULUS ③
**PRIOR MENU** STIMULUS
**NEXT MENU** NONE

**PRESET** CONTINUAL ④
**COUPLED** ALWAYS COUPLED **RECALLED** YES

---

**Manual Sequence**

STIMULUS MENU ⑤
MORE
HOLD

**Program Sequence**

HOLD ; ⑥

---

The raw data array(s) are not updated and the Enhancement Label **H** appears in the enhancement labeled area of the CRT.

Updating of the trace does result from any of the following: FORMAT changes, RESPONSE changes, DOMAIN changes, DISPLAY changes, DOMAIN changes, and completion of INPU<data type> HP-IB operations.

If the CHANNEL or PARAMETER is changed and raw data for the new selection is not available, the trace is zeroed (x,y = 0,0). All basic parameter raw data is available when 2-Port correction is On, and at least one group of sweeps is taken prior to HOLD.

MEASUREMENT RESTART has no effect. ⑦

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In the example, the softkey HOLD appears on the continuation of the STIMULUS menu. The Main Menu and Prior Menu entries are identical in this case, because the softkey appears on a main menu. No additional menus will appear after this softkey is pressed or the programming command is executed, so the Next Menu entry is NONE.

④ **PRESET**
**COUPLED**
**RECALLED**

Entries given next depend on the function, and information is supplied only when it is applicable to the function:

**PRESET** State or value selected by PRESET.

In the example, the CONTINUAL mode is selected by PRESET. This indicates that to operate the instrument in the HOLD mode the softkey HOLD must be pressed or the programming mnemonic **HOLD** must be executed.

When a function is selected automatically by PRESET, the function name appears in this place.

Details on the HP 8510 PRESET state are given in the HP 8510 Operating and Programming Manual. A complete list describing the PRESET state or value for each function begins on p. 407 of this Keyword Dictionary.

**COUPLED** Indicates, for this function, whether Channel 1 and Channel 2 are coupled (the setting for one channel is automatically duplicated in the other channel), or uncoupled (each channel is set independently).

ALWAYS COUPLED indicates that for this function the channels cannot be set independently. Thus, in the example, ALWAYS COUPLED indicates that if HOLD is selected for one channel, HOLD is also selected automatically for the other channel.

ALWAYS UNCOUPLED indicates that for this function settings on one channel have no effect on settings of the other channel. Unless the settings are changed for one or both channels, the PRESET state or values are used.

MAY BE UNCOUPLED indicates that for this function the two channels can be set independently, but only by selecting UNCOUPLED CHANNELS (UNCC) before setting the channels.

COUPLED CHANNELS is the PRESET state for all functions, and only those functions labeled MAY BE UNCOUPLED or ALWAYS UNCOUPLED can be set independently.

Details on coupled and uncoupled functions appear in the HP 8510 Operating and Programming Manual. A complete list of coupled and uncoupled functions appears in this Keyword Dictionary under the entry of COUPLED CHANNELS (Table 6, p. 70).

**RECALLED** YES/NO. Indicates whether selections made by pressing the softkey or hardkey or executing the programming command can be saved in an Instrument State Register and recalled when that Instrument State is recalled.

In the example, HOLD will be recalled if the Instrument State is saved and recalled.

Other items are provided when applicable:

**INITIALIZED** State or value when the operating system program is first loaded from the operating system tape, or upon Power Up. If no listing appears, this state or value is the same as the PRESET state or value.

**RANGE** Indicates the range of values that may be entered for this function.

**TIME DOMAIN OPTION 010 ONLY**

Indicates that this function is available only if the HP 8510 network analyzer system being used is equipped with Time Domain Option 010.

**SEE ALSO** Lists other entries in this Keyword Dictionary that should be consulted in connection with this function.

## ⑤ Manual Sequence

Listed under this heading are the hardkeys and softkeys to be pressed, in the order given, to execute the function in manual operation. The first key to be pressed is always one of the HP 8510 front-panel keys (hardkeys). The remaining keys are softkeys, labeled in the menu area of the HP 8510 CRT display, or front-panel keys (such as those in the ENTRY block) used to enter values, specify units, or to make channel or parameter selections.

In the example, to execute HOLD, first press the MENU key in the STIMULUS block on the HP 8510 front panel. This will bring the first-level (main) Stimulus Menu onto the CRT. Second, press the softkey beside the label MORE. This will display the continuation of the Stimulus Menu. Third, press the softkey beside the label HOLD. The HOLD mode will be selected for both channels and the sweep will be stopped.

Conventions used in describing more complex operations are the same for both Manual and Program Sequences and are illustrated in the example on the next page. These conventions are:

<text>

Angle brackets identify user-definable text that may be part of the softkey label or programming mnemonic, or to indicate actions that are to be performed at this point by the operator.

In the example on the next page:
<cal kit 1 label> indicates that a user-defined kit label may appear on the CRT display along with the label CAL 1.
<measure 1-PORT standards> indicates that after the softkey REFLECT'N is pressed the operator should measure the calibration standards for a 1-Port calibration.

*or*

The word *or*, in italics, indicates that at this point either (or any) of the softkeys or mnemonics listed may be used. One of them must be selected before proceeding.

CAL 1 <cal kit 1 label> *or*
CAL 2 <cal kit 2 label>
  FULL 2-PORT *or*
  ONE-PATH 2-PORT
indicates that at this point either CAL 1 or CAL 2 must be selected, then either FULL 2-PORT or ONE-PATH 2-PORT.

*continued on p. 9* →

-- -- -- SAMPLE -- -- --

REFLECT'N . . . DONE HP 8510 Keyword Dictionary
**REFL . . . REFD**

① softkey REFLECT'N
mnemonic **REFL**

② After Selection of 2-PORT Measurement Calibration, Begin Reflection Calibration Sequence.

softkey REFLECT'N DONE
mnemonic **REFD**

2-Port Reflection Calibration Sequence is Complete. Compute Reflection Error Coefficients.

---

**MAIN MENU** CAL ③

**SEE ALSO** CALIBRATE: $S_{11}$ 1-PORT ④

---

**Manual Sequence**

⑤

```
CAL
  CAL 1 <cal kit 1 label> or
  CAL 2 <cal kit 2 label>
    FULL 2-PORT or
    ONE-PATH 2-PORT
      REFLECT'N
        <measure 1-PORT standards>
          REFLECT'N DONE
            <transmission and isolation calibration steps>
              SAVE 2-PORT CAL
                CAL SET n    (n = 1 - 8)
```

**Program Sequence**

⑥

```
CAL1 ; or CAL2 ;
  CALIFUL2 ; or CALIONE2 ;
    REFL ;
      <measure 1-PORT standards>
        REFD ;
          <transmission and isolation calibration steps>
            SAV2 ;
              CALS n ;  (n = 1 - 8)
```

---

 *continued* →

*n*

The letter *n*, in italics, indicates that a variable entry value, representing either part of a key label or a mnemonic, is to be supplied, either by pressing the corresponding softkey or as part of the programming command.

In the example on the facing page, CAL SET *n* (mnemonic: CALS *n* ;) indicates that a value identifying the cal set is required.

(*n* = )

Lower case text in parentheses describes the range of values which may be input for the selected function.

In the example on the facing page, one of the softkeys labeled 1 through 8 must be pressed, or, in programming, an integer from 1 through 8 must be entered.

Other conventions, not shown in the example on the facing page, are:

entry

Indicates that a numeric value is to be entered using the knob, the STEP keys, or a numeric entry followed by one of these terminators:

G/n = Giga or nano,
M/μ = Mega or micro,
k/m = kilo or milli,
x1 = Basic units: Hz, seconds, dB, volts

If a specific terminator is required, it is shown with the entry.

[optional]

Square brackets indicate that whatever is enclosed in the bracket is optional.

For example:

SMOOTHING ON [entry] (x1 = percent of span)

indicates that after pressing the softkey labeled SMOOTHING ON a numeric value is to be entered, followed by the terminator x1 to indicate percent of span. But as the square brackets indicate, the entry is optional. If no entry is made, the PRESET or most recently entered value will be selected.

## ⑥ Program Sequence

Listed under this heading are the programming commands to use, in the order given, to execute the function in programmed operation. Details on programming the HP 8510 network analyzer system, using an HP 200 series computer as the external controller, are given in the Introduction to Programming section of the HP 8510 Operating and Programming Manual.

Conventions are the same as in the Manual Sequence. Additional conventions, applicable only to programmed operation, are:

MNEMONIC ; — Program mnemonics must appear exactly as shown with no embedded spaces.

The semicolon ( ; ) is the required terminator character for each program instruction.

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

value — A constant or a pre-assigned simple or complex numeric or string variable transferred to the HP 8510.

variable — A simple or complex numeric or string variable which receives the value returned by the HP 8510.

[suffix] — Optional programmer entry Units Terminator for frequency and time units:

| Frequency Suffix | Time Suffix | Voltage Suffix |
|---|---|---|
| GHz | fs | - |
| MHz | ps | - |
| kHz | ns | - |
| Hz | µs | µV |
| | ms | mV |
| | s | V |

If no optional terminator is specified, the units will be the basic units: Hz, sec, V.

For example, the Program Sequence in the Frequency Domain:

SPAN [value [freq suffix] ] ;

indicates that the program can be written in three different ways, as desired:

| | |
|---|---|
| SPAN ; | Makes Span the Active Function. |
| SPAN 100 ; | Makes Span the Active Function, Sets Span to 100 Hz. |
| SPAN 100 MHz ; | Makes Span the Active Function, Sets Span to 100 MHz. |

Once a function is Active, any value input will change its value. For example. sending the string

START 1 GHz ;

makes START the Active function and sets it to 1 GHz. As long as the function is active, sending the string

2 GHz

will set the START frequency to 2 GHz.

⑦ **Additional Information**

Additional information is supplied about each function as required.

| | |
|---|---|
| softkey | <adapter class label> <cal kit 1 label> |
| mnemonic | ADAP1 |

| | |
|---|---|
| softkey | <adapter class label> <cal kit 2 label> |
| mnemonic | ADAP2 |

Specify Cal Kit Containing Adapter
in Adapter Removal Modify Cal Set.

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | ADAPTER REMOVAL |
| SEE ALSO | ADAPTER REMOVAL |

---

During the adapter removal process, an estimate of the adapter's electrical length is needed. The estimate needs to be with 90 degrees of the true phase value at each frequency, which is computed during the process.

The cal kit that contains the adapter definition is selected by ADAP1 or ADAP2; only one is needed. If more than one adapter is defined in the selected cal kit, a menu providing the choices will be displayed. No other characteristic of the adapter is used, other than the estimate of its electrical length, and whether it is of COAX or WAVEGUIDE type.

softkey ADAPTER REMOVAL
mnemonic ADAR

Select Adapter Removal Modify Cal Set.

---

MAIN MENU CAL
PRIOR MENU CAL MORE
NEXT MENU ADAPTER REMOVAL

---

**Manual Sequence**

CAL
MORE
MODIFY CAL SET
ADAPTER REMOVAL
CAL SET for PORT 1
CAL SET 1 . . . *n* (*n* = 1 - 8)
CAL SET for PORT 2
CAL SET 1 . . . *n* (*n* = 1 - 8)
<adapter class label> <cal kit 1 label> *or*
<adapter class label> <cal kit 2 label>
MODIFY & SAVE
CAL SET *n* (*n* = 1 - 8)

**Program Sequence**

ADAR;
CALSPORT1; CALS*n*;
CALSPORT2; CALS*n*;
ADAP1; or ADAP2;
MODS; CALS*n*

---

Adapter removal is a post-calibration process for creating a calibration set for non insertable devices. Two previous 2-port calibrations were made with a calibration adapter connected to port 1 in one case, and the same adapter to port 2 in the second case.

The adapter removal process will create a third calibration set with the effects of the adapter completely removed. The two calibration sets must have the same conditions (number of points, frequency range, etc.).

softkey ADD
mnemonic SADD

Add Frequency List Segment.

---

MAIN MENU STIMULUS
NEXT MENU SEGMENT EDIT
COUPLED ALWAYS COUPLED

SEE ALSO EDIT LIST

---

**Manual Sequence**

STIMULUS MENU
MORE
EDIT LIST
ADD
START *or*
STOP *or*
CENTER *or*
SPAN *or*
NUMBER OF POINTS *or*
STEP SIZE *or*
CW
DONE
DONE FREQUENCY LIST

**Program Sequence**

```
EDITLIST;
  SADD;
    CENTER [value];
    SPAN [value];
    STPSIZE [value];
    SDON;
      EDITDONE;
        LISFREQ;
```

---

The last segment edited is added to the list for editing when the ADD key or SADD command is done. The commands that follow edit only this segment.

softkey ADDRESS of 8510
mnemonic **ADDR8510**

HP-IB Address of HP 8510.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM *or* LOCAL | | |
| **PRIOR MENU** | HP-IB ADDRESSES | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | NOT CHANGED | | |
| **INITIALIZED** | 16 | **RANGE** | 0 - 30 |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | NO |
| **SEE ALSO** | HP-IB ADDRESSES | | |

---

**Manual Sequence**

```
LOCAL or
  SYSTEM, HP-IB ADDRESSES
    ADDRESS of 8510 [entry x1]   (entry = 0 - 30)
      PRESET
```

**Program Sequence**

```
ADDR8510 [value];      (value = 00 - 30)
  PRES;
```

---

An external controller uses this address to communicate with the HP 8510 measurement control and data transfer functions.

The HP 8510 address is part of the Hardware State. It is not changed by Power Up, PRESET or RECALL.

softkey ADDRESS of DISC
mnemonic **ADDRDISC**

Disc Unit System Bus Address.

---

| | | | |
|---|---|---|---|
| MAIN MENU | SYSTEM or LOCAL | | |
| PRIOR MENU | HP-IB ADDRESSES | | |
| NEXT MENU | NONE | | |
| PRESET | NOT CHANGED | | |
| INITIALIZED | 0 | RANGE | 0 to 7 |
| COUPLED | ALWAYS COUPLED | RECALLED | NO |
| SEE ALSO | HP-IB ADDRESSES<br>DISC UNIT NUMBER<br>DISC VOLUME | | |

---

**Manual Sequence**

LOCAL *or*
SYSTEM, HP-IB ADDRESSES,
ADDRESS of DISC [entry x1] (entry = 0 - 7)
PRESET

**Program Sequence**

```
ADDRDISC [value]; (value = 0 - 7)
  PRES;
```

---

Disc functions expect a disc drive at this address on the HP 8510 system bus. The DISC HP-IB address is part of the Hardware State. It is not changed by Power up, PRESET, or RECALL.

The HP 8510 uses the SUBSET/80 (SS/80) disc protocol.

softkey ADDRESS of PASS-THRU
mnemonic **ADDRPASS**

System Bus Address of Device to Communicate with External Controller via HP-IB.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM *or* LOCAL | | |
| **PRIOR MENU** | HP-IB ADDRESSES | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | NOT CHANGED | | |
| **INITIALIZED** | 31 | **RANGE** | 0 - 31 |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | NO |
| **SEE ALSO** | HP-IB ADDRESSES<br>ADDRESS of SYSTEM BUS | | |

---

**Manual Sequence**

```
LOCAL or
  SYSTEM, HP-IB ADDRESSES
    ADDRESS of PASS-THRU [entry x1]   (entry = 0 - 31)
      PRESET
```

**Program Sequence**

```
ADDRPASS [value];    (value = 00 - 31)
  PRES;
```

---

Pass-thru allows transfer of commands and data between an external controller connected to the HP 8510 HP-IB and the network analyzer system instruments connected to the HP 8510 System Bus.

Data bytes written to the HP 8510 System Bus address (see ADDRESS of SYSTEM BUS) will be "passed through" without interpretation by the HP 8510 to the instrument on the HP 8510 System Bus whose address corresponds to the current ADDRESS of PASS-THRU.

*continued* →

If the instrument on the system bus is commanded to output data, the data bytes from the instrument will be "passed through" and be available at the HP 8510 System Bus address.

The sending instrument must terminate its output with a linefeed.

Address 31 is an illegal address for an instrument, but is used to address the HP 8510 user display area of memory. A separate section at the end of this Keyword Dictionary is devoted to user display keywords and describes the HP-GL command subset which allows graphics and text to be written to the HP 8510 CRT.

HP-IB activity at the HP 8510 System Bus address causes an automatic SYSTEM BUS "LOCAL." After completion of a pass-thru operation, the next HP-IB activity (HP-IB command or HP 8510 instruction) at the HP 8510 HP-IB address causes automatic SYSTEM BUS "REMOTE."

HP-IB addressed or universal commands cannot be passed-through to an instrument on the system bus.

The PASS-THRU address is part of the harware state. It is not changed by Power Up or PRESET or RECALL.

| | |
|---|---|
| softkey | ADDRESS of PLOTTER |
| mnemonic | **ADDRPLOT** |

Digital Plotter System Bus Address.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM *or* LOCAL | | |
| **PRIOR MENU** | HP-IB ADDRESSES | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | NOT CHANGED | | |
| **INITIALIZED** | 05 | **RANGE** | 0 - 30 |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | NO |
| **SEE ALSO** | HP-IB ADDRESSES | | |

---

**Manual Sequence**

```
LOCAL or
  HP-IB ADDRESSES
    ADDRESS of PLOTTER [entry x1]   (entry = 0 - 30)
      PRESET
```

**Program Sequence**

```
ADDRPLOT [value];    (value = 00 - 30)
  PRES;
```

---

COPY functions expect the system digital plotter at this address on the HP 8510 System Bus.

The HP 8510 outputs variable length HP-GL strings using standard HP-IB digital plotter protocol.

The PLOTTER HP-IB address is part of the Hardware State. It is not changed by Power Up, PRESET or RECALL.

| | |
|---|---|
| softkey | ADDRESS of PRINTER |
| mnemonic | **ADDRPRIN** |

Printer System Bus Address.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM *or* LOCAL | | |
| **PRIOR MENU** | HP-IB ADDRESSES | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | NOT CHANGED | | |
| **INITIALIZED** | 01 | **RANGE** | 0 - 30 |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | NO |
| **SEE ALSO** | HP-IB ADDRESSES | | |

---

**Manual Sequence**

```
LOCAL or
  HP-IB ADDRESSES
    ADDRESS of PRINTER [entry x1]   (entry = 0 - 30)
      PRESET
```

**Program Sequence**

```
ADDRPRIN [value];    (value = 00 - 30)
  PRES;
```

---

COPY functions expect the system printer at this address on the HP 8510 System Bus.

The HP 8510 uses standard HP-IB line printer protocol.

The PRINTER HP-IB address is part of the Hardware State. It is not changed by Power Up, PRESET, or RECALL.

| | |
|---|---|
| softkey | ADDRESS of RF SWITCH |
| mnemonic | ADDRRFS |

RF Switch System Bus Address.

---

| | | | |
|---|---|---|---|
| MAIN MENU | SYSTEM or LOCAL | | |
| PRIOR MENU | HP-IB ADDRESSES | | |
| NEXT MENU | NONE | | |
| PRESET | NOT CHANGED | | |
| INITIALIZED | 31 | RANGE | 0 - 31 |
| COUPLED | ALWAYS COUPLED | RECALLED | NO |
| SEE ALSO | HP-IB ADDRESSES<br>ADDRESS OF TEST SET | | |

---

**Manual Sequence**

SYSTEM *or*
LOCAL, HP-IB ADDRESSES
MORE
ADDRESS of RF SWITCH [entry x 1] (entry = 0 - 31)
PRESET

**Program Sequence**

```
ADDRRFS [value]; (value = 00 - 31)
  PRES;
```

---

The RF SWITCH HP-IB address is part of the Hardware State. It is not changed by Power Up, PRESET, or RECALL. This is for use in conjunction with multiple test sets, and switching the RF power. See ADDRESS of TEST SET for additional information.

| | |
|---|---|
| softkey | ADDRESS of SOURCE #1 |
| mnemonic | **ADDRSOUR** |

Source #1 System Bus Address.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM *or* LOCAL | | |
| **PRIOR MENU** | HP-IB ADDRESSES | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | NOT CHANGED | | |
| **INITIALIZED** | 19 | **RANGE** | 0 - 30 |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | NO |
| **SEE ALSO** | HP-IB ADDRESSES<br>TRIG | | |

---

**Manual Sequence**

```
LOCAL or
  SYSTEM, HP-IB ADDRESSES
    ADDRESS of SOURCE  [entry x1]   (entry = 0 - 31)
      PRESET
```

**Program Sequence**

```
ADDRSOUR [value];    (value = 00 - 31)
  PRES;
```

---

HP 8510 measurement control functions expect the network analyzer source at this address on the HP 8510 System Bus.

Setting ADDRESS of SOURCE #1 to 31 indicates that there is no source on the HP 8510 System Bus; system source functions are controlled by an external controller. No source tuning operations are attempted.

Phase lock operations use the current STIMULUS frequency settings, unless LOCK to NONE is selected. Stimulus frequency limits become 45 MHz to 40 GHz (999 GHz if no test set connected) instead of normal source or test set frequency limitations.

*continued* →

When the ADDRESS of SOURCE #1 changed back to the address of the instrument, select STIMULUS MENU, MORE, CONTINUAL to restart the source.

If the HP 8510 is used in the HOLD mode without a source connected and the source address is set to anything other than 31, or if the source is turned off (regardless of setting), caution beeps will result. Setting ADDRESS of SOURCE to 31 will eliminate the caution beeps.

The SOURCE #1 HP-IB address is part of the Hardware State. It is not changed by Power Up, PRESET *or* RECALL.

softkey ADDRESS of SOURCE #2
mnemonic **ADDRSOU2**

Source #2 System Bus Address.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM *or* LOCAL | | |
| **PRIOR MENU** | HP-IB ADDRESSES | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | NOT CHANGED | | |
| **INITIALIZED** | 31 | **RANGE** | 0 to 31 |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | NO |
| **SEE ALSO** | HP-IB ADDRESSES | | |

---

**Manual Sequence**

```
LOCAL
  MORE
    ADDRESS of SOURCE # 2 [entry x1] (entry = 0 - 31)
      PRESET
```

**Program Sequence**

```
ADDRSOU2 [value]; (value = 0 - 31)
  PRES;
```

---

In multiple source mode, the 8510 will talk to the second source at this address. The initialized address is 31. For multiple source operation, the recommended value is 18.

Changing the address of the second source must always be followed by an instrument preset.

The SOURCE #2 HP-IB address is part of the Hardware State. It is not changed by Power-up, PRESET, or RECALL.

softkey ADDRESS of SYSTEM BUS
mnemonic **ADDRSYSB**

HP-IB Address of HP 8510 System Bus.

---

| | | | |
|---|---|---|---|
| MAIN MENU | SYSTEM *or* LOCAL | | |
| PRIOR MENU | HP-IB ADDRESSES | | |
| NEXT MENU | NONE | | |
| PRESET | NOT CHANGED | | |
| INITIALIZED | 17 | RANGE | 0 - 30 |
| COUPLED | ALWAYS COUPLED | RECALLED | NO |
| SEE ALSO | HP-IB ADDRESSES<br>ADDRESS of PASS-THRU | | |

---

**Manual Sequence**

```
LOCAL or
  HP-IB ADDRESSES
    ADDRESS of SYSTEM BUS  [entry x1]   (entry = 0 - 30)
      PRESET
```

**Program Sequence**

```
ADDRSYSB [value];    (value = 00 - 30)
  PRES;
```

---

An external controller uses this address to communicate with the HP 8510 System Bus.

The SYSTEM BUS HP-IB address is part of the Hardware State. It is not changed by Power Up, PRESET, or RECALL. It is not recommended to change this entry via HP-IB because this can cause the HP 8510 to stop responding via HP-IB.

softkey ADDRESS of TEST SET
mnemonic **ADDRTESS**

Test Set System Bus Address.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM *or* LOCAL | | |
| **PRIOR MENU** | HP-IB ADDRESSES | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | NOT CHANGED | | |
| **INITIALIZED** | 20 | **RANGE** | 0 - 31 |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | NO |
| **SEE ALSO** | HP-IB ADDRESSES<br>ADDRESS of PASS-THRU<br>ADDRESS of RF SWITCH | | |

---

**Manual Sequence**

LOCAL *or*
  HP-IB ADDRESSES
    ADDRESS of TEST SET [entry x1] (entry = 0 - 31)
      PRESET

**Program Sequence**

ADDRTESS [value]; (value = 00 - 31
  PRES;

---

HP 8510A measurement control functions expect the test set at this address on the HP 8510 System Bus. If the test set is turned off or is not connected to the System Bus, a caution beep and an error message is displayed and the test set will not execute the command.

Setting the ADDRESS of TEST SET to 31 indicates that the test set is not connected to the HP 8510 System Bus (signal routing is controlled manually or by an external controller). No test set signal path control functions are attempted.

The TEST SET HP-IB address is part of the Hardware State. It is not changed by Power Up, PRESET, or RECALL.

If the address of the RF Switch is <31, changing the address of the test set will send commands via the system bus to devices such as the HP 11713A Driver.

Table 1. HP 11713A Driver
RF Switch Settings

| Module of Test Set Address/4 | Switch S9 | Switch S0 |
|---|---|---|
| 0 | OFF | OFF |
| 1 | OFF | ON |
| 2 | ON | OFF |
| 3 | ON | ON |

softkey ALL SEGMENTS
mnemonic **ASEG**

Measure All Frequency List Segments.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | STIMULUS | | |
| **PRIOR MENU** | STIMULUS | | |
| **PRESET** | ALL SEGMENTS | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |
| **SEE ALSO** | FREQUENCY LIST | | |
| | SINGLE SEGMENT | | |

---

**Manual Sequence**

STIMULUS MENU
  FREQUENCY LIST
    ALL SEGMENTS *or*
    SINGLE SEGMENT
    (use knob, step, or numeric entry to select segment)

**Program Sequence**

LISFREQ;
  ASEG; *or*
  SSEG *n*; (*n* = segment number)

---

After pressing FREQUENCY LIST, the Frequency List Segment Select Menu appears. ALL SEGMENTS selects measurement of all segments in the current frequency list.

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softkey ANALOG OUT OFF
mnemonic **ANAOOFF**

Analog Output Off.

softkey ANALOG OUT ON
mnemonic **ANAOON**

Analog Output On.

---

**MAIN MENU** SYSTEM
**PRIOR MENU** SYSTEM

**PRESET** ANALOG OUT OFF
**COUPLED** ALWAYS UNCOUPLED **RECALLED** YES

**SEE ALSO** AUX DOMAIN

---

**Manual Sequence**

SYSTEM
MORE
ANALOG OUT ON *or*
ANALOG OUT OFF

**Program Sequence**

ANAOOFF; *or*
ANAOON;

---

This function enables an analog voltage output, which represents the displayed data. This signal represents the vertical axis only, and appears at the AUX OUT connector on the rear panel of the HP 85102B IF/Detector.

*continued* →

The analog output full-scale limit value is 7.8V, so any displayed signal > 5 vertical divisions from the center reference line will "clip" the analog output signal (the center reference line represents an analog output of zero volts). In these cases, vary the scale/division and/or reference position to keep the displayed trace amplitude within the analog output limits.

An analog output voltage of 1.56V corresponds to a displayed signal amplitude of one vertical division on the display (the minimum resolution is 5mv). This function is disabled when AUX DOMAIN is selected.

If ANALOG OUT is ON when both channels are displayed (dual channel function), then only channel 1 is output.

| | |
|---|---|
| softkey | ATTENUATOR PORT: 1 |
| mnemonic | **ATTP1** |
| softkey | ATTENUATOR PORT: 2 |
| mnemonic | **ATTP2** |

Port 1 or Port 2 Test Port Attenuation
in S-Parameter Test Sets.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | STIMULUS | | |
| **PRIOR MENU** | POWER | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | 0 dB, PORT 1 AND PORT 2 | | |
| **RANGE** | 0 -90 dB, 10 dB steps | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |

---

**Manual Sequence**

STIMULUS MENU
POWER MENU
ATTENUATOR PORT: 1 [entry x1] *or*
ATTENUATOR PORT: 2 [entry x1]
(entry = 0, 10, 20, 30, 40, 50, 60, 70, 80, *or* 90)

**Program Sequence**

ATTP1 [value]; *or*
ATTP2 [value];
(value = 0, 10, 20, 30, 40, 50, 60, 70, 80, *or* 90)

---

*continued* →

This keyword allows changing the signal level at the test port of the HP 8514A or HP 8515A S-parameter test sets without changing the reference signal level. The test port attenuator range for these test sets is 0 to 90 dB in 10 dB steps.

For the HP 8514A and HP 8515A test sets, if the entry is not an exact multiple of 10, then the attenuator is set to the next lower multiple of 10.

This instruction is ignored if the test set used is the HP 8511A, HP 8512A, or HP 8513A.

Attenuator settings are part of the Cal Set Limited Instrument State and are recalled with the Cal Set. Changing either attenuator with correction on will not cause correction to be turned off but will result in measurement errors due to the change in incident signal level.

hardkey AUTO
mnemonic **AUTO**

Automatic Selection of REF VALUE and SCALE for Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | NONE (HARDKEY) | | |
| **PRESET** | DISPLAY: DATA | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

AUTO

**Program Sequence**

AUTO;

---

Selects values for reference value (see REF VALUE) and scale/division (see SCALE), which place the entire data trace within the graticule. Selecting AUTO does not change the current active function.

If DISPLAY: DATA and MEMORY is selected, then AUTO operates only on the data trace.

If DISPLAY: MEMORY is selected, then AUTO operates only on the memory trace.

softkey AUTO DELAY
mnemonic **AUTD**

Automatic Selection of Electrical Delay to Balance Phase.

---

MAIN MENU RESPONSE
PRIOR MENU RESPONSE
NEXT MENU NONE

SEE ALSO ELECTRICAL DELAY

---

**Manual Sequence**

<select channel>
<select parameter>
RESPONSE MENU
AUTO DELAY
(press ELECTRICAL DELAY to view delay value)

**Program Sequence**

AUTD;

---

This function automatically selects an electrical delay value that "flattens" the phase response in the region of the selected marker. The result should approximate a trace that has excess phase (or delay) removed.

softkey AUX. VOLT OUTPUT
mnemonic AUXV

Measurement Synchronized to AUX. OUT.

---

| | |
|---|---|
| MAIN MENU | DOMAIN |
| PRIOR MENU | DOMAIN |
| PRESET | FREQUENCY DOMAIN |
| RANGE | -10V to +9.95V maximum range<br>4.88mV minimum step |
| COUPLED | ALWAYS UNCOUPLED RECALLED YES |

---

**Manual Sequence**

DOMAIN MENU
FREQUENCY
STIMULUS MENU
SINGLE POINT
CENTER [entry] (x1 = Hz) (desired measurement frequency).
DOMAIN MENU
AUX. VOLT OUTPUT
STIMULUS MENU
RAMP
<use STIMULUS controls to set staircase>

**Program Sequence**

```
FREQ;
  SINP;
    CENT [value [freq suffix] ];
      AUXV;
        RAMP;
        <use STIMULUS controls to set staircase>
```

---

If in START/STOP or CENTER/SPAN, the frequency sweep is stopped at the current start frequency. If in SINGLE POINT, the frequency is not changed.

After selecting RAMP, the STIMULUS controls set range, sweep time, and number of points of digital ramp staircase (x-axis) available at HP 8510B rear panel AUX. OUT ANALOG ± 10V connector.

softkey AVERAGING OFF
mnemonic **AVEROFF**

Turn Off Averaging for Selected Channel.

---

| | |
|---|---|
| **MAIN MENU** | RESPONSE |
| **PRIOR MENU** | RESPONSE |
| NEXT MENU | NONE |
| **PRESET** | AVERAGING OFF<br>AVERAGING FACTOR = 1 |
| **COUPLED** | ALWAYS UNCOUPLED **RECALLED** YES |

---

**Manual Sequence**

RESPONSE MENU
AVERAGING OFF

**Program Sequence**

AVEROFF;

---

When AVERAGING ON/restart is selected, the last selected averaging factor is recalled.

softkey AVERAGING ON/restart
mnemonic **AVERON**

Turn On or Change Averaging for Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | RESPONSE | | |
| **PRIOR MENU** | RESPONSE | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | AVERAGING OFF | | |
| **RANGE** | 1 - 4096 | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |
| **SEE ALSO** | SINGLE (STEP mode)<br>NUMBER of GROUPS (RAMP mode) | | |

---

**Manual Sequence**

RESPONSE MENU
AVERAGING ON/restart [entry x1]
(entry = 1 - 4096, $2^n$ sequence)

**Program Sequence**

AVERON [value];
(value = 1 - 4096, $2^n$ sequence)

---

Starts/Restarts averaging with the current (or new) averaging factor. Any sweep in progress is aborted and restarted. When averaging is turned on for the current selected channel, the enhancement annotation A is displayed in the enhancement labels area of the CRT.

Averaging is always uncoupled, and must be turned on separately for each channel. Averaging is saved as part of the instrument state.

Selecting a calibration standard for measurement automatically initiates NUMBER of GROUPS (1 group in STEP mode; n+1 groups in RAMP mode, where n is current averaging factor) then returns to CONTINUOUS or HOLD as previously selected. See NUMBER of GROUPS.

*continued* →

If a value not in a 1, 2, 4, 8, . . . , 4096 sequence is entered, then the next lowest power of 2 number in the sequence is used as the averaging factor.

In dual-channel operation with 401-point, full 2-port error correction, correction will be reset if different averaging factors are used on the two channels, due to a lack of available memory. The same averaging factor must be used for both channels for 401-point, full 2-port error correction.

RAMP mode: Exponential running average with fast convergence algorithm. Displayed trace equals

$$((1/n) \cdot \text{current data}) + ((n-1) / n) \cdot \text{last trace})$$

after n+1 groups (n = averaging factor).

STEP mode: Block (linear) average n readings at each point.

SINGLE POINT mode: Block average n readings.

Averaging is also automatically restarted by selecting MEASUREMENT RE-START, selecting a calibration standard for measurement, changing the averaging factor, selecting NUMBER of GROUPS, and selecting a new parameter.

See SINGLE (STEP mode) or NUMBER of GROUPS (RAMP mode) for program control of averaging process during device measurement.

Averaging produces a theoretical increase in dynamic range:

$$\text{Increase (dB)} = 10 \log_{10} (\text{Averaging Factor})$$

$$10 \text{ dB} = 10 \log_{10} (10)$$

$$36 \text{ dB} = 10 \log_{10} (4096)$$

The actual maximum increase is more nearly 15 - 20 dB, however, because noise is not only thermally related. Crosstalk and other sources of noise must also be considered.

softkey BACK SPACE

On Title Menu, Backspace to Replace Last Character in Title.

---

MAIN MENU SYSTEM

SEE ALSO
TITLE
PARAMETER LABEL
LABEL: <std class>
LABEL KIT
LABEL STD

hardkey BACKSPACE

Backspace to Replace Last Character in
Active Function Entry.

---

MAIN MENU NONE (HARDKEY)

---

Part of ENTRY area.

If pressed immediately after selection of Active Function, clears active function value from screen but does not change value of Active Function.

No effect if no Active Function currently selected.

softkey BEEPER OFF
mnemonic **BEEPOFF**

Turn Caution/Warning Beep Off.

softkey BEEPER ON
mnemonic **BEEPON**

Turn Caution/Warning Beep On.

---

MAIN MENU SYSTEM
PRIOR MENU SYSTEM
NEXT MENU NONE

**COUPLED** ALWAYS COUPLED **RECALLED** NO

---

**Manual Sequence**

SYSTEM
BEEPER
ON *or* OFF

**Program Sequence**

BEEPON or BEEPOFF

---

Beeper status is part of the Hardware State. It is not changed by Power Up, PRESET, or RECALL.

softkey $C_0$
mnemonic **C0**

Open Circuit dc Capacitance
($x10^{-15}F$).

softkey $C_1$
mnemonic **C1**

Open Circuit Capacitance Times Frequency
($x10^{-27}F/Hz$).

softkey $C_2$
mnemonic **C2**

Open Circuit Capacitance Times Frequency Squared
($x10^{-36}F/Hz^2$).

softkey $C_3$
mnemonic **C3**

Open Circuit Capacitance Times Frequency Cubed.
($x10^{-45}F/Hz^3$).

Part of Open Circuit Cal Kit Definition.

---

| | |
|---|---|
| **MAIN MENU** | CAL |
| **PRIOR MENU** | |
| **NEXT MENU** | STD DONE (DEFINED) |
| **PRESET** | NOT AFFECTED |
| **INITIALIZED** | See 7mm and 3.5mm Cal Kits. |
| **RANGE** | - 10 k to + 10 k |
| **SEE ALSO** | STD TYPE: OPEN |

---

*continued* →

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
DEFINE STANDARD entry x1 (entry = 1 - 22)
STD TYPE: OPEN
$C_0$ [entry x1] (x1 = $x10^{-15}$F)
$C_1$ [entry x1] (x1 = $x10^{-27}$F/Hz)
$C_2$ [entry x1] (x1 = $x10^{-36}$F/$Hz^2$)
$C_3$ [entry x1] (x1 = $x10^{-45}$F/$Hz^3$)
<other changes>
STD DONE (DEFINED)
<other changes>
KIT DONE (DEFINED)

**Program Sequence**

MODI1; *or* MODI2;
DEFS value;
STDTOPEN;
C0 [ value ]; (value = $x10^{-15}$F)
C1 [ value ]; (value = $x10^{-27}$F/Hz)
C2 [ value ]; (value = $x10^{-36}$F/$Hz^2$)
C3 [ value ]; (value = $x10^{-45}$F/$Hz^3$)
<other changes>
STDD;
<other changes>
KITD;

*continued* →

Specify the capacitive phase shift of the open circuit standard using

$C_{total} = C_0 + (C_1 \cdot f) + (C_2 \cdot f^2) + (C_3 \cdot f^3)$

where f is the current frequency in Hz, $C_0 = x10^{-15}$ Farads, $C_1 = x10^{-27}$ Farads, $C_2 = x10^{-36}$ Farads, and $C_3 = x10^{-45}$ Farads.

Manual and program entries assume that the values are input in the specified units.

| | |
|---|---|
| hardkey | CAL |
| mnemonic | MENUCAL |

Present Cal Menu.

---

| | |
|---|---|
| **MAIN MENU** | NONE (HARDKEY) |
| **SEE ALSO** | CAL 1 <cal kit 1 label><br>CAL 2 <cal kit 2 label> |

---

**Manual Sequence**

CAL
- CORRECTION ON *or*
- CORRECTION OFF *or*
- CAL 1 <cal kit 1 label> *or*
- CAL 2 <cal kit 2 label> *or*
- RESUME CAL SEQUENCE *or*
- MORE
  - PORT EXTENSIONS *or*
  - SET $Z_0$ *or*
  - TRIM SWEEP *or*
  - MODIFY CAL SET *or*
  - MODIFY 1 <cal kit 1 label> *or*
  - MODIFY 2 <cal kit 2 label> *or*
  - DELETE CAL SET.

**Program Sequence**

```
MENUCAL;
```

| | |
|---|---|
| softkey | CAL 1 <cal kit 1 label> |
| mnemonic | **CAL1** |
| softkey | CAL 2 <cal kit 2 label> |
| mnemonic | **CAL2** |

Begin Measurement Calibration Sequence
Using Cal Kit 1 or Cal Kit 2.

---

| | |
|---|---|
| **MAIN MENU** | CAL |
| **PRIOR MENU** | CAL |
| **NEXT MENU** | SEE BELOW |
| **PRESET INITIALIZED** | NOT CHANGED<br>CAL KIT 1 = 7 mm<br>CAL KIT 2 = 3.5 mm |
| **SEE ALSO** | MODIFY 1 <cal kit 1 label><br>MODIFY 2 <cal kit 2 label><br>LABEL KIT |

---

**Manual Sequence**

CAL
- CAL 1 <cal kit 1 label> *or*
- CAL 2 <cal kit 2 label>
  - CALIBRATE: RESPONSE *or*
  - CALIBRATE: RESPONSE & ISOL'N
  - CALIBRATE: $S_{11}$ 1-PORT *or*
  - CALIBRATE: $S_{22}$ 1-PORT *or*
  - CALIBRATE: ONE-PATH 2-PORT *or*
  - CALIBRATE: FULL 2-PORT
  - CALIBRATE: TRL 2-PORT
    - <measure calibration standards>
      - DONE: RESPONSE *or*
      - SAVE RESP & ISOL'N *or*
      - SAVE 1-PORT CAL *or*
      - SAVE 2-PORT CAL *or*
      - SAVE TRL 2-PORT
        - CAL SET *n* (*n* = 1-8)

*continued* →

**Program Sequence**

CAL1; *or*
CAL2;
  CALIRESP; *or*
  CALIRAI; *or*
  CALIS111; *or*
  CALIS221; *or*
  CALIONE2; *or*
  CALIFUL2;
    <measure calibration standards>
      DONE; *or*
      RAID; *or*
      SAV1; *or*
      SAV2; *or*
      SAVT;
        CALS *n*; ($n$ = 1 - 8)

---

Selecting CAL 1 or CAL 2 loads the specified calibration kit into active memory and presents the Cal Set Selection menu.

If the cal kit has been modified (see MODIFY 1 and MODIFY 2) , an asterisk ( * ) replaces the last character of the cal kit label. See LABEL KIT.

softkey CALIBRATE: FULL 2-PORT
mnemonic **CALIFUL2**

Select Full 2-Port Measurement Calibration
Using Current Cal Kit.

---

MAIN MENU CAL

SEE ALSO CAL 1 <cal kit 1 label>
CAL 2 <cal kit 2 label>

---

Full 2-Port measurement calibration requires twelve classes of standards to measure forward and reverse directivity, source match, reflection signal path frequency response, load match, transmission signal path frequency response, and transmission signal path isolation.

This procedure is most accurate when measuring 2-port devices, but all four S-parameters must be measured in order to provide corrected data for any parameter.

It is used with the S-parameter test sets which provide automatic forward and reverse signal path switching. Reflection calibration is performed using three standard classes for each port (typically short, open, and load).

Transmission calibration uses four different standard classes (typically the same standard, a thru) to measure forward and reverse frequency response and load match. Forward and reverse transmission isolation use the same standard (an open transmission path).

For S-parameter test sets, the correct parameter is automatically selected during the measurement calibration and measurement sequences.

This procedure may be used with a reflection/transmission (one-path) test set when the forward and reverse signal paths cannot be assumed to be identical. All measurement calibration takes place with respect to Port 1 and the operator must manually reverse the device under test during measurement.

The order in which the standards are measured is not important.

*continued* →

**Manual Sequence: Measurement Calibration**

CAL
CAL 1 <cal kit 1 label> *or*
CAL 2 <cal kit 2 label>
CALIBRATE: FULL 2-PORT
REFLECT'N
<measure $S_{11}$ standards>
<measure $S_{22}$ standards>
REFLECT'N DONE
TRANSMISSION
<measure forward standards>
<measure reverse standards>
TRANS. DONE
ISOLATION
<measure forward standard>
<measure reverse standard>
ISOLATION DONE
SAVE 2-PORT CAL
CAL SET *n* ($n$ = 1 - 8)

**Manual Sequence: Measurements Using S-Parameter Test Sets**

- Connect device; press MEASUREMENT RESTART.
  All four S-parameters are automatically measured.
- Select display of any S-parameter and view data.
- Connect new device and select MEASUREMENT RESTART.

**Manual Sequence: Measurements Using Reflection/Transmission Test Sets**

- If RAMP mode, select AVERAGING OFF.
- Connect device; press MEASUREMENT RESTART.
  Prompt "CONNECT DEVICE FOR FORWARD MEASUREMENT"
  is displayed.
  Connect device then select PRESS to CONTINUE.
  ($S_{11}$ and $S_{21}$ measured, sweep stopped.)
- Prompt "CONNECT DEVICE FOR REVERSE MEASUREMENT"
  is displayed.
  Reverse device then select PRESS to CONTINUE.
  ($S_{22}$ and $S_{12}$ measured, trace updated, sweep stopped.)
- Select display of any S-parameter and view data.
- Prompt "CONNECT DEVICE FOR FORWARD MEASUREMENT"
  is displayed.
  Connect new device and repeat sequence.

*continued* →

MEASUREMENT RESTART can be selected at any time to restart the measurement sequence.

For Reflection/Transmission test sets, averaging cannot be used in the RAMP mode unless the user actually reverses the device by n + 1 times.

**Program Sequence: Measurement Calibration**

CAL1; *or* CAL2;
  CALIFUL2;
    REFL;
    <measure $S_{11}$ standards>
    <measure $S_{22}$ standards>
      REFD;
        TRAN;
        <measure forward standards>
        <measure reverse standards>
          TRAD;
            ISOL;
            <measure forward standard>
            <measure reverse standard>
              ISOD;
                SAV2;
                  CALS *n*; (*n* = 1 - 8)

**Program Sequence: Measurements Using S-Parameter Test Sets**

- Connect device; issue REST;
  All four S-parameters are automatically measured.
- Select display of any S-parameter and view data.
- Connect new device; issue REST;

*continued* →

**Program Sequence: Measurements Using Reflection/Transmission Test Sets**

- If RAMP mode, select AVERAGING OFF.
- Connect device then issue REST;
  Prompt "CONNECT DEVICE FOR FORWARD MEASUREMENT"
  is displayed.
- Issue HP-IB Addressed Command GET.
  ($S_{11}$ and $S_{21}$ are measured,
  bit 3 of Primary Status Byte set when sweeps complete,
  sweep stopped.)
- Prompt "CONNECT DEVICE FOR REVERSE MEASUREMENT"
  is displayed.
  Reverse device then issue HP-IB Addressed Command GET.
  ($S_{22}$ and $S_{12}$ measured,
  bit 3 of Primary Status Byte set when sweeps complete,
  trace updated,
  sweep stopped.)
- Select display of any S-parameter and view data.
- Prompt "CONNECT DEVICE FOR FORWARD MEASUREMENT"
  is displayed.
  Connect new device and repeat sequence.

MEASUREMENT RESTART can be selected at any time to restart the measurement sequence.

For Reflection/Transmission test sets, averaging cannot be used in the RAMP mode unless the user actually reverses the device n + 1 times.

*continued* →

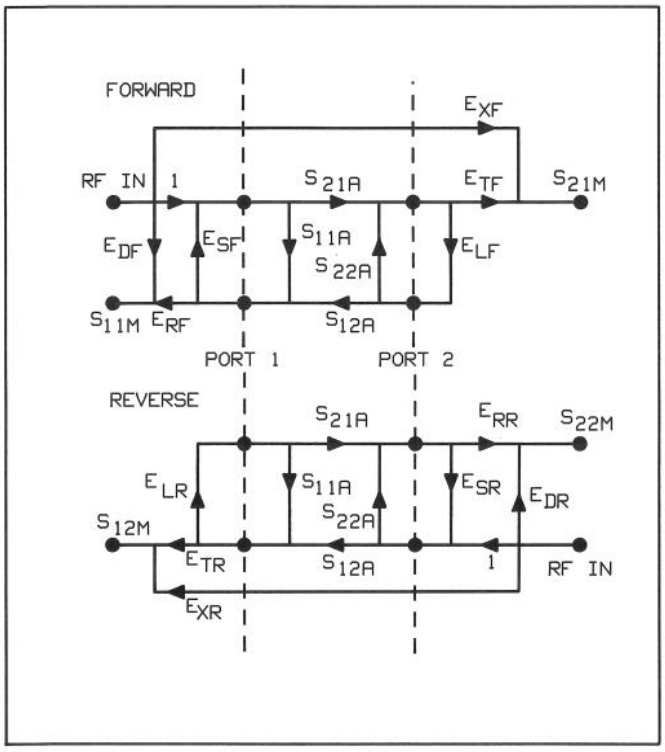


*Figure 1. Full 2-Port Error Model Flowgraph*

softkey CALIBRATE: ONE-PATH 2-PORT
mnemonic **CALIONE2**

Select One-Path 2-Port Measurement Calibration
Using Current Cal Kit.

---

MAIN MENU CAL

SEE ALSO CAL 1 <cal kit 1 label>
CAL 2 <cal kit 2 label>

---

Typically, a One-Path 2-Port measurement calibration is used only with reflection/transmission test sets that require the device under test to be manually reversed to measure reverse parameters. This type ofcalibration requires six classes of standards to measure:

forward directivity
source match
load match
reflection signal path frequency response
transmission signal path frequency response
transmission signal path isolation

Reflection calibration is performed using three standard classes at Port 1 (typically a short, open, and load). Transmission calibration uses two different standard classes (typically the same standard - a thru) to measure forward frequency response and load match. Forward transmission isolation uses a single standard (an open transmission path).

The reverse transmission and reflection signal paths are assumed to be identical to the forward transmission and reflection signal paths, respectively.

*continued* →

This procedure is not recommended for use with S-parameter test sets. The correct parameter for measurement will be automatically selected but since the same forward error terms are used for both forward and reverse measurements, the measured data will be in error.

The order in which the standards are measured is not important.

MEASUREMENT RESTART can be selected at any time to restart the measurement sequence.

For Reflection/Transmission test sets, averaging cannot be used in the RAMP mode unless the user actually reverses the device n + 1 times.

---

**Manual Sequence: Measurement Calibration**

CAL
  CAL 1 <cal kit 1 label> *or*
  CAL 2 <cal kit 2 label>
    CALIBRATE: ONE-PATH 2-PORT
      REFLECT'N
      <measure $S_{11}$ standards>
        REFLECT'N DONE
          TRANSMISSION
          <measure forward standards>
          TRANS. DONE
            ISOLATION
            <measure forward standard>
            ISOLATION DONE
              SAVE 2-PORT CAL
                CAL SET *n* (*n* = 1 - 8)

*continued* →

**Manual Sequence: Measurements Using Reflection/Transmission Test Sets**

- If RAMP mode, select AVERAGING OFF.
- Connect device; select MEASUREMENT RESTART.
  Prompt "CONNECT DEVICE FOR FORWARD MEASUREMENT" is displayed.
- Select PRESS to CONTINUE.
  ($S_{11}$ and $S_{21}$ measured, sweep stopped.)
- Prompt "CONNECT DEVICE FOR REVERSE MEASUREMENT" is displayed.
  Reverse device then select PRESS to CONTINUE.
  ($S_{22}$ and $S_{12}$ measured, trace updated, sweep stopped.)
- Select display of any S-parameter and view data.
- Prompt "CONNECT DEVICE FOR FORWARD MEASUREMENT" is displayed.
  Connect new device and repeat sequence.

**Program Sequence: Measurement Calibration**

```
CAL1; or
CAL2;
  CALIONE2;
    REFL;
    <measure S11 standards>
      REFD;
        TRAN;
        <measure forward standards>
          TRAD;
            ISOL;
            <measure forward standard>
              ISOD;
                SAV2;
                  CALS n; (n = 1 - 8)
```

*continued* →

**Program Sequence: Measurements Using Reflection/Transmission Test Sets**

- If RAMP mode, select AVERAGING OFF.
- Connect device; issue REST;
  Prompt "CONNECT DEVICE FOR FORWARD MEASUREMENT" is displayed.
- Issue HP-IB Addressed Command GET
  ($S_{11}$ and $S_{21}$ measured,
  bit 3 of Primary Status Byte set when sweeps complete,
  sweep stopped.)
- Prompt "CONNECT DEVICE FOR REVERSE MEASUREMENT" is displayed.
  Reverse device then issue HP-IB Addressed Command GET.
  ($S_{22}$ and $S_{12}$ measured,
  bit 3 of Primary Status Byte set when sweeps complete,
  trace updated,
  sweep stopped.)
- Select display of any S-parameter and view data.
- Prompt "CONNECT DEVICE FOR FORWARD MEASUREMENT" is displayed.
  Connect new device and repeat sequence.

---

*continued* →

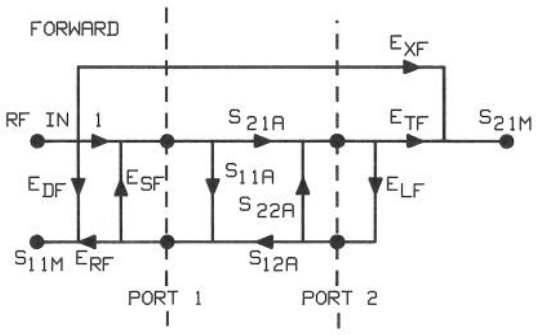


*Figure 2. One-Path 2-Port Error Model*
(Forward Error Terms Duplicated for Reverse Measurements)

softkey CALIBRATE: RESPONSE
mnemonic **CALIRESP**

Select Frequency Response Measurement Calibration for Current Parameter Using Current Cal Kit.

---

MAIN MENU CAL

---

**Manual Sequence**

CAL
  CAL 1 <cal kit 1 label> *or*
  CAL 2 <cal kit 2 label>
    CALIBRATE: RESPONSE
    <measure reflection or transmission response standard>
      DONE: RESPONSE
        CAL SET *n* ($n$ = 1 - 8)

**Program Sequence**

CAL1; *or* CAL2;
  CALIRESP;
  <measure reflection or transmission response standard>
    DONE;
      CALS *n*; ($n$ = 1 - 8)

---

Response calibration requires a single standard class to measure the selected signal path frequency response exclusive of source/load match and directivity/isolation effects. Transmission parameters typically use a thru, and reflection parameters typically use either a short circuit or an open circuit. When DONE: RESPONSE is selected, data from the last standard measured is used to develop the error coefficient.

Both Basic and User parameters can use this calibration method.

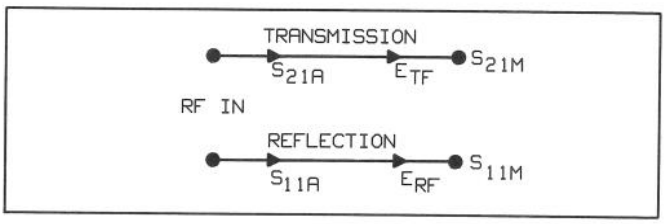


*Figure 3. Transmission and Reflection Response Error Models*

softkey CALIBRATE: RESPONSE & ISOL'N
mnemonic **CALIRAI**

Main Menu Calibration Select Response and Isolation Cal.

---

**Manual Sequence**

CAL
CAL 1 <cal kit 1 label> *or*
CAL 2 <cal kit 2 label>
RESPONSE & ISOL'N
RESPONSE
<measure reflection or transmission response standard>
DONE RESPONSE
ISOL'N STD
<measure reflection or transmission isolation standard>
SAVE RESP & ISOL
CAL SET *n* (*n* = 1 - 8)

**Program Sequence**

CAL1; or CAL2;
CALIRAI;
RAIRESP;
<measure reflection or transmission response standard>
RAISOL;
<measure reflection or transmission isolation standard>
RAID;
CALS*n*; (*n* = 1 - 8)

*continued* →

The response and isolation calibration requires two standard classes, and is more complete than response cal; it is, however not as complete as the 1-Port or 2-Port calibrations.

It may be used for reflection measurements (source match is excluded), or for transmission measurements (source and load match are excluded).

It may be used with user parameters. Refer to Figure 4, Transmission/Reflection Response and Isolation Error Model.

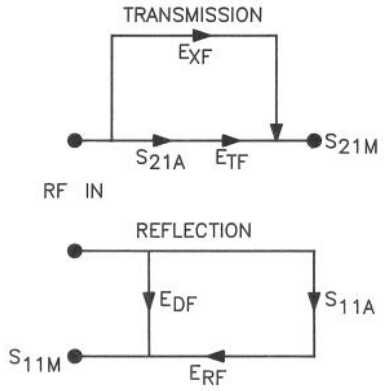


*Figure 4. Transmission/Reflection Response and Isolation Error Model*

softkey CALIBRATE: $S_{11}$ 1-PORT
mnemonic **CALIS111**

Select $S_{11}$ 1-PORT Measurement Calibration
Using Current Cal Kit.

---

**MAIN MENU** CAL

---

**Manual Sequence** *Example: Standard 7mm Cal Kit*

CAL
CAL 1 <cal kit 1 label> *or*
CAL 2 <cal kit 2 label>
CALIBRATE: $S_{11}$ 1-PORT
$S_{11}$: OPEN
$S_{11}$: SHORT
$S_{11}$: LOADS
BROADBAND
DONE: LOADS
SAVE 1-PORT CAL
CAL SET *n* (*n* = 1 - 8)

**Program Sequence** *Example: Standard 7mm Cal Kit*

```
CAL1: or
CAL2:
  CALIS111;
    CLASS11A;
      CLASS11B;
        CLASS11C;
          STANA;
            DONE;
              SAV1;
                CALS n;  (n = 1 - 8)
```

*continued* →

An $S_{11}$ 1-PORT measurement calibration requires three classes of standards to measure port 1 directivity, source match, and reflection signal path frequency response. The order in which the standards are measured is not important.

$S_{11}$ is automatically selected during the measurement calibration sequence.

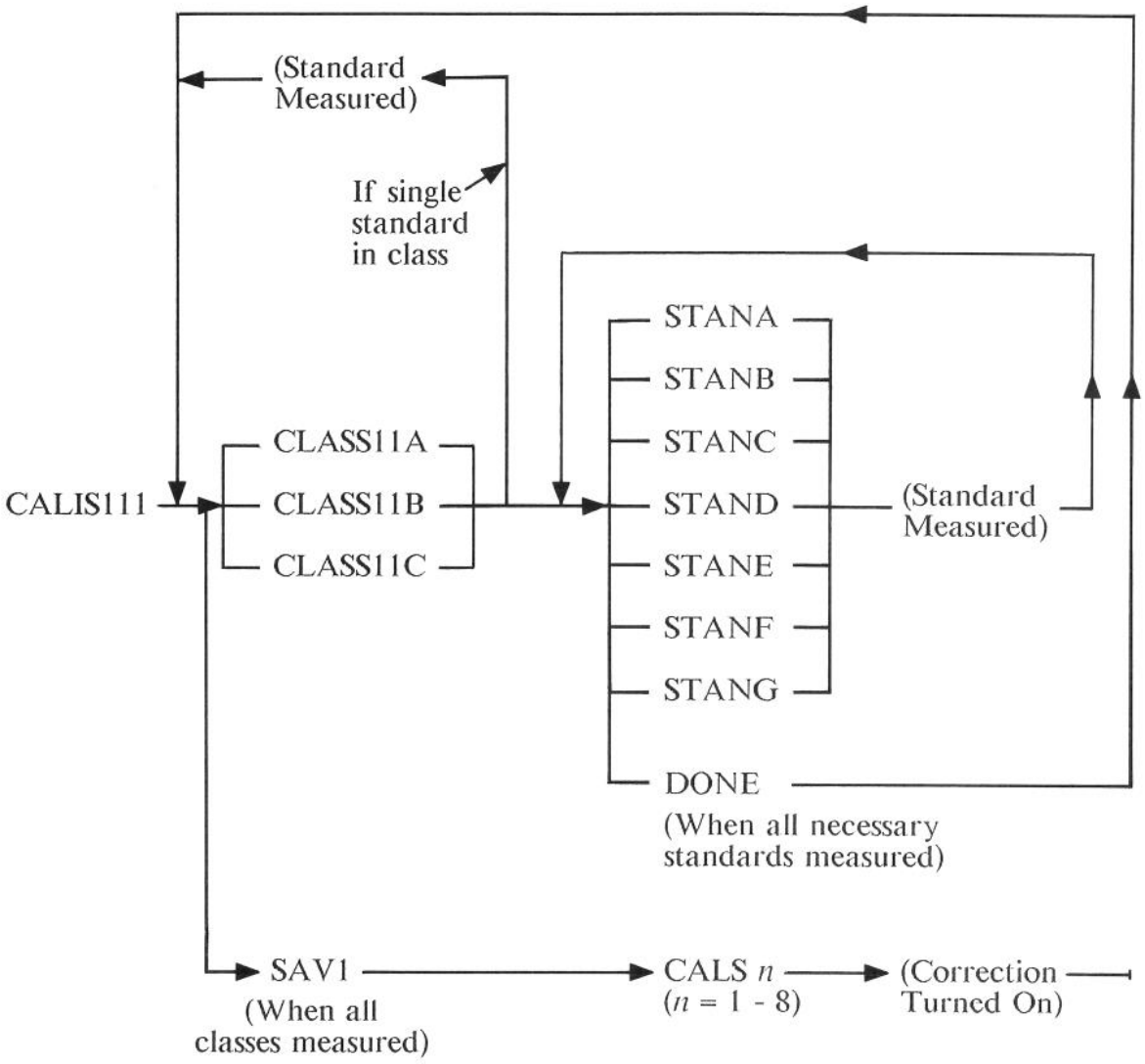


*Figure 5. Measuring Standards, $S_{11}$ 1-Port*

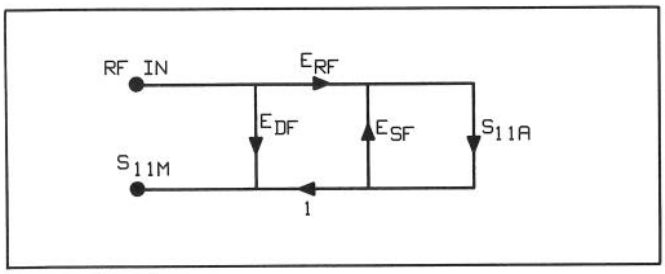


*Figure 6. 1-Port Error Model*

softkey CALIBRATE: $S_{22}$ 1-PORT
mnemonic **CALIS221**

Select $S_{22}$ 1-PORT Measurement Calibration Using Current Cal Kit.

---

**MAIN MENU** CAL
**PRIOR MENU** CAL 1 *or* CAL 2
**NEXT MENU** CAL SET SELECTION

**SEE ALSO** CALIBRATE: $S_{11}$ 1-PORT

---

**Manual Sequence**

CAL
  CAL 1 <cal kit 1 label> *or*
  CAL 2 <cal kit 2 label>
    CALIBRATE: $S_{22}$ 1-PORT
    <measure $S_{22}$ standards>
      SAVE 1-PORT CAL
        CAL SET *n* (*n* = 1 - 8)

**Program Sequence**

CAL1; *or*
CAL2;
  CALIS221;
  <measure $S_{22}$ standards>
    SAV1;
      CALS *n*; (*n* = 1 - 8)

*continued* →

An $S_{22}$ 1-PORT measurement calibration requires three classes of standards to measure Port 2 directivity, source match, and reflection signal path frequency response.

$S_{22}$ is automatically selected during the measurement calibration sequence. If a Reflection/Transmission test set is used, all calibration takes place with respect to PORT 1.

The order in which the standards are measured is not important.

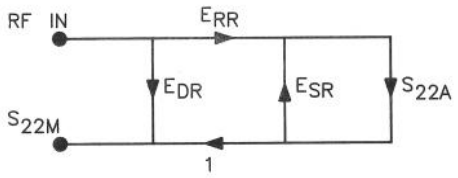


*Figure 7. $S_{22}$ 1-Port Error Model Flowgraph*

softkey CALIBRATE: TRL 2-PORT
mnemonic **CALITRL2**

Select TRL 2-Port Cal.

---

**MAIN MENU** CAL

**SEE ALSO** CAL 1 <cal kit 1 label>
CAL 2 <cal kit 2 label>

---

**Manual Sequence** 7mm Cal Kit

CAL
CAL 1 <cal kit 1 label> *or*
CAL 2 <cal kit 2 label>
CALIBRATE: TRL 2-PORT
THRU THRU
$S_{11}$ REFLECT SHORT
$S_{22}$ REFLECT SHORT
ISOLATION
<measure forward standard>
<measure reverse standard>
Isolation done.
LINE 2-18 LINE
SAVE TRL 2-PORT
CAL SET *n* (*n* = 1 - 8)

**Manual Sequence: Measurements Using S-Parameter Test Sets**

1. Connect device; press MEASURMENT RESTART. All Four S-parameters are automatically measured.

2. Select display of any S-parameter and view data.

3. Connect new device and select MEASURMENT RESTART.

*continued* →

This 2-Port measurement calibration is used with the S-parameter test sets which provide automatic forward and reverse signal path switching. This procedure cannot be used with reflection/transmission (one-path) test sets. The calibration requires six classes of standards to measure:

source match
load match
forward and reverse directivity
reflection signal path frequency response
transmission signal path frequency response
transmission signal path isolation

This procedure gives the greatest accuracy when measuring 2-port devices, but all four S-parameters must be measured in order to provide corrected data for any parameter.

For S-parameter test sets, the correct parameter is automatically selected during the measurement calibration and measurement sequences. The order in which the standards are measured is not important.

| | |
|---|---|
| softkey | CAL KIT 1 |
| mnemonic | CALK1 |
| softkey | CAL KIT 2 |
| mnemonic | CALK2 |

Tape/Disc Store/Load/Delete Selected Cal Kit.

---

| | |
|---|---|
| MAIN MENU | TAPE/DISC |
| PRIOR MENU | DATA TYPE SELECT |
| NEXT MENU | FILE SELECT |
| SEE ALSO | STORE |

---

**Manual Sequence**

TAPE/DISC
  STORAGE IS TAPE *or*
  STORAGE IS DISC
    STORE *or* LOAD *or* DELETE
      CAL KIT 1-2
        CAL KIT 1 *or* CAL KIT 2
          FILE *n*  (*n* = 1 - 8) (for Tape) *or*
          <enter *or* select disc file>
            STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

*See* STORE.

STOITAPE; *or* STOIDISC
STOR; *or* LOAD; *or* DELE;
  CALK1; *or* CALK2;
    FILE*n*;  (*n* = 1 - 8) (for Tape) *or*
      DISF "filename"; (for Disc)

*continued* →

*Table 2. Standard Cal Kit Tapes*

| Name | Description | HP Part Number |
|---|---|---|
| 7mm | HP 85050B | 85050-10002 |
| 7mm Economy | HP 85050D | 85050-10004 |
| 3.5mm | HP 85052B | 85052-10002 |
| 3.5mm Economy | HP 85052E | 85052-10003 |
| Type-N | HP 85054B | 85054-10002 |

Older HP 8510A cal kits are useable with HP 8510B's but they do not support all of the newer calibration approaches. The new cal kit designed for the HP 8510B may be used with any HP 8510A, but only to support HP 8510A calibration approaches.

Make sure the actual cal kit being used matches the definition loaded into the HP 8510.

Tape Information: 1 tape block per file.

softkey CAL KIT 1-2

Present Cal Kit Selection Menu
During Tape/Disc Store/Load/Delete Cal Kit Selection.

---

| | |
|---|---|
| MAIN MENU | TAPE/DISC |
| PRIOR MENU | TAPE/DISC |
| NEXT MENU | CAL KIT SELECT |
| SEE ALSO | CAL KIT 1 |
| | CAL KIT 2 |

---

**Manual Sequence**

TAPE/DISC
STORAGE IS TAPE *or*
STORAGE IS DISC
STORE *or* LOAD *or* DELETE
CAL KIT 1-2
CAL KIT *n* ($n$ = 1, 2)
FILE *n* ($n$ = 1 - 8)

| | | | |
|---|---|---|---|
| softkey mnemonic | CAL SET 1<br>**CALS1** | softkey mnemonic | CAL SET 5<br>**CALS5** |
| softkey mnemonic | CAL SET 2<br>**CALS2** | softkey mnemonic | CAL SET 6<br>**CALS6** |
| softkey mnemonic | CAL SET 3<br>**CALS3** | softkey mnemonic | CAL SET 7<br>**CALS7** |
| softkey mnemonic | CAL SET 4<br>**CALS4** | softkey mnemonic | CAL SET 8<br>**CALS8** |

Under CAL,
Select Cal Set to Save Results of Measurement Calibration and Turn Correction On, or Delete a Particular Cal Set.

---

| | |
|---|---|
| **MAIN MENU** | CAL |
| **PRIOR MENU** | SEE BELOW |
| **NEXT MENU** | NONE |
| **PRESET** | CONTENTS NOT CHANGED |
| **INITIALIZED** | NO CAL SETS ALLOCATED |
| **COUPLED** | MAY BE UNCOUPLED |
| **SEE ALSO** | CORRECTION ON<br>DELETE CAL SET |

*continued* →

**Manual Sequence**

CAL
  CAL 1 <cal kit 1 label> *or*
  CAL 2 <cal kit 2 label>
    <perform measurement calibration>
      CAL SET *n*  (*n* = 1 - 8)

*or* (*see* CORRECTION ON)

CAL
  CORRECTION ON
    CAL SET *n*  (*n* = 1 - 8)

*or* (*see* DELETE CAL SET)

CAL
  MORE
    DELETE CAL SET
      CAL SET *n*  (*n* = 1 - 8)

**Program Sequence**

*See* CAL 1 *and* CAL 2.

CAL1; *or* CAL2;
  <perform measurement calibration>
    CALS *n* ; (*n* = 1 - 8)

*or* (*see* CORRECTION ON)

CORRON;
  CALS *n*;  (*n* = 1 - 8)

*or* (*see* DELETE CAL SET)

DELC;
  CALS *n*;  (*n* = 1 - 8)

*continued* →

After measurement calibration, selecting a cal set causes the calibration coefficients, along with a limited instrument state (Table 3) to be stored in the specified Cal Set and Correction to be turned On.

An asterisk (*) with the softkey label indicates that calibration coefficients are currently stored in that cal set. Selecting a cal set already used deletes the existing cal coefficients then stores the new cal coefficients.

The Cal Set Limited Instrument State contains important network analyzer control settings at the time the cal set was stored. See Cal Set Limited Instrument State in Table 3. Recalling a cal set restores all of the stimulus settings (listed in Table 3) to their state at the time the cal set was saved.

*Table 3. Cal Set Limited Instrument State*

| |
|---|
| Parameter(s) Corrected<br>will not turn Correction On if parameter is not included |
| Frequency Range<br>Number of Points<br>both turn Correction Off if changed and new parameter is not included |
| Source Power<br>Sweep Time<br>Power Slope<br>Ramp/Step/Single Point<br>Trim Sweep<br>CORRECTION MAY BE INVALID is displayed if changed. |

*continued* →

## Data Storage

808 x 12 error terms total data point storage available. Allows storage of two 401 point 2-Port cal sets, or eight 401 point Response cal sets, or any combination such as one 401 point 2-Port cal set and four 401 point Response cal sets. Table 4 shows the maximum number of cal sets of each type.

*Table 4. Cal Sets Available*

| Cal Type | Number of Points | | | | |
|---|---|---|---|---|---|
| | 51 | 101 | 201 | 401 | 801 |
| Frequency Response | 8 | 8 | 8 | 8 | 8 |
| Response & Isolation | 8 | 8 | 8 | 8 | 8 |
| 1-Port | 8 | 8 | 8 | 8 | 8 |
| 2-Port | 8 | 8 | 8 | 8 | 4 |

| | | | |
|---|---|---|---|
| softkey mnemonic | CAL SET 1<br>**CALS1** | softkey mnemonic | CAL SET 5<br>**CALS5** |
| softkey mnemonic | CAL SET 2<br>**CALS2** | softkey mnemonic | CAL SET 6<br>**CALS6** |
| softkey mnemonic | CAL SET 3<br>**CALS3** | softkey mnemonic | CAL SET 7<br>**CALS7** |
| softkey mnemonic | CAL SET 4<br>**CALS4** | softkey mnemonic | CAL SET 8<br>**CALS8** |

Under Tape or Disc File Select Menu,
Select Cal Set.

---

| | |
|---|---|
| **MAIN MENU** | TAPE/DISC |
| **PRIOR MENU** | DATA TYPE SELECT |
| **NEXT MENU** | FILE SELECT |
| **SEE ALSO** | STORE |

---

**Manual Sequence**

TAPE/DISC
  STORAGE IS TAPE *or*
  STORAGE IS DISC
  STORE *or* LOAD *or* DELETE
    CAL SET 1-8
      CAL SET *n*  (*n* = 1 - 8)
        FILE *n*  (*n* = 1 - 8) (for Tape) *or*
        <enter or select disc file>
          STORE FILE *or* LOAD FILE *or* DELETE FILE

continued →

**Program Sequence**

*See* STORE.

STOITAPE; or STOIDISC;
  STOR; *or* LOAD; *or* DELE;
    CALS*n*;  (*n* = 1 - 8)
      FILE*n*;  (*n* = 1 - 8) (for Tape) *or*
      DISF "filename"; (for Disc)

Select CORRECTION OFF for all parameters before Loading Cal Set.

*Table 5. Tape Blocks per File*

| Number of Points | Calibration Type | | | |
|---|---|---|---|---|
| | Response | Response and Isolation | 1-Port | 2-Port |
| 51 | 1 | 1 | 1 | 2 |
| 101 | 1 | 1 | 1 | 3 |
| 201 | 1 | 2 | 2 | 6 |
| 401 | 2 | 2 | 3 | 12 |
| 801 | 2 | 4 | 6 | 23 |

softkey CAL SET 1-8

Present Cal Set Select Menu
During Tape/Disc Data Type Selection.

---

| | |
|---|---|
| **MAIN MENU** | TAPE/DISC |
| **PRIOR MENU** | TAPE/DISC |
| **NEXT MENU** | CAL SET SELECTION |
| **SEE ALSO** | CAL SET 1 . . . 8 |
| | TAPE/DISC |

---

**Manual Sequence**

TAPE/DISC
STORAGE IS TAPE *or*
STORAGE IS DISC
STORE *or* LOAD *or* DELETE
CAL SET 1-8
CAL SET *n* (*n* = 1 - 8)
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter *or* select disc file>
STORE FILE *or* LOAD FILE *or* DELETE FILE

softkey CAL SET ALL
mnemonic **CALSALL**

Disc Data Type Select All Cal Sets 1 through 8.

---

**MAIN MENU** TAPE/DISC
**PRIOR MENU** TAPE/D*ISC*
**NEXT MENU** FILE SELECTION

**SEE ALSO** STORE

---

**Manual Sequence**

TAPE/DISC
STORAGE IS DISC
STORE *or* LOAD *or* DELETE
CAL SET ALL
<enter or select disc file>
STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

*See* STORE.

STOITAPE; *or* STOIDISC;
STOR; *or* LOAD; *or* DELE;
CALSALL;
DISF "filename";

---

Select CORRECTION OFF for all parameters before Loading Cal Sets.

Only cal sets that actually exist (those designated with an asterisk ( * ) will be stored during a STORE operation.

HP 8510B note: Due to size limitations, CAL SET ALL operations are only available with disc.

softkey CAL SET FOR PORT 1
mnemonic **CALSPORT1**

Specify Port 1 Cal Set in Adapter Removal Modify Cal Set.
Followed by CALS*n*.

softkey CAL SET FOR PORT 2
mnemonic **CALSPORT2**

Specify Port 2 Cal Set in Adapter Removal Modify Cal Set.
Followed by CALS*n*.

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | ADAPTER REMOVAL |
| NEXT MENU | CAL SET SELECT |
| SEE | ADAPTER REMOVAL |

---

In the adapter removal process, the appropriate cal sets need to be selected. The cal set with port 1 in the final measurement configuration (and therefore the adapter on port 2) is the one to be selected by CALSPORT1. Likewise, the cal set with port 2 in the final measurement configuration (and adapter on port 1) is selected by CALSPORT2.

Calsport1 must be done first, and that cal set will become active. CALSPORT2 must agree in number of points and frequency range, or an error will occur.

softkey CAL $Z_0$: LINE $Z_0$
mnemonic CALZLINE

TRL Error Terms Computed Relative to Line $Z_0$.

softkey CAL $Z_0$: SYSTEM $Z_0$
mnemonic CALZSYST

Correct TRL Error Terms for Specified $Z_0$ of Line and Loss Effects to the System $Z_0$.

---

**MAIN MENU** CAL
**PRIOR MENU** MODIFY CAL KIT

**SEE ALSO** CALIBRATE: TRL 2-PORT
MODIFY 1 and MODIFY 2
TRL OPTIONS

---

**Manual Sequence**

CAL
  MORE
    MODIFY 1 *or* MODIFY 2
      TRL OPTION
        CAL Z0: LINE Z0 *or*
        CAL Z0: SYSTEM Z0
        <other option selections>
          TRL OPTION DEFINED
          <other changes>
            KIT DONE (modified)

**Program Sequence**

MODI1; *or* MODI2;
  CALZLINE; *or* CALZSYST;
  <other option selections>
    TRLO;
    <other changes>
      KITD;

---

During a TRL calibration, the line standard is assumed to have no reflections. This is the nominal assumption in CALZLINE.

If the actual impedance differs (and is known) from system $Z_0$, then selecting CALZSYST will cause a correction to occur during the TRL calibration process. If the line is coaxial, then an additional correction for impedance skin loss effects will be used. If a coaxial line is not used, then the loss term should be set to zero.

hardkey CENTER
mnemonic **CENT**

Select Center/Span Stimulus Mode;
Active Function is Current CENTER Stimulus Value.

---

| | |
|---|---|
| **MAIN MENU** | NONE (HARDKEY) |
| **PRESET** | FREQUENCY DOMAIN<br>START/STOP STIMULUS MODE |
| **RANGE** | SEE BELOW |
| **COUPLED** | MAY BE UNCOUPLED |
| **RECALLED** | YES |

---

**Manual Sequence**

CENTER [entry] (x1 = Hz, seconds, *or* volts)

**Program Sequence**

CENT [value [suffix] ];

---

In the FREQUENCY domain, CENTER/SPAN sets the frequency sweep; in the TIME domain, it sets the display upper and lower x-axis limits. In the AUX. VOLT OUTPUT domain, it sets the upper and lower limits of the AUX.VOLT OUTPUT ± 10V analog output.

PRESET selects appropriate frequency range according to the test set.

Refer to SEGMENT: when using the HP-IB mnemonic CENT with FREQUENCY LIST.

| | |
|---|---|
| hardkey | CHANNEL 1 |
| mnemonic | **CHAN1** |
| hardkey | CHANNEL 2 |
| mnemonic | **CHAN2** |

Select Channel to which Uncoupled Manual or Program Commands will Apply.

---

| | |
|---|---|
| MAIN MENU | NONE (HARDKEY) |
| **PRESET** | CHANNEL 1<br>SINGLE CHANNEL<br>COUPLED CHANNELS |
| **RECALLED** | YES |

---

**Manual Sequence**

CHANNEL 1 *or* CHANNEL 2

**Program Sequence**

CHAN1; *or* CHAN2;

---

The indicator near the CHANNEL 1 or CHANNEL 2 keys will light to indicate the selected channel. In SINGLE CHANNEL display mode, the selected channel is displayed. In DUAL CHANNEL display modes, only the selected channel is controlled by functions which are not coupled.

Changing the channel selection initiates a Measurement Restart.

Changing channels does not change the Active Function, although if the function is uncoupled, the value of the function for the selected channel is displayed.

| | |
|---|---|
| softkey | CLASS DONE (SPEC'D) |
| mnemonic | **CLAD** |

Current Standard Class is Specified.

---

| | |
|---|---|
| **MAIN MENU** | CAL |
| **PRIOR MENU** | SPECIFY CLASS |
| **NEXT MENU** | SPECIFY CLASS |
| **SEE ALSO** | SPECIFY: <class><br>MODIFY 1 <cal kit 1 label><br>MODIFY 2 <cal kit 2 label> |

---

**Manual Sequence**

```
CAL
  MORE
    MODIFY 1 <cal kit 1 label> or
    MODIFY 2 <cal kit 2 label>
      SPECIFY CLASS
        SPECIFY: <class> stanAno x1 [stanBno x1] . . . [stanGno x1]
        (stanA-Gno = stdno = 1 - 22)   (1 to 7 stds/class)
          CLASS DONE (SPEC'D)
            <other changes>
              KIT DONE (MODIFIED)
```

**Program Sequence**

*See* MODIFY 1 and MODIFY 2.

```
MODI1; or
MODI2;
  SPEC<class> <stanAno> [ , <stanBno>] . . . [ , <stanGno>];
  (stanA-Gno = stdno = 1 - 22)   (1 to 7 stds/class)
    CLAD;
      <other changes>
        KITD;
```

---

All necessary standards are assigned to the current class.

softkey CLEAR LIST

softkey CLEAR LIST YES
mnemonic **CLEL**

softkey CLEAR LIST NO

Clear Frequency List Yes/No.

---

**MAIN MENU** STIMULUS
**PRIOR MENU** STIMULUS MORE
**NEXT MENU** CLEAR LIST

**COUPLED** ALWAYS COUPLED

**SEE ALSO** EDIT FREQUENCY LIST

---

**Manual Sequence**

STIMULUS MENU
MORE
EDIT LIST
CLEAR LIST
CLEAR LIST YES *or*
CLEAR LIST NO

**Program Sequence**

```
EDITLIST;
  CLEL;
    EDITDONE;
```

---

All segments are deleted from the list.

If frequency list mode is active when the list is cleared, the sweep mode is not changed. The HP 8510 just continues to measure the old list.

mnemonic **CLES**

Clear HP 8510 Status Bytes.

---

| | |
|---|---|
| MAIN MENU | NONE (HP-IB ONLY) |
| SEE ALSO | OUTPSTAT<br>SRQM |

---

**Program Sequence**

```
CLES;
```

---

This command sets HP 8510 Status Bytes to 0, 0 and turns Off SRQ and the S LED. It does not change the HP 8510 Status Request Mask.

softkey COAX
mnemonic COAX

Coaxial (Linear Phase) Calibration Standard.

---

| | |
|---|---|
| **MAIN MENU** | CAL |
| **PRIOR MENU** | SPECIFY OFFSET |
| **NEXT MENU** | STANDARD DEFINITION |
| **SEE ALSO** | DEFINE STANDARD |
| | MODIFY 1 <cal kit 1 label> |
| | MODIFY 2 <cal kit 2 label> |

---

**Manual Sequence**

```
CAL
  MORE
    MODIFY 1 <cal kit 1 label> or
    MODIFY 2 <cal kit 2 label>
      DEFINE STANDARD entry x1     (entry = stdno = 1 - 22)
        STD TYPE: <std type>
          SPECIFY OFFSET
            COAX
            <specify other characteristics>
              STD DONE (DEFINED)
              <other changes>
                KIT DONE (MODIFIED)
```

*continued* →

**Program Sequence**

*See* MODIFY 1 *or* MODIFY 2.

```
MODI1; or
MODI2;
 DEFS value;  (value = stdno = 1 - 22)
  STDT <std type>;
    COAX;
    <specify other characteristics>;
      STDD;
      <other changes>;
        KITD;
```

---

=

Specifies the current standard as exhibiting a linear phase shift versus frequency according to its offset delay, using

$$e^{-jnfd}$$

where

| | | |
|---|---|---|
| d | = | delay in seconds |
| n | = | 1 for transmission<br>2 for reflection |
| f | = | frequency in Hz. |

softkey COAXIAL DELAY
mnemonic **COAD**

Select Coaxial (linear phase) Electrical Delay.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | RESPONSE | | |
| **PRIOR MENU** | RESPONSE | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | COAXIAL DELAY | | |
| **INITIALIZED** | COAXIAL DELAY | | |
| **COUPLED** | UNCOUPLED | **RECALLED** | YES |
| **SEE ALSO** | TABLE DELAY<br>WAVEGUIDE DELAY<br>ELECTRICAL DELAY | | |

---

**Manual Sequence**

RESPONSE MENU
  MORE
    COAXIAL DELAY

**Program Sequence**

COAD;

---

This command sets the mode for electrical delay to apply linear phase shift with frequency.

softkey CONSTANT FREQUENCY
mnemonic **CONF**

Specify Constant Frequency Value, Multiple Source.

---

| | | |
|---|---|---|
| **MAIN MENU** | SYSTEM | |
| **PRIOR MENU** | MULTIPLE SOURCE MENU | |
| **PRESET** | NO CHANGE | |
| **INITIALIZED** | SAME AS OFFSET FREQ. RANGE | 0 Hz to end of the source frequency range |
| **COUPLED** | ALWAYS COUPLED | |
| **SEE ALSO** | EDIT MULT. SRC<br>DEFINE: SOURCE 1<br>MULTIPLIER NUMERATOR<br>OFFSET FREQUENCY | |

---

**Manual Sequence**

SYSTEM
MORE
EDIT MULT. SRC
DEFINE:
SOURCE 1 *or*
SOURCE 2 *or*
RECEIVER
CONSTANT FREQUENCY
<define other characteristics>
DONE
MULT. SRC: ON/SAVE *or*
MULT. SRC: OFF/SAVE

**Program Sequence**

EDITMULS;
DEFISOUR1;
CONF [value]; (X1 = HZ)
<define other characteristics>
MULSON;
MULSOFF

---

This key makes the equation a constant value. It sets the numerator to zero and makes the given value the offset frequency.

| | |
|---|---|
| softkey | CONTINUAL |
| mnemonic | CONT |

Select Continual Sweep.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | STIMULUS | | |
| **PRIOR MENU** | STIMULUS | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | CONTINUAL, RAMP | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |

---

**Manual Sequence**

STIMULUS MENU
  MORE
    CONTINUAL

**Program Sequence**

CONT;

---

The instrument executes the selected RAMP, STEP, or SINGLE POINT data acquisition, and the trace is continuously updated.

softkey CONVERSION

Present Conversion Menu to Select Conversion for Display of Current Basic or User Parameter.

---

| | |
|---|---|
| **MAIN MENU** | PARAMETER |
| **PRIOR MENU** | REDEFINE PARAMETER |
| **NEXT MENU** | REDEFINE PARAMETER |
| **PRESET** | STANDARD BASIC AND USER PARAMETERS (CONVERT to S) |
| **COUPLED** | ALWAYS COUPLED **RECALLED** YES |
| **SEE ALSO** | REDEFINE PARAMETER |

---

**Manual Sequence**

<select basic or user parameter>
PARAMETER MENU
  REDEFINE PARAMETER
    CONVERSION
      CONVERT to S *or*
      CONVERT to 1/S *or*
      CONVERT to Y *or*
      CONVERT to Z
        <other changes>
          REDEFINE DONE

**Program Sequence**

*See* REDEFINE PARAMETER.

---

Changes in parameter definition are executed immediately.

REDEFINE DONE stores the current parameter definition.

softkey CONVERT to 1/S
mnemonic **CONV1S**

Convert Current Parameter to 1/S.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | PARAMETER | | |
| **PRIOR MENU** | CONVERSION | | |
| **NEXT MENU** | REDEFINE PARAMETER | | |
| **PRESET** | STANDARD BASIC AND USER PARAMETERS (CONVERT to S) | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |
| **SEE ALSO** | CONVERSION<br>REDEFINE PARAMETER | | |

---

**Manual Sequence**

*See* CONVERSION.

PARAMETER MENU
REDEFINE PARAMETER
CONVERSION
CONVERT to 1/S
<other changes>
REDEFINE DONE

**Program Sequence**

*See* REDEFINE PARAMETER.

---

Performs the complex inversion of the currently selected parameter.

softkey CONVERT to S
mnemonic CONVS

Display S-Parameter (no conversion).

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | PARAMETER | | |
| **PRIOR MENU** | CONVERSION | | |
| **NEXT MENU** | REDEFINE PARAMETER | | |
| **PRESET** | STANDARD BASIC AND USER PARAMETERS (CONVERT to S) | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |
| **SEE ALSO** | CONVERSION<br>REDEFINE PARAMETER | | |

---

**Manual Sequence**

PARAMETER MENU
REDEFINE PARAMETER
CONVERSION
CONVERT to S
<other changes>
REDEFINE DONE

**Program Sequence**

*See* REDEFINE PARAMETER.

softkey CONVERT to Y
mnemonic CONVY

Convert Current Parameter to Y-Parameter.

---

| | | | |
|---|---|---|---|
| MAIN MENU | PARAMETER | | |
| PRIOR MENU | CONVERSION | | |
| NEXT MENU | REDEFINE PARAMETER | | |
| PRESET | STANDARD BASIC AND USER PARAMETERS (CONVERT to S) | | |
| COUPLED | ALWAYS COUPLED | RECALLED | YES |
| SEE ALSO | CONVERSION<br>REDEFINE PARAMETER | | |

---

**Manual Sequence**

PARAMETER MENU
REDEFINE PARAMETER
CONVERSION
CONVERT to Y
<other changes>
REDEFINE DONE

**Program Sequence**

*See* REDEFINE PARAMETER.

---

Used only for reflection parameters to allow display of

$$Y_{ij} = (1/Z_0) \cdot ((1 - S_{ij}) / (1 + S_{ij})) .$$

On Cartesian displays, CONVERT to Y presents the 1-port immitance parameter which applies to the driven port with the undriven port terminated in $Z_0$. This is not the classical 2-port, 4-parameter Y parameter.

Select CONVERT to Y then display the G value (Siemens) using the REAL format and the +jB value (Siemens) using the IMAGINARY format.

softkey CONVERT to Z
mnemonic CONVZ

Convert Current Parameter to Z-Parameter.

---

| | | | |
|---|---|---|---|
| MAIN MENU | PARAMETER | | |
| PRIOR MENU | CONVERSION | | |
| NEXT MENU | REDEFINE PARAMETER | | |
| PRESET | STANDARD BASIC AND USER PARAMETERS (CONVERT to S) | | |
| COUPLED | ALWAYS COUPLED | RECALLED | YES |
| SEE ALSO | REDEFINE PARAMETER | | |

---

**Manual Sequence**

PARAMETER MENU
REDEFINE PARAMETER
CONVERSION
CONVERT to Z
<other changes>
REDEFINE DONE

**Program Sequence**

*See* REDEFINE PARAMETER.

---

Used only for reflection parameters to allow display of

$$Z_{ij} = Z_0 \cdot ((1 + S_{ij}) / (1 - S_{ij})) .$$

On Cartesian displays, CONVERT to Z presents the one-port immittance parameter which applies to the driven port with the undriven port terminated in $Z_0$. Note that this is not the classical 2-port, four parameter, Z parameter.

Select CONVERT to Z then display the R value (Ohms) using the REAL format and the +jB value (Ohms) using the IMAGINARY format.

hardkey COPY
mnemonic **MENUCOPY**

Present Copy Menu.

---

**MAIN MENU** NONE (HARDKEY)

---

**Manual Sequence**

COPY
PLOT: ALL *or*
PLOT: TRACE *or*
PLOT: GRATICULE *or*
PLOT: MARKER(S) *or*
PLOT: TEXT *or*
SELECT QUADRANT *or*
SELECT PEN COLOR *or*
MORE
LIST TRACE VALUES *or*
SYSTEM PARAMETERS *or*
OPERATING PARAMETERS

**Program Sequence**

```
MENUCOPY;
```

---

Any COPY operation can be terminated by pressing any front panel hardkey (such as ENTRY OFF). The message "PLOT ABORTED" or "PRINT ABORTED" appears, although the plotter or printer may continue plotting for a short time due to buffering.

softkey CORRECTION OFF
mnemonic **CORROFF**

Select Correction Off; Display Uncorrected Data.

---

**MAIN MENU** CAL
**PRIOR MENU** CAL
NEXT MENU NONE

**PRESET** CORRECTION OFF

**COUPLED** MAY BE UNCOUPLED

---

**Manual Sequence**

CAL
CORRECTION OFF

**Program Sequence**

CORROFF;

---

If the channels are coupled, this command turns correction off for the current parameter and other parameters covered by the current cal set.

If channels are uncoupled, correction is turned off only for the current parameter and other parameters covered by the current cal set on the selected channel.

If correction is turned on for any displayed parameter, the enhancement annotation **C** will continue to be displayed. Otherwise, the annotation will be turned off.

softkey CORRECTION ON
mnemonic **CORRON**

Select Correction On, Select Cal Set;
Display Error-Corrected Data.

---

| | | | |
|---|---|---|---|
| MAIN MENU | CAL | | |
| PRIOR MENU | CAL | | |
| NEXT MENU | CAL SET SELECTION | | |
| PRESET | CORRECTION OFF | | |
| COUPLED | MAY BE UNCOUPLED | RECALLED | YES |

---

**Manual Sequence**

CAL
  CORRECTION ON
    CAL SET *n* (*n* = 1 - 8)

**Program Sequence**

CORRON;
  CALS *n*; (*n* = 1 - 8)

---

Selecting CORRECTION ON and then a cal set recalls the cal set and its limited instrument state. If the current parameter is part of the cal set, then the instrument is set to the limited cal set instrument state. Correction is also turned on for all parameters covered by the cal set, and corrected data is displayed.

If the current parameter is not part of the cal set instrument state, the limited instrument state recall is executed but correction is not turned on.

When Correction is turned on for any displayed parameter (on either channel for dual display modes), the Enhancement Annotation **C** is displayed on the CRT.

*continued* →

Correction remains on until turned off (see CORRECTION OFF) or until the frequency range or number of points is changed. See list of Cal Set Limited Instrument State with CAL SET *n*.

When TIME LOW PASS domain is currently selected, CORRECTION ON, CAL SET *n* resets TIME LOW PASS domain to FREQUENCY domain.

With HOLD selected, CORRECTION ON, CAL SET *n* does not cause the trace to be updated until CONTINUAL, SING, or NUMBER of GROUPS is executed.

If COUPLED is selected, correction applies to all parameters covered on both channels.

If UNCOUPLED is selected, correction applies only to the parameters covered on the currently selected channel.

In dual-channel operation with 401-point, full 2-port error correction, correction will be reset if different averaging factors are used on the two channels, due to a lack of available memory. The same averaging factor must be used for both channels for 401-point, full 2-port error correction.

softkey COUPLED CHANNELS
mnemonic COUC

Couple Channel 1 and Channel 2 Stimulus and Cal Sets.

---

| | |
|---|---|
| **MAIN MENU** | STIMULUS |
| **PRIOR MENU** | STIMULUS |
| **NEXT MENU** | NONE |
| **PRESET** | UNCOUPLED CHANNELS |
| **RECALLED** | YES |
| **SEE ALSO** | UNCOUPLED CHANNELS |

---

**Manual Sequence**

STIMULUS MENU
MORE
COUPLED CHANNELS

**Program Sequence**

COUC;

---

All functions normally coupled apply to both Channel 1 and to Channel 2. Selecting COUPLED CHANNELS assumes that the functions listed in the cal set limited instrument state (see CAL SET *n*) are the same for both channels and that a given parameter uses the same cal set on both channels.

If the instrument state is changed from UNCOUPLED CHANNELS to COUPLED CHANNELS, then the Stimulus values for the current selected channel are applied to both channels, but correction is not turned on for the non-active channel.

*continued* →

*Table 6. Coupled and Uncoupled Functions*

| Always Coupled | Always Uncoupled | May Be Uncoupled |
|---|---|---|
| Number of Points<br>Ramp/Step/Single Point, FREQ List<br>Measurement Markers<br>Attenuator Port 1, 2<br>Hold/Single/# of Groups/Continual<br>HP-IB Addresses | PARAMETER<br>FORMAT<br>RESPONSE<br>DISPLAY Default Trace Memories<br>DISPLAY Default Trace Math<br>Domain<br>Time Domain Gate Shape<br>Time Domain Window Shape<br>Gate ON/OFF | Frequency Range<br>Sweep Time<br>Source Power<br>Power Slope<br>CORR. ON, Cal Sets<br>Time Domain Gate MKRS. |

softkey CREATE & SAVE
mnemonic **CRES**

Create and Save Frequency Subset.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | CAL | | |
| **PRIOR MENU** | MODIFY CAL SET TYPE | | |
| **COUPLED** | New Cal Set is ALWAYS COUPLED | **RECALLED** | YES |
| **SEE ALSO** | FREQUENCY LIST<br>FREQUENCY SUBSET | | |

---

**Manual Sequence**

CAL
MORE
MODIFY CAL SET
FREQUENCY SUBSET
<set trace markers>
CREATE & SAVE
CALSET *n* (*n* = 1 - 8)

**Program Sequence**

FRES;
<set frequency subset>
CRES;
CALS *n*; (*n* = 1 - 8)

---

One or more frequency list segments are created and the appropriate error coefficients for the current specified frequency subset are transferred to the new cal set.

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softkey CRT OFF
mnemonic **CRTO**

Turn HP 8510 CRT Display Off.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM | | |
| **PRIOR MENU** | SYSTEM | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | TURNS CRT ON | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | NO |

---

**Manual Sequence**

SYSTEM
CRT OFF

**Program Sequence**

CRTO;

---

Filament power to the CRT is turned off, resulting in a blank display. External displays driven by the HP 8510 rear panel X, Y, and Z outputs will continue to function.

PRESET or RECALL of instrument state with CRT on will turn CRT on.

softkey DATA: DATA
mnemonic **DATADATA**

Tape/Disc Data Type Select
Selected Channel Corrected Data Array.

---

**MAIN MENU** TAPE/DISC
**PRIOR MENU** TAPE/DISC
**NEXT MENU** FILE SELECT

**SEE ALSO** STORE

---

**Manual Sequence**

<select channel>
TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
STORE *or* LOAD *or* DELETE
MORE
DATA: DATA
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter *or* select disc file>
STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

*See* STORE.

<select channel>
STOITAPE; *or* STOIDISC;
STOR; *or* LOAD; *or* DELE;
DATADATA;
FILE *n*; (*n* = 1 - 8) (for Tape) *or*
DISF "filename"; (for Disc)

*continued* →

*Table 7. Corrected Data Array: Tape Blocks per File*

| Number of Points | Tape Blocks Per File |
|---|---|
| 51 | 1 |
| 101 | 1 |
| 201 | 1 |
| 401 | 2 |
| 801 | 2 |

softkey DATA: FORMATTED
mnemonic **DATAFORM**

Tape Data Type Select
Selected Channel Formatted Data Array.

---

| | |
|---|---|
| **MAIN MENU** | TAPE/DISC |
| **PRIOR MENU** | STORE *or* LOAD *or* DELETE |
| **NEXT MENU** | FILE SELECTION |
| **SEE ALSO** | STORE |

---

**Manual Sequence**

<select channel>
TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
STORE *or* LOAD *or* DELETE
MORE
DATA: FORMATTED
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter or select disc file>
STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

*See* STORE.

<select channel>
STOITAPE; *or* STOIDISC;
STOR; *or* LOAD; *or* DELE;
DATAFORM;
FILE *n*; (*n* = 1 - 8) (for Tape) *or*
DISF "filename"; (for Disc)

*continued* →

*Table 8. Formatted Data Array: Tape Blocks per File*

| Number of Points | Tape Blocks Per File |
|---|---|
| 51 | 1 |
| 101 | 1 |
| 201 | 1 |
| 401 | 2 |
| 801 | 2 |

softkey DATA from CHANNEL 1
mnemonic **DATACHAN1**

softkey DATA from CHANNEL 2
mnemonic **DATACHAN2**

When DUAL CHANNEL Display Modes are selected,
Trace Math Uses Current Data from
Channel 1 or Channel 2 Instead of Data from Memory.

---

**MAIN MENU** DISPLAY
**PRIOR MENU** SPECIFY DEFAULTS
**NEXT MENU** NONE

**PRESET** DISPLAY: DATA

**COUPLED** MAY BE UNCOUPLED **RECALLED** YES

---

**Manual Sequence**

DISPLAY
DUAL CHANNEL
OVERLAY *or*
SPLIT
CHANNEL 1 *or*
CHANNEL 2
DISPLAY
SPECIFY DEFAULTS
MORE
DATA from CHANNEL 1 *or*
DATA from CHANNEL 2

**Program Sequence**

OVER; *or* SPLI;
CHAN1; *or* CHAN2;
DATACHAN *n*; ($n$ = 1, 2)

---

Unpredictable results can occur when SINGLE CHANNEL display modes are selected and the other channel is the specified default.

softkey DATA → MEMORY *n*
mnemonic **DATI**

Transfer Selected Channel Corrected Data
to Default Trace Memory.

---

| | |
|---|---|
| MAIN MENU | DISPLAY |
| PRIOR MENU | DISPLAY |
| NEXT MENU | NONE |
| PRESET | MEMORY 1 for Channel 1<br>MEMORY 2 for Channel 2 |
| COUPLED | ALWAYS UNCOUPLED |
| SEE ALSO | SPECIFY DEFAULTS |

---

**Manual Sequence**

CHANNEL 1 *or* CHANNEL 2
DISPLAY
<specify default memory if necessary>
DATA → MEM

**Program Sequence**

```
CHAN1; or CHAN2;
  <specify default memory if necessary>
    DATI;
```

---

The transfer of data from the selected channel corrected data array to the specified default memory occurs immediately. Thus, the stored trace may consist of parts of the previous and current sweeps. If this is a problem, use SINGLE or NUMBER of GROUPS, then select DATA → MEMORY after the instrument completes the sweep and enters the HOLD mode.

Data stored in a particular domain may be used for operations using any format in that domain. Unpredictable results occur when trace math is performed using a trace stored in a different domain, or with a different number of points. So memory operations are turned off if the domain or number of points is changed.

softkey DATA: RAW
mnemonic **DATARAW**

Tape/Disc Data Type Select
Selected Channel, Current Parameter Raw Data Array(s).

---

MAIN MENU TAPE/DISC
PRIOR MENU TAPE/DISC
NEXT MENU FILE SELECTION

SEE ALSO STORE

---

**Manual Sequence**

<select channel>
TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
STORE *or* LOAD *or* DELETE
MORE
DATA: RAW
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter *or* select disc file>
STORE FILE (for Disc)

**Program Sequence**

*See* STORE.

<select channel>
STOITAPE; *or* STOIDISC;
STOR; *or* LOAD; *or* DELE;
DATARAW;
FILE *n*; (*n* = 1 - 8) (for Tape)
DISF "<disc file name>" (for Disc)

*continued* →

If 2-Port correction is on, then all four of the raw data arrays for the selected channel are stored or loaded.

*Table 9. Raw Data Array: Tape Blocks per File*

| Number of Points | Calibration Type | | | |
|---|---|---|---|---|
| | Response or None | Response and Isolation | 1-Port | 2-Port |
| 51 | 1 | 1 | 1 | 1 |
| 101 | 1 | 1 | 1 | 2 |
| 201 | 1 | 1 | 1 | 3 |
| 401 | 2 | 2 | 2 | 5 |
| 801 | 3 | 3 | 2 | 9 |

mnemonic **DEBUOFF**

Turn Off Debug Mode.

mnemonic **DEBUON**

Turn On Debug Mode.

---

| | |
|---|---|
| MAIN MENU | NONE (HP-IB ONLY) |
| **PRESET** | DEBUOFF |
| **INITIALIZED** | DEBUOFF |
| **RECALLED** | NO |

---

**Program Sequence**

DEBUOFF;

**Program Sequence**

DEBUON;

---

The last 28 characters accepted at the HP 8510 HP-IB interface are displayed in the Title Area of the HP 8510 CRT. When an instruction has completed execution, it is moved off the display line.

When a syntax error is detected, the instrument temporarily enters the Debug mode with an arrow at the error in the data stream. Detection of a syntax error stops acceptance of data over the HP-IB and sets bit 5 of the HP 8510 Primary Status byte. Press the HP 8510 LOCAL key or issue HP-IB commands DCL, or SDC to restore normal operation.

Once turned on by DEBUON, this feature must be turned off using DEBUOFF, PRESET, or by cycling HP 8510 line power.

Data block input following the block preamble #A is not displayed. Input at the Pass-Thru address is not displayed.

Since the instructions are buffered, instructions which are displayed may be awaiting completion of a previous instruction.

softkey DEFAULT
mnemonic **DEFA**

Multiple Source Default Equation.

---

**MAIN MENU** SYSTEM
**PRIOR MENU** MULTIPLE SOURCE MENU

**SEE ALSO** EDIT MULTIPLE SOURCE
DEFINE: SOURCE 1

---

**Manual Sequence**

DEFINE: SOURCE 1 *or*
DEFINE: SOURCE 2 *or*
DEFINE: RECEIVER
DEFAULT
DONE
<other configurations>
MULT. SRCE: ON/SAVE *or*
MULT. SRCE: OFF/SAVE

**Program Sequence**

EDITMULS;
DEFISOUR1; *or*
DEFISOUR2; *or*
DEFIRECV;
DEFA;
<other definitions>
MULSON; *or*
MULSOFF;

---

Change the selected equation to the default or initialized setting.

The default settings are:

SOURCE 1 = 1 * (FREQ + 0.0 GHz)

SOURCE 2 = 0 * (FREQ + 0.0 GHz)

RECEIVER = 1 * (FREQ + 0.0 GHz)

| | | | |
|---|---|---|---|
| softkey | DEFAULT to MEMORY: 1 | softkey | DEFAULT to MEMORY: 5 |
| mnemonic | **DEFM1** | mnemonic | **DEFM5** |
| softkey | DEFAULT to MEMORY: 2 | softkey | DEFAULT to MEMORY: 6 |
| mnemonic | **DEFM2** | mnemonic | **DEFM6** |
| softkey | DEFAULT to MEMORY: 3 | softkey | DEFAULT to MEMORY: 7 |
| mnemonic | **DEFM3** | mnemonic | **DEFM7** |
| softkey | DEFAULT to MEMORY: 4 | softkey | DEFAULT to MEMORY: 8 |
| mnemonic | **DEFM4** | mnemonic | **DEFM8** |

Specify Memory Used for Trace Math on Selected Channel.
Specify Memory to be Output using OUTPMEMO.

---

| | |
|---|---|
| **MAIN MENU** | DISPLAY |
| **PRIOR MENU** | SELECT DEFAULTS |
| **NEXT MENU** | NONE |
| **PRESET** | DEFAULT to MEMORY: 1 for Channel 1<br>DEFAULT to MEMORY: 2 for Channel 2 |
| **COUPLED** | ALWAYS UNCOUPLED **RECALLED** YES |

**Manual Sequence**

CHANNEL 1 *or* CHANNEL 2
DISPLAY
SELECT DEFAULTS
(selected channel default memory is underlined)
DEFAULT to MEMORY: 1 *or*
DEFAULT to MEMORY: 2 *or*
DEFAULT to MEMORY: 3 *or*
DEFAULT to MEMORY: 4 *or*
MORE
DEFAULT to MEMORY: 5 *or*
DEFAULT to MEMORY: 6 *or*
DEFAULT to MEMORY: 7 *or*
DEFAULT to MEMORY: 8 *or*
DATA → MEMORY *n* (*n* = selected memory location).

*continued* →

**Program Sequence**

```
CHAN1; or CHAN2;
  DEFM n;   (n = 1 - 8)
```

**Program Sequence for OUTPMEMO**

```
DEFM n;   (n = 1 - 8)
  DISPDATM; or DISPMEMO;   (turn on memory)
    FORM n;   (n = 1 - 8)
      OUTPMEMO;
        <read data block from HP 8510 HP-IB>
```

**Program Sequence for HP-IB transfer to memory**

```
DEFM n;   (n = 1 - 8)
  DISPDATM; or DISPMEMO;   (turn on memory)
    FORM n;   (n = 1 - 8)
      INPUDATA;
        <send data block to HP 8510 HP-IB>
          DATI;   (store data into memory)
```

---

Memory operations use a default memory array which can be selected independently for each channel. Trace math and HP-IB memory operations both use the selected default memory. DATA → MEMORY stores the trace into the selected default memory.

Memories 1 through 4 are non-volatile and are therefore not lost when power is turned off. Memories 5 through 8 are volatile and should be used for HP-IB operations. This is because they operate faster and because memories 1 through 4 have a wearout limit of greater than 10,000 save cycles.

softkey DEFINE: RECEIVER
mnemonic **DEFIRECV**

Multiple Source Define Receiver Equation.

softkey DEFINE: SOURCE 1
mnemonic **DEFISOUR1**

Multiple Source Define Source #1 Equation.

softkey DEFINE: SOURCE 2
mnemonic **DEFISOUR2**

Multiple Source Define Source #2 Equation.

---

=

**MAIN MENU** SYSTEM
**PRIOR MENU** SYSTEM MORE MENU
**NEXT MENU** EQUATION DEFINITION MENU

**SEE ALSO** EDIT MULT. SRC

---

**Manual Sequence**

SYSTEM
  MORE
    EDIT MULT. SRC
      DEFINE: SOURCE 1 *or*
      DEFINE: SOURCE 2 *or*
      DEFINE: RECEIVER *or*
        MULTIPLIER NUMER. *or*
        MULTIPLIER DENOM. *or*
        OFFSET FREQUENCY *or*
        CONSTANT FREQUENCY *or*
        DEFAULT *or*
        DONE
          MULT SRC: on/save *or*
          MULT SRC: off/save

**Program Sequence**

EDITMULS;
  DEFISOUR1;
    <edit equation>
  DEFISOUR2;
    <edit equation>
    DEFIRECV;
      <edit equation>
    MULSON; *or*
    MULSOFF;

---

These commands define and initiate the equation editing process. Over HP-IB, the appropriate command must precede the device editing commands. The definitions are not made a part of the Hardware State until MULT. SRCE: ON/SAVE is selected.

softkey DEFINE STANDARD
mnemonic **DEFS**

Define the Standard in the Current Cal Kit to be Modified.

---

**MAIN MENU** CAL
**PRIOR MENU** MODIFY CAL KIT
**NEXT MENU** STANDARD TYPE

**SEE ALSO** MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

```
CAL
  MORE
    MODIFY 1 < cal kit 1 label> or
    MODIFY 2 <cal kit 2 label>
      DEFINE STANDARD entry x1    (entry = stdno = 1 - 21)
        STD TYPE: <standard type>
          <specify standard characteristics>
            STD DONE (DEFINED)
              <other changes>
                KIT DONE (MODIFIED)
```

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

```
MODI1; or
MODI2;
  DEFS value;    (value = stdno = 1 - 21)
    STDT <standard type>;
      <specify standard characteristics>;
        STDD;
          <other changes>;
            KITD;
```

---

Each standard in the calibration kit is assigned a standard number. Select the standard to be created, modified, or inspected by entering its number. Refer to the calibration kit manuals for definitions of the standard cal kit contents.

hardkey DELAY
mnemonic **DELA**

Select Cartesian Group Delay Format
for Current Parameter on Selected Channel.
$(-\Delta\phi/\Delta\omega)$

---

| | |
|---|---|
| MAIN MENU | NONE (HARDKEY) |
| **PRESET** | REF VALUE = 0 ns<br>REF POSN = 5 ns<br>SCALE = 10 ns/div |
| **COUPLED** | ALWAYS UNCOUPLED<br>COUPLED TO PARAMETER |
| **RECALLED** | YES |

---

**Manual Sequence**

<select channel>
<select parameter>
DELAY

**Program Sequence**

<select channel>
<select parameter>
DELA;

---

Uses the point-slope form for determining group delay:

$$t_g = -((\phi_{n+1} - \phi_n) / (360 \cdot f_{step}))$$

where n is the current frequency point number and

$$f_{step} = (f_{span} / \text{number of points}).$$

If SMOOTHING OFF is selected, the aperture is equal to $f_{step}$.

*continued* →

The minimum aperture with SMOOTHING OFF is equal to $f_{step}$ .

To increase the aperture, select fewer NUMBER OF POINTS or select SMOOTHING ON.

If SMOOTHING ON is selected, $\Delta\phi$ is accumulated over the specified percent of span prior to $t_g$ computation. This is represented as

$$-\Delta\phi \; / \; \Delta\omega$$

in the Channel Identification area of the CRT. $\Delta\phi$, the change in degrees over $f_{step}$ , must be less than 180 degrees or errors in the displayed group delay value will result. (See SMOOTHING ON.)

Delay results are changed by ELECTRICAL DELAY and PORT EXTENSIONS.

Selecting DELAY recalls the last selected RESPONSE selections on that channel.

| | |
|---|---|
| softkey | DELAY TABLE |
| mnemonic | **DELT** |

Tape/Disc Delay Table Data Type.

---

| | |
|---|---|
| MAIN MENU | TAPE/DISC |
| PRIOR MENU | TAPE/DISC |
| NEXT MENU | FILE SELECT |
| SEE ALSO | STORE |
| | TABLE DELAY |

---

**Manual Sequence**

<select channel>
TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
STORE *or* LOAD *or* DELETE
MORE
DELAY TABLE
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter *or* select disc file>
STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

*See* STORE.

<select channel>
STOITAPE; *or* STOIDISC;
STOR; *or* LOAD; *or* DELE;
DELT;
FILE *n*; (*n* = 1 - 8) (for Tape) *or*
DISF "filename"; (for Disc)

---

Store, Load, Delete real, imaginary pairs of Table Delay under Response, Electrical Delay.

softkey DELETE
mnemonic **DELE**

Delete Specified Tape/Disc File.

---

| | |
|---|---|
| **MAIN MENU** | TAPE/DISC |
| **PRIOR MENU** | TAPE/DISC |
| **NEXT MENU** | SEE BELOW |
| **SEE ALSO** | STORE |
| | UN-DELETE |

---

**Manual Sequence**

TAPE/DISC
STORAGE IS TAPE or STORAGE IS DISC
DELETE
INST STATE 1-8 *or* INST STATE ALL *or*
MEMORY 1-4 *or* MEMORY ALL *or*
CAL SET 1-8 *or* CAL SET ALL *or* CAL KIT 1-2 *or*
MORE
DATA: RAW *or* DATA: DATA *or*
DATA: FORMATTED *or*
DELAY TABLE *or*
USER DISPLAY *or*
HARDWARE STATE *or*
MACHINE DUMP
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter or select disc file>
DELETE FILE (for Disc)

**Program Sequence**

*See* STORE.

---

See UN-DELETE to recover a deleted tape file.

softkey DELETE CAL SET
mnemonic **DELC**

Delete Specified Cal Set from Internal Memory.

---

MAIN MENU CAL
PRIOR MENU CAL
NEXT MENU CAL SET SELECTION

SEE ALSO STORE

---

**Manual Sequence**

CAL
MORE
DELETE CAL SET
CAL SET *n* (*n* = 1 - 8)

**Program Sequence**

DELC;
CALS *n*; (*n* = 1 - 8)

---

Delete an existing cal set to make room for a new cal set. A deleted cal set cannot be recovered.

See STORE to store a cal set using the tape/disc.

softkey DELETE FILE
mnemonic **DISF**

Delete Disc Filename.

---

MAIN MENU TAPE/DISC
PRIOR MENU DATA TYPE SELECT
NEXT MENU TAPE/DISC

SEE ALSO STORE FILE

---

**Manual Sequence**

```
TAPE/DISC
  STORAGE IS DISC
    DELETE
      <select data type>
      <select file name>
        DELETE FILE
```

---

**Program Sequence**

```
STOIDISC;
  DELE;
  <select data type>
    DISF "<disc file name>"
```

softkey DENOMINATOR

Present Denominator Menu to Select Denominator for Current Basic or User Parameter.

---

| | |
|---|---|
| **MAIN MENU** | PARAMETER |
| **PRIOR MENU** | REDEFINE PARAMETER |
| **NEXT MENU** | NONE |
| **PRESET** | STANDARD BASIC AND USER PARAMETERS |
| **COUPLED** | ALWAYS COUPLED |
| **RECALLED** | BASIC PARAMETERS: NO<br>USER PARAMETERS: YES |
| **SEE ALSO** | REDEFINE PARAMETER |

---

**Manual Sequence**

<select basic or user parameter>
PARAMETER MENU
REDEFINE PARAMETER
DENOMINATOR
DENOMINATOR: $a_1$ *or*
DENOMINATOR: $a_2$ *or*
DENOMINATOR: $b_1$ *or*
DENOMINATOR: NO RATIO
<other changes>
REDEFINE DONE

**Program Sequence**

*See* REDEFINE PARAMETER.

---

See REDEFINE PARAMETER for standard basic and user parameter definitions.

Parameter definition changes are executed immediately.

REDEFINE DONE stores current parameter definition.

| | |
|---|---|
| softkey | DENOM.: $a_1$ |
| mnemonic | **DENOA1** |

Select $a_1$ as the Denominator for the Current Parameter.

| | |
|---|---|
| softkey | DENOM.: $a_2$ |
| mnemonic | **DENOA2** |

Select $a_2$ as the Denominator for the Current Parameter.

| | |
|---|---|
| softkey | DENOM.: $b_1$ |
| mnemonic | **DENOB2** |

Select $b_1$ as the Denominator for the Current Parameter.

| | |
|---|---|
| softkey | DENOM.: NO RATIO |
| mnemonic | **DENONOR** |

Select No Ratio for the Current Parameter. (DENOMINATOR = 1)

---

| | |
|---|---|
| MAIN MENU | PARAMETER |
| PRIOR MENU | REDEFINE PARAMETER |
| NEXT MENU | NONE |
| PRESET | STANDARD BASIC AND USER PARAMETERS |
| COUPLED | ALWAYS COUPLED |
| RECALLED | BASIC PARAMETERS: NO<br>USER PARAMETERS: YES |
| SEE ALSO | DENOMINATOR<br>REDEFINE PARAMETER |

---

**Manual Sequence**

*See* DENOMINATOR.

**Program Sequence**

*See* REDEFINE PARAMETER.

---

Note that DENOMINATOR $b_2$ is not available.

To redefine a parameter with denoninator $b_2$, select NUMERATOR $b_2$ then select CONVERSION, CONVERT to 1/S.

If $a_1$ is the numerator, the denominator defaults to NO RATIO. If $a_1/x$ is desired, define $x/a_1$ and use 1/S.

softkey DIRECTORY
mnemonic **DIRE**

Display Directory for Current Tape/Disc.

---

**MAIN MENU** TAPE/DISC
**PRIOR MENU** NONE
**NEXT MENU** SEE BELOW

---

**Manual Sequence**

TAPE/DISC
  STORAGE IS TAPE *or*
  STORAGE IS DISC
  DIRECTORY
    RESTORE DISPLAY *or*
    NEXT PAGE *or* PREVIOUS PAGE *or*
    FIRST PAGE *or* LAST PAGE

**Program Sequence**

*See* Figure 8, next page.

STOITAPE; *or* STOIDISC;
DIRE;

---

Selecting RESTORE DISPLAY or pressing any hardkey restores the measurement display.

The tape or disc directory cannot be printed, plotted, or output via the HP 8510 HP-IB.

*continued* →

**Directory Examples:**

TAPE DIRECTORY

| FILE | NO. | BLOCK SIZE |
|---|---|---|
| <file type> | <file number> | <blocks used> |

There is a maximum of 85 blocks per tape, with 2560 bytes/tape block.

---

DISC DIRECTORY

| FILE NAME | CONTENTS | TYPE |
|---|---|---|

The disc file name listed in the directory consists of a three-character prefix that is used by the HP 8510 to determine data type. It is not necessary for the user to include this prefix in the filename for any disc store, load, or delete operation.

---

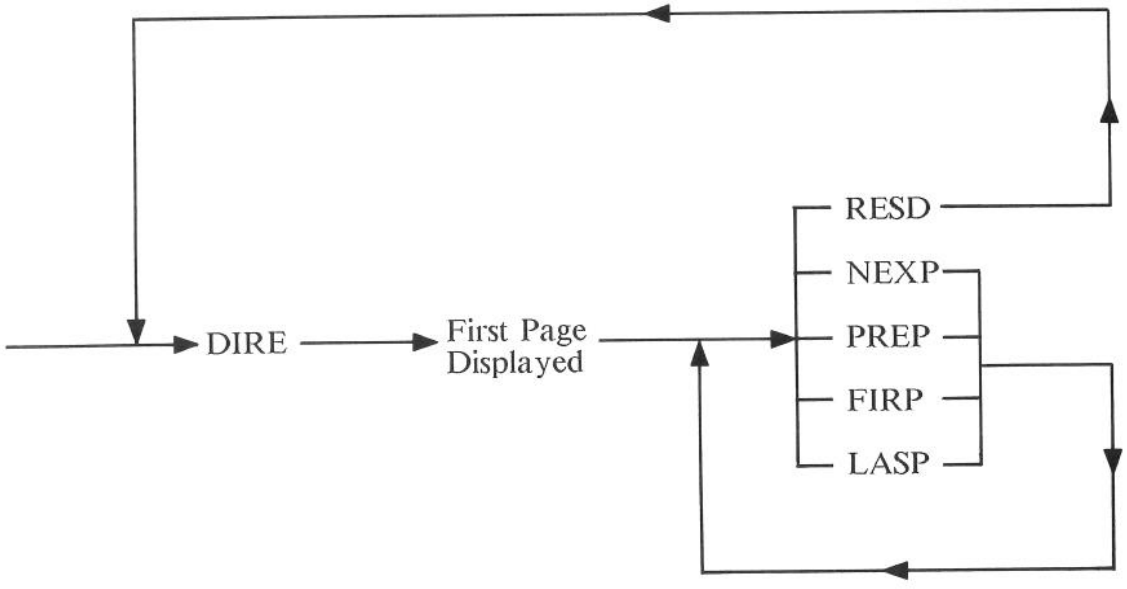



*Figure 8. Tape Directory Sequence*

softkey DISC UNIT NUMBER
mnemonic **DISCUNIT**

Disc Unit Number.
Usually 0 (left drive), 1 (right drive).

softkey DISC VOLUME
mnemonic **DISCVOL**

Disc Volume Number.

---

**MAIN MENU** TAPE/DISC
**PRIOR MENU** SET UP DISC
**NEXT MENU** NONE

DISC UNIT NUMBER

| | | | |
|---|---|---|---|
| **PRESET** | NOT CHANGED | | |
| **INITIALIZED** | 0 | **RANGE** | 0 to 15 |

DISC VOLUME

| | | | |
|---|---|---|---|
| **PRESET** | NOT CHANGED | | |
| **INITIALIZED** | 0 | **RANGE** | 0 to 7 |

**SEE ALSO** ADDRESS of DISC

---

**Manual Sequence**

```
TAPE/DISC
  STORAGE IS DISC
    SETUP DISC
      DISC UNIT NUMBER [entry x1] (entry = 0 - 15)
      DISC VOLUME [entry x1] (entry = 0 - 7)
```

**Program Sequence**

```
DISCUNIT [value]; (value = 0 - 15)

DISCVOL [value]; (value = 0 - 7)
```

*continued* →

The disc unit number and volume number are part of the hardware state. They are not changed by Power-up, Preset, or Recall.

For DISCUNIT:

A disc drive may contain more than one disc unit. A particular unit is selected using this command.

For DISCVOL:

A large disc unit may be divided into volumes. This is usually a hardware setting on the disc drive. A particular volume is selected using this command.

hardkey DISPLAY
mnemonic **MENUDISP**

Present Display Menu.

---

MAIN MENU NONE (HARDKEY)

---

**Manual Sequence**

DISPLAY
SINGLE CHANNEL *or*
DUAL CHANNEL *or*
DISPLAY: DATA *or*
DISPLAY: MEMORY *or*
DISPLAY: DATA and MEMORY *or*
DISPLAY: MATH (<operator>) *or*
SPECIFY DEFAULTS *or*
DATA → MEMORY *n*

**Program Sequence**

MENUDISP;

softkey DISPLAY: DATA
mnemonic **DISPDATA**

Display current data for selected channel.

---

| | |
|---|---|
| **MAIN MENU** | DISPLAY |
| **PRIOR MENU** | NONE |
| **NEXT MENU** | NONE |
| **PRESET** | DISPLAY: DATA |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | YES |

---

**Manual Sequence**

*<select channel>*
DISPLAY
DISPLAY: DATA

**Program Sequence**

*<select channel>*
DISPDATA;

---

The parameter label is displayed in the Channel Identification area of the CRT.

The MARKER value is the current trace value at the Active Marker position.

softkey DISPLAY: MATH (<operator>)
mnemonic **DISPMATH**

Display Selected Channel Data with Default Math using Default Memory.

---

| | |
|---|---|
| **MAIN MENU** | DISPLAY |
| **PRIOR MENU** | DISPLAY |
| **NEXT MENU** | NONE |
| **PRESET** | DISPLAY: DATA<br>MATH ( / ) |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | NO (Instrument state RECALL turns math off) |
| **SEE ALSO** | MATH OPERATIONS |

---

**Manual Sequence**

<select channel>
DISPLAY
DISPLAY: MATH (<operator>)

**Program Sequence**

```
<select channel>
DISPMATH;
```

---

The parameter label **<operator>** is displayed in the Channel Identification area of the CRT. The MARKER value gives the current trace value at the Active Marker position after math is applied.

The trace will be in error if the memory trace was stored with a different NUMBER of POINTS than is currently selected. Math will not turn on if the current number of points is different, and will turn off if points is changed.

RECALL of instrument state selects DISPLAY: DATA.

softkey DISPLAY: MEMORY
mnemonic **DISPMEMO**

Display Selected Channel Default Memory.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | DISPLAY | | |
| **PRIOR MENU** | DISPLAY | | |
| NEXT MENU | NONE | | |
| **PRESET** | DISPLAY: DATA | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | NO |

---

**Manual Sequence**

<select channel>
DISPLAY
DISPLAY: MEMORY

**Program Sequence**

<select channel>
DISPMEMO;

---

The annotation **M only** is displayed in the Channel Identification area of the CRT. In this state only, the MARKER readout gives the current memory trace value at the Active Marker position.

The trace will be in error if the memory trace was stored with a different NUMBER of POINTS than is currently selected. Math will not turn on if the current number of points is different, and will turn off if points is changed.

RECALL of instrument state selects DISPLAY: DATA.

softkey DIVIDE ( / )
mnemonic **DIVI**

Select Complex Division Trace Math
for Selected Channel.

---

| | |
|---|---|
| MAIN MENU | DISPLAY |
| PRIOR MENU | MATH OPERATIONS |
| NEXT MENU | NONE |
| PRESET | MATH ( / ) for Channels 1 and 2 |
| COUPLED | ALWAYS UNCOUPLED RECALLED YES |

---

**Manual Sequence**

<select channel>
DISPLAY
SPECIFY DEFAULTS
MATH OPERATIONS
DIVIDE ( / )

**Program Sequence**

```
<select channel>
DIVI;
```

---

Provides vector normalization. The softkey label becomes MATH ( / ) .

hardkey DOMAIN
mnemonic **MENUDOMA**

Present Domain Menu.

---

| | |
|---|---|
| MAIN MENU | NONE (HARDKEY) |
| **PRESET** | FREQUENCY DOMAIN for Channels 1 and 2 |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | YES |

---

**Manual Sequence**

DOMAIN
FREQUENCY *or*
TIME LOW PASS *or*
TIME BAND PASS *or*
AUX. VOLT OUTPUT *or*
SPECIFY TIME *or*
SPECIFY GATE

**Program Sequence**

MENUDOMA;

| | |
|---|---|
| softkey | DONE: <standard class label> |
| mnemonic | **DONE** |

Standard Class Done During Measurement Calibration.

---

| | |
|---|---|
| **MAIN MENU** | CAL |
| **PRIOR MENU** | CAL 1 *or* CAL 2 |
| **NEXT MENU** | CAL SET SELECTION |

---

**Manual Sequence** *Example:* RESPONSE, *7 mm Cal Kit*

```
S11
  CAL
    CAL 1  7 mm
      RESPONSE
        SHORT
          DONE: RESPONSE
            CAL SET n   (n = 1 - 8)
```

**Program Sequence** *Example:* RESPONSE, *7 mm Cal Kit*

```
S11;
  CAL1;
    CALIRESP;
      STANA;
        DONE;
          CALS n;   (n = 1 - 8)
```

---

*continued* →

This keyword appears on the Standard Selection menu which is displayed when there is more than one standard in the class. When it is selected, the following things happen:

1. logic checks that all necessary standards in the class have been measured

2. the appropriate error terms are computed

3. the class label is underlined to signify that the standard class is complete

4. control is passed to the next procedure

If the complete current frequency range is not covered by the standards thus far selected, then the message "CAUTION: ADDITIONAL STANDARDS NEEDED" is displayed and bit 1 of the Primary Status byte is set.

If standards in the class overlap in frequency coverage (see MINIMUM FREQUENCY and MAXIMUM FREQUENCY), then data from the last standard measured in the overlapping frequency area is used to develop the error coefficients.

In the RESPONSE cal, DONE must be followed by CAL SET *n* or error coefficients will be lost.

## softkey DONE (Multiple source Define Frequencies menu)

| | |
|---|---|
| MAIN MENU | SYSTEM |
| PRIOR MENU | MULTIPLE SOURCE |
| NEXT MENU | MULTIPLE SOURCE |
| SEE ALSO | EDIT MULT. SRC |

DONE or PRIOR MENU returns to Multiple Source menu. Changed source and receiver definitions are not stored in the Hardware State until MULT. SRCE: ON/SAVE or MULT. SRCE: OFF/SAVE is selected.

softkey DONE (Edit Frequency List Menu)
mnemonic **EDITDONE**

Completes the Frequency List Entry Process.

---

| | |
|---|---|
| **MAIN MENU** | STIMULUS |
| **PRIOR MENU** | STIMULUS MORE MENU |
| NEXT MENU | STIMULUS MENU |
| **SEE ALSO** | EDIT LIST |
| | SEGMENT: |

---

**Manual Sequence**

STIMULUS
MORE
EDIT LIST
<enter frequency list segments>
DONE

**Program Sequence**

EDITLIST;
<enter frequency
list segments>
EDITDONE

---

When editing or creating a frequency list, this should be the last key or HP-IB mnemonic executed.

PRESET clears frequency list.

| | |
|---|---|
| softkey | DONE LOADS |
| mnemonic | DONE |

Necessary Standards on the Loads Menu Have Been Measured.

---

| | |
|---|---|
| **MAIN MENU** | CAL |
| **PRIOR MENU** | 1-PORT CAL MENU |
| **NEXT MENU** | 1-PORT CAL MENU |
| **SEE ALSO** | CALIBRATE: $S_{11}$ 1-PORT |

---

If standarda thus far measured do not cover the current frequency range, a caution message is displayed.

softkey DRIVE

Present Drive Menu to Select Port at which the Stimulus (Drive) will be Applied for Current Basic or User Parameter.

---

| | |
|---|---|
| **MAIN MENU** | PARAMETER |
| **PRIOR MENU** | REDEFINE PARAMETER |
| **NEXT MENU** | NONE |
| **PRESET** | STANDARD BASIC AND USER PARAMETERS |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | BASIC PARAMETERS: NO<br>USER PARAMETERS: YES |
| **SEE ALSO** | REDEFINE PARAMETER |

---

**Manual Sequence**

<select basic or user parameter>
PARAMETER MENU
REDEFINE PARAMETER
DRIVE
DRIVE: PORT 1 *or*
DRIVE: PORT 2 *or*
DRIVE: NONE
<other changes>
REDEFINE DONE

**Program Sequence**

*See* REDEFINE PARAMETER.

---

Parameter definition changes are executed immediately.

REDEFINE DONE stores current parameter definition.

softkey DRIVE: NONE
mnemonic **DRIVNONE**

Do Not Drive Either Port 1 or Port 2;
Do Not Attempt 1st IF Phase Lock.

softkey DRIVE: PORT 1
mnemonic **DRIVPORT1**

Select Port 1 as the Drive Port.

softkey DRIVE: PORT 2
mnemonic **DRIVPORT2**

Select Port 2 as the Drive Port.

---

| | |
|---|---|
| MAIN MENU | PARAMETER |
| PRIOR MENU | REDEFINE PARAMETER |
| NEXT MENU | NONE |
| PRESET | STANDARD BASIC AND USER PARAMETERS |
| COUPLED | ALWAYS UNCOUPLED |
| RECALLED | BASIC PARAMETERS: NO<br>USER PARAMETERS: YES |
| SEE ALSO | DRIVE<br>REDEFINE PARAMETER |

---

**Manual Sequence**

*See* DRIVE.

**Program Sequence**

*See* REDEFINE PARAMETER.

---

The indicator adjacent to $a_1$ or $a_2$ on the test set lights to show the drive port.

For Reflection/Transmission test sets, only DRIVE: PORT 1 is valid.

softkey DUAL CHANNEL

Present Dual Channel Display Select Menu.

---

| | |
|---|---|
| **MAIN MENU** | DISPLAY |
| **PRIOR MENU** | DISPLAY |
| **NEXT MENU** | OVERLAY *or* SPLIT |
| **PRESET** | SINGLE CHANNEL |
| **RECALLED** | YES |
| **SEE ALSO** | OVERLAY |
| | SPLIT |

---

**Manual Sequence**

DISPLAY
DUAL CHANNEL
OVERLAY *or*
SPLIT

**Program Sequence**

*See* OVERLAY *and* SPLIT.

---

For DUAL CHANNEL displays, only the Raw, Corrected, and Formatted data arrays for the selected channel are available.

softkey DUPLICATE POINTS

Presents Duplicate Points Mode Menu.

softkey DUPLICATES DELETED
mnemonic **DUPD**

Frequency List Delete Duplicate Points.

softkey DUPLICATES MEASURED
mnemonic **DUPM**

Frequency List Measure Duplicate Points.

---

**MAIN MENU** STIMULUS
**PRIOR MENU** EDIT LIST
**NEXT MENU** EDIT LIST

**PRESET** DUPLICATES MEASURED
**COUPLED** ALWAYS COUPLED
**RECALLED** YES

**SEE ALSO** FREQUENCY LIST

---

**Manual Sequence**

STIMULUS MENU
MORE
EDIT LIST
DUPLICATE POINTS
DUPLICATES DELETED *or*
DUPLICATES MEASURED
DONE

**Program Sequence**

```
EDITLIST;
  DUPD; or
  DUPM;
    EDITDONE;
```

---

The frequency list is recreated so that duplicate points are deleted or measured; this happens independently of sweep mode. If the sweep mode is FREQUENCY LIST, then the data trace is updated. Use DELETE DUPLICATES for measuring group delay where measurements at duplicate frequency points cause errors in the group delay trace.

DUPLICATES DELETED and DUPLICATES MEASURED are part of the Cal Set Limited Instrument State, so the selection must be made before the calibration is started.

softkey Δ MODE MENU

Present Delta Mode Menu.

---

| | |
|---|---|
| MAIN MENU | MARKER |
| PRESET | Δ MODE OFF |
| COUPLED | ALWAYS UNCOUPLED |
| RECALLED | YES |
| SEE ALSO | MARKER *n*<br>Δ OFF<br>Δ REF = *n* |

---

**Manual Sequence**

MARKER
  MARKER *n* (*n* = 1 - 5) (select active marker)
    Δ MODE MENU
      Δ REF = *n* (*n* = 1 - 5) (select reference marker)

---

In the Δ MARKER mode, the marker readout shows the difference in stimulus and parameter values between the active marker and the reference marker. If the active marker and the reference marker are the same, then the marker readout is zero.

softkey Δ OFF
mnemonic **DELO**

Select Delta Marker Mode Off.

---

| | |
|---|---|
| **MAIN MENU** | MARKER |
| **PRIOR MENU** | Δ MODE |
| **NEXT MENU** | NONE |
| **PRESET** | Δ OFF |

---

**Manual Sequence**

MARKER
Δ MODE MENU
Δ OFF

**Program Sequence**

```
DELO;
```

---

The blinking Δ annotation near the reference marker and the Active entry annotation are erased.

softkey Δ REF = 1
mnemonic **DELR1**

softkey Δ REF = 2
mnemonic **DELR2**

softkey Δ REF = 3
mnemonic **DELR3**

softkey Δ REF = 4
mnemonic **DELR4**

softkey Δ REF = 5
mnemonic **DELR5**

Select Reference Marker for Delta Marker Mode.

---

| | |
|---|---|
| **MAIN MENU** | MARKER |
| **PRIOR MENU** | Δ MODE |
| **NEXT MENU** | MARKER |
| **PRESET** | Δ OFF |
| **COUPLED** | ALWAYS COUPLED |
| **RECALLED** | YES |

---

**Manual Sequence**

MARKER
  MARKER *n* (*n* = 1 - 5)
    Δ MODE MENU
      Δ REF = *n* (*n* = 1 - 5)

**Program Sequence**

DELR *n*; (*n* = 1 - 5)

*continued* →

When a reference marker is first selected, the Active Entry marker readout shows:

active marker number - reference marker number

to indicate that the marker readout shows the difference in Stimulus and Parameter values between the active marker and the reference marker (see MARKER *n*).

The blinking Δ symbol appears beside the reference marker, and the marker menu is displayed with the Reference marker identified. If the active marker and the reference marker are the same, then the marker readout is zero.

Stimulus entries apply to the Active marker.

To select a different Active marker, press a key on the Marker menu. To select a different Reference marker, press a key on the Δ Mode menu.

For MARKER to TARGET in Δ mode, the search begins at the reference marker instead of the lowest stimulus value.

softkey EDIT
mnemonic **SEDI**

Edit Present Edit Frequency List Menu.

---

| | |
|---|---|
| MAIN MENU | STIMULUS |
| COUPLED | ALWAYS COUPLED |
| SEE ALSO | EDITLIST |
| | SEGMENT |

---

**Manual Sequence**

```
STIMULUS MENU
  MORE
    EDIT LIST
      SEGMENT entry x1
        EDIT
        <define segment>
          DONE
            DONE
```

**Program Sequence**

```
EDITLIST;
  SEDI [value];
    <define segment>
      SDON;
        EDITDONE;
```

---

From the front panel, the edit key edits the active segment. Over HP-IB, the edit command edits the segment specified by the value following the command (e.g. SEDI3 edits segment 3).

If edit is selected and the list is empty, then a default segment is added for the editing.

softkey EDIT LIST
mnemonic **EDITLIST**

Edit Frequency List.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | STIMULUS | | |
| **PRIOR MENU** | NONE | | |
| **NEXT MENU** | EDIT FREQUENCY LIST | | |
| **PRESET** | CLEARS FREQUENCY LIST | | |
| **COUPLED** | ALWAYS COUPLED | **RANGE** | 401 points or 31 segments |
| | | **RECALLED** | YES |
| **SEE ALSO** | FREQUENCY LIST<br>DUPLICATE POINTS | | |

---

**Manual Sequence**

STIMULUS MENU
  MORE
    EDIT LIST
      SEGMENT *or*
      EDIT *or*
      DELETE *or*
      ADD *or*
      DUPLICATE POINTS *or*
      CLEAR LIST *or*
      DONE
        DONE
          FREQUENCY LIST

**Program Sequence**

EDITLIST; CLEL; SADD;
  <enter frequency list segment>
    SDON;
      EDITDONE; LISFREQ;

---

The EDIT LIST key starts the process of creating or editing a frequency list. The EDITLIST HP-IB command must be the first command in any sequence that adds, deletes, or edits the frequency list.

*continued* →

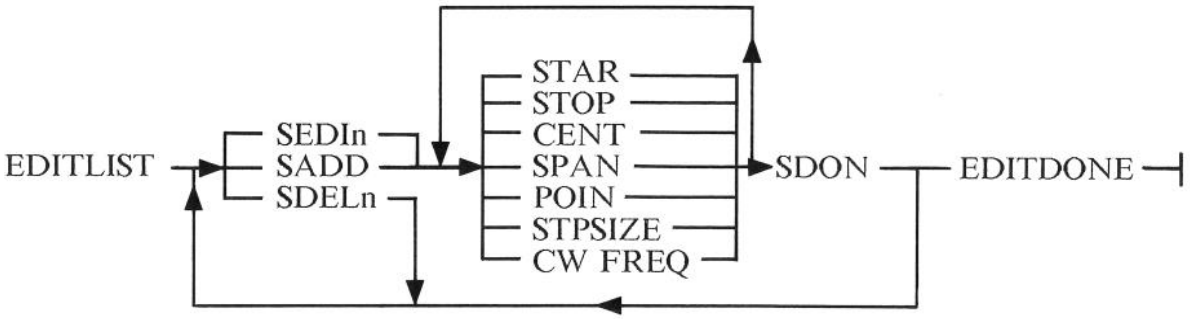



*Figure 9. Edit Frequency List Menu*

softkey EDIT MULT. SRC
mnemonic **EDITMULS**

Edit Multiple Source Equations.

---

**MAIN MENU** SYSTEM
**PRIOR MENU** SYSTEM
**NEXT MENU** MULTIPLE SOURCE

**SEE ALSO** MULT. SRC: OFF / SAVE
MULT. SRC: ON / SAVE
DEFINE: SOURCE 1

---

**Manual Sequence**

SYSTEM
MORE
EDIT MULT. SRC
DEFINE: *and / or*
MULT. SRC: ON/SAVE *or*
MULT. SRC: OFF/SAVE

**Program Sequence**

```
EDITMULS;
  DEFA;
    MULSON; or
      MULSOFF;
```

---

This key starts the process of editing the multiple source equations. These equations are part of the hardware state. They are not changed by Preset, Power On, or Instrument State Recall.

Any programming sequence to edit the multiple source equations must start with EDITMULS.

softkey ELECTRICAL DELAY
mnemonic **ELED**

Set Electrical Delay for Current Parameter on Selected Channel.

---

| | |
|---|---|
| MAIN MENU | RESPONSE |
| PRIOR MENU | RESPONSE |
| NEXT MENU | NONE |
| **PRESET** | ELECTRICAL DELAY = 0 seconds<br>FOR ALL BASIC AND USER PARAMETERS,<br>CHANNEL 1 AND CHANNEL 2 |
| **RANGE** | +1 SECOND TO -1 SECOND<br>WITH FEMTOSECOND RESOLUTION |
| **COUPLED** | SEPARATE FOR EACH PARAMETER<br>ON EACH CHANNEL |
| **RECALLED** | YES |
| **SEE ALSO** | COAXIAL DELAY<br>OFFSET DELAY<br>PORT EXTENSIONS<br>TABLE DELAY<br>VELOCITY FACTOR<br>WAVEGUIDE DELAY |

---

**Manual Sequence**

<select channel>
  <select parameter>
    RESPONSE MENU
      ELECTRICAL DELAY [entry]  (x1 = seconds)

**Program Sequence**

<select channel>
  <select parameter>
    ELED [value [time suffix] ];

*continued* →

ELECTRICAL DELAY allows a time/phase shift that is independent of PORT EXTENSIONS. It produces an effect upon phase, delay, and time domain traces in any format. Separate values for electrical delay are Saved/Recalled for each Basic and User parameter on each channel (total eight separate memories).

The Enhancement Annotation **D** is displayed on the CRT when TABLE DELAY is selected, or the sum of Electrical Delay and Port Extensions is non-zero for any displayed parameter. The supplementary display below the active entry value shows the corresponding physical length of transmission line which exhibits the characteristic:

$$\text{delay} = \text{physical length} / C$$

where C = the current velocity factor
= the speed of light in free space
= 299.79 Mm/s, after Preset

The phase shift applied to the measurement can be either linear or dispersive, depending upon the COAXIAL DELAY or WAVEGUIDE DELAY selection.

hardkey ENTRY OFF
mnemonic **ENTO**

Turn Off Active Function and Active Entry Display.

---

**MAIN MENU** NONE (HARDKEY)

---

**Manual Sequence**

ENTRY OFF

**Program Sequence**

ENTO;

---

This keyword clears the Active Entry area of the HP 8510 CRT, including Caution/Tell messages, and disables the Active Function entry. The value of last active function is not changed.

Under HP-IB control, Caution/Tell messages are cleared from the CRT display using OUTPERRO.

softkey ERASE TITLE

Erase Current Title.

---

| | |
|---|---|
| MAIN MENU | SYSTEM |
| PRIOR MENU | TITLE |
| NEXT MENU | NONE |
| | |
| SEE ALSO | TITLE |

hardkey = MARKER
mnemonic **EQUA**

Set Current Active Function Value Equal to the Value of the Current Active Marker.

---

MAIN MENU NONE (HARDKEY)

---

**Manual Sequence**

MARKER
MARKER *n* (*n* = 1 - 5)
<position marker>
<select active function>
= MARKER

**Program Sequence**

MARK *n* [value [freq or time suffix] ]; (*n* = 1 - 5)
<select active function>
EQUA;

---

The current Active Function (see list of functions below) is assigned the active marker value. The marker value and the trace are updated.

If no active marker is currently selected, then the most recently active marker is turned on (MARKER 1 after PRESET) and its value is used.

If the current active function is not appropriate, the message "INCONSISTENT WITH CURRENT ACTIVE FUNCTION" is displayed.

Valid functions are:

| | |
|---|---|
| START | REF VALUE |
| STOP | ELECTRICAL DELAY |
| CENTER | PHASE OFFSET |
| SPAN | PORT EXTENSIONS |
| (any frequency entry) | WAVEGUIDE CUTOFF |

mnemonic **FASC**

Execute Fast CW Data Acquisition

---

MAIN MENU NONE (HP-IB ONLY)

---

**Program Sequence**

```
SINP;
  <set frequency, parameter, channel>
    FASC;
      <wait for Bit 2 of Primary Status Byte>
        <HP-IB GROUP EXECUTE TRIGGER> (GET 716)
          <Controller ENTER statement>
            <issue hardware trigger>
```

---

Selecting Fast CW allows data acquisition and output to be controlled by a TTL pulse applied to the TRIGGER IN connector on the HP 8510B rear panel.

After issuance of the HP-IB Group Execute Trigger, the falling edge of the trigger input initiates the selected measurement. The data point is transferred to the Raw Data Array, and, if a controller enter statement is active, the data point is output to the controller in FORM1 format. If a controller enter statement is not active, the data point is stored in the next available element.

If multiple hardware triggers are received before data is read, data is output on a first-in/first-out basis. If more than the current number of points is measured before the data is read, the buffer overflows, the message "SWEEP TOO FAST" is displayed, and the mode is terminated.

| | | | |
|---|---|---|---|
| softkey | <data type> FILE 1 | softkey | <data type> FILE 5 |
| mnemonic | **FILE1** | mnemonic | **FILE5** |
| softkey | <data type> FILE 2 | softkey | <data type> FILE 6 |
| mnemonic | **FILE2** | mnemonic | **FILE6** |
| softkey | <data type> FILE 3 | softkey | <data type> FILE 7 |
| mnemonic | **FILE3** | mnemonic | **FILE7** |
| softkey | <data type> FILE 4 | softkey | <data type> FILE 8 |
| mnemonic | **FILE4** | mnemonic | **FILE8** |

Select Tape Cartridge File
to Store/Load/Delete Data Type.

---

| | |
|---|---|
| MAIN MENU | TAPE/DISC |
| **PRIOR MENU** | DATA TYPE SELECT |
| NEXT MENU | NONE |
| SEE ALSO | DELETE |
| | LOAD |
| | STORE |

---

**Manual Sequence**

TAPE/DISC
  STORAGE IS TAPE
    STORE *or* LOAD *or* DELETE
      <select data type>
        FILE *n*  (*n* = 1 - 8)

**Program Sequence**

```
STOITAPE;
  STOR; or LOAD; or DELETE;
    <select data type>
      FILE n;  (n = 1 - 8)
```

---

The tape file data type currently selected is shown at the top to the file select menu. An asterisk ( * ) preceding FILE on the File Select menu indicates that the file currently contains data.

Selecting a tape file that already contains data deletes the existing file before storing new data. Each data type can use up to eight data files, tape space permitting.

softkey FIRST PAGE
mnemonic **FIRP**

Display First Page of Tape Directory
on HP 8510 CRT.

---

MAIN MENU TAPE
PRIOR MENU DIRECTORY
NEXT MENU NONE

SEE ALSO DIRECTORY

---

**Manual Sequence**

*See* DIRECTORY.

**Program Sequence**

*See* DIRECTORY.

| | |
|---|---|
| softkey | FIXED |
| mnemonic | FIXE |

Define Load Type as Fixed.

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | STANDARD TYPE |
| NEXT MENU | NONE |
| SEE ALSO | STD TYPE: LOAD<br>MODIFY 1 <cal kit 1 label><br>MODIFY 2 <cal kit 2 label> |

---

**Manual Sequence**

*See* STD TYPE: LOAD.

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

When the standard is selected during the measurement calibration sequence, the load is treated as fixed load requiring a single measurement to obtain a value for directivity.

hardkey FORMAT MENU
mnemonic **MENUFORM**

Present Format Menu.

---

MAIN MENU NONE (HARDKEY)

---

**Manual Sequence**

FORMAT MENU
SWR *or*
LINEAR MAGNITUDE *or*
LIN mkr on POLAR *or*
LOG mkr on POLAR *or*
Re/Im mkr on POLAR *or*
INVERTED SMITH *or*
IMAGINARY *or*
REAL *or*
PRIOR MENU *to exit*

**Program Sequence**

MENUFORM;

mnemonic **FORM1**

Input/Output HP 8510A Internal Binary Format
Real/Imaginary Pairs (6 bytes/data point) .

mnemonic **FORM2**

Input/Output IEEE 32 bit Floating Point Format
Real/Imaginary Pairs (8 bytes/data point) .

mnemonic **FORM3**

Input/Output IEEE 64 bit Floating Point Format
Real/Imaginary Pairs (16 bytes/data point) .

mnemonic **FORM4**

Input/Output ASCII Format
(strings separated by comma) .

---

| | |
|---|---|
| MAIN MENU | NONE (HP-IB ONLY) |
| **PRESET** | SELECTS FORM1 |

---

These mnemonics specify the various data block formats used to transfer data via the HP-IB. It is good practice to precede each INPU/OUTP instruction with one of the FORM specifiers.

**Example: FORM1, FORM2, FORM3**

```
FORMAT OFF
DIM Data (Number of Points, 2)
Listen Nwa; "FORM3; OUTPDATA;"
Talk Nwa_data; Preamble, Size, Data(*)
.
.
.
Listen Nwa; "FORM3; INPUDATA;"
Listen Nwa; Preamble, Size, Data (*)

Preamble = Standard Block Header, #A
Size = Number of Bytes in Block.
```

SAVE/RECALL and LEARN STRING selects FORM1.

*continued* →

**Example: FORM4**

```
FORMAT ON
DIM Data (Number of points, 2)
Listen Nwa; "FORM4; OUTPDATA;"
Talk Nwa_data; Data(*)

FORMAT ON
DIM Data (Number of points, 2)
Listen Nwa; "FORM4; INPUDATA;"; <suppress line feed>
Talk Nwa_data; Data(*)
```

---

**FORM1**

NUMBER of POINTS

#A bytea byteb ↓ imag/real data point ↑ EOI on last byte of data block

#A is standard block header.
Bytea and byteb hold number of bytes to follow.
imag/real data point is 3 16 bit words for each data point:

15←——— 015←——— 015←——————————— 0

11 7

| imaginary mantissa | real mantissa | imag | real | common exponent |
|---|---|---|---|---|

Bits 7-15 of LSB provide additional resolution; used only for Raw Data.

FORM1 is internal binary representation used for fast I/O and is not intended to be modified by the user.

7 - 15 of LSB may not be accepted on input.

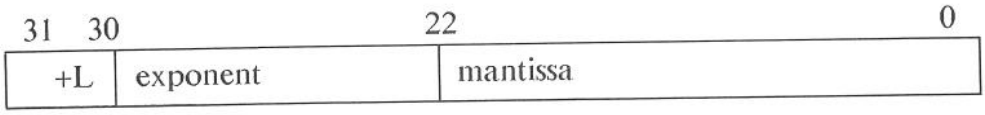
*continued* →

**FORM2**

NUMBER of POINTS

#A bytea byteb ↓ real data point imag data point | EOI on last byte

#A is standard block header.
Bytea and byteb integer number of bytes to follow.
real data point is 31 bit word for each data point,
imag data point is 31 bit word for each data point:




32 bit IEEE 728 standard data block transfer format with 1 bit sign, 8 bit biased exponent, 23 bit fraction whose complete value, n, is interpreted as follows:

If exp = 255 and mant < > 0, then n = not a number.

If exp = 255 and mant = 0, then $n = -1^s \cdot$ infinity.

If 0 < exp < 255, then $n = -1^s \cdot 2^{(exp-127)} \cdot (1.mant)$.

If exp = 0 and mant < > 0, then $n= -1^s \cdot 2^{(-126)} \cdot (0.mant)$.

If exponent = 0 and f = 0, then $n = -1^s \cdot 0$.

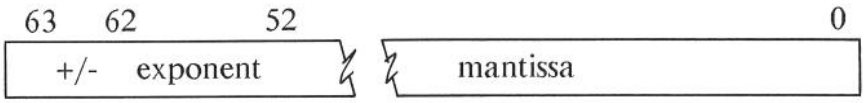
*continued* →

**FORM3**

NUMBER of POINTS

#A bytea byteb ↓ real data point imag data point ↑ EOI on last byte

#A is standard block header.
Bytea and byteb integer number of bytes to follow.
real data point is 64 bit word for each data point;
imag data point is 64 bit word for each data point:




64 bit IEEE 728 standard data block transfer format with 1 bit sign, 11 bit biased exponent, 52 bit fraction whose complete value, n, is interpreted as follows:

If exp = 2047 and mant < > 0, then n = not a number.

If exp = 2047 and mant = 0, then n = $-1^{s} \cdot$ infinity.

If 0 < exp < 2047, then n = $-1^{s} \cdot 2^{(exp-127)} \cdot$ (1.mant).

If exp = 0 and mant < > 0, then n= $-1^{s} \cdot 2^{(-1022)} \cdot$ (0.mant).

If exponent = 0 and f = 0, then n = $-1^{s} \cdot 0$.

*continued* →

**FORM4**

NUMBER of POINTS

↓ <real ASCII value>, <imag ASCII value><line feed> EOI on last byte

The real and the imaginary ASCII values are:

Sxxx.yyyyyyyyyyyyyyyESzz

where

S = unforced sign ( - if negative and blank if positive)

x = 3 digits to the left of the decimal point
(leading blanks for < 3 digits followed by
sign, if applicable, and 1 or 2 digits)

y = 15 significant digits to the right of the decimal point

E = exponential notation

z = 2 significant digits for exponent

Each data point is two 24-character strings (first real then imag), with each string separated by a comma and terminated by a line feed. EOI is asserted on the last byte of the data block.

When using FORM4 for transfers from the controller to the HP 8510 via the HP 8510 HP-IB, suppress the line feed which normally terminates the INPU<data type> instruction.

mnemonic **FRER**

Select Free-Run Sweep Mode.

| | |
|---|---|
| MAIN MENU | NONE (HP-IB ONLY) |
| PRESET | FRER |
| RECALLED | YES |
| SEE ALSO | TRIG |

**Program Sequence**

FRER;

Used after TRIG to restore normal operation.

Selected RAMP, STEP, or SINGLE POINT data acquisition continues (CONTINUAL or HOLD).

softkey FREQUENCY
mnemonic **FREQ**

Select Frequency Domain for Selected Channel.

---

| | |
|---|---|
| MAIN MENU | DOMAIN |
| PRIOR MENU | DOMAIN |
| NEXT MENU | NONE |
| **PRESET** | FREQUENCY DOMAIN for Channel 1 and Channel 2 |
| **COUPLED** | ALWAYS UNCOUPLED |

---

**Manual Sequence**

<select channel>
DOMAIN
FREQUENCY

**Program Sequence**

<select channel>
FREQ;

---

The measured characteristic is displayed versus frequency. START/STOP/CENTER/SPAN and other stimulus controls apply to the frequency sweep.

Switching from TIME LOW PASS or TIME BAND PASS to FREQUENCY automatically selects DISPLAY: DATA.

softkey FREQUENCY LIST
mnemonic **LISFREQ**

Select Frequency List Sweep Mode for Both Channels.

---

| | | | |
|---|---|---|---|
| MAIN MENU | STIMULUS | | |
| **PRESET** | RAMP | | |
| **COUPLED** | ALWAYS COUPLED | **RANGE** | 401 POINTS MAXIMUM |
| | | **RECALLED** | YES |
| SEE ALSO | STEP<br>EDIT LIST<br>SEGMENT: | | |

---

**Manual Sequence**

STIMULUS MENU
FREQUENCY LIST

**Program Sequence**

LISFREQ;

---

Frequency list is a sweep mode that steps the source through a list of unique frequencies. The operation always starts with the lowest frequency and progresses to the highest in the list.

If no list is specified, the CRT displays "Frequency List Empty."

Averaging is accomplished in the same way as in the STEP Sweep Mode.

softkey FREQUENCY OFF
mnemonic **FREO**

Turn Off Display of Frequency Annotations.

---

| | |
|---|---|
| **MAIN MENU** | SYSTEM |
| **PRIOR MENU** | SYSTEM |
| **NEXT MENU** | NONE |
| **PRESET** | RESTORES NORMAL FREQUENCY DOMAIN DISPLAYS AND PRESET FREQUENCY VALUES |
| **RECALLED** | YES |

---

**Manual Sequence**

SYSTEM
FREQUENCY OFF

**Program Sequence**

FREO;

---

All STIMULUS functions operate normally except that the START/STOP/CENTER/SPAN display values are set to 0.000000000 GHz and the MARKER frequency value is blanked. Time domain and Aux. Voltage Output domain stimulus displays are not changed.

RECALL of Instrument State stored without FREQUENCY OFF restores normal Frequency domain displays.

Not part of Cal Set Limited Instrument State.

softkey FREQUENCY SUBSET
memonic **FRES**

Begin Creation of Frequency Subset.

---

| | |
|---|---|
| **MAIN MENU** | CAL |
| **PRIOR MENU** | MODIFY CAL SET TYPE |
| **NEXT MENU** | FREQUENCY SUBSET |
| **PRESET** | CORRECTION OFF |
| **COUPLED** | SUBSETS ALWAYS COUPLED |
| | **RECALLED** YES |
| **SEE ALSO** | CREATE & SAVE |
| | FREQUENCY LIST |
| | SUBSET: CENTER, SUBSET: SPAN |
| | SUBSET: START, SUBSET: STOP |

---

**Manual Sequence**

```
CAL
  MORE
    MODIFY CAL SET
      FREQUENCY SUBSET
        <set trace markers>
        (see SUBSET: START, STOP, CENTER, SPAN)
          CREATE & SAVE
            CAL SET n (n = 1 - 8)
```

**Program Sequence**

```
FRES;
  <set frequency subset>
    CRES;
      CALS n (n = 1 - 8)
```

---

*continued* →

With correction on, selecting FREQUENCY SUBSET causes the Frequency Subset menu to be displayed and markers to appear on the trace. Select SUBSET: START, SUBSET: STOP, SUBSET: CENTER, or SUBSET: SPAN and use the knob, step keys, and numeric entry to set the trace markers to appropriate points on the trace.

When the frequency subset is correct, press CREATE & SAVE, then select a cal set. The appropriate existing cal set error coefficients are transferred to the new cal set and corrected data is displayed in the frequency list sweep mode.

The actual frequencies in this subset may be examined by selecting STIMULUS MENU, MORE, EDIT LIST. Recall the original frequency sweep by selecting the original cal set.

mnemonic **FREU**

Update Frequency Annotation With No Sweep.

---

**MAIN MENU** NONE (HP-IB ONLY)

**SEE ALSO** HOLD

---

**Program Sequence**

```
HOLD;
  <change frequency sweep>
    FREU;
```

---

This command forces the HP 8510 to read the current STIMULUS state from the source and then update the current entry channel with the new data.

The START/STOP and CENTER/SPAN frequency annotation is updated at the end of each sweep. If in HOLD, changes to the frequency annotation will not be made. FREU; provides a means to update the source settings and the display annotation without actually taking a sweep.

softkey FWD ISOL'N ISOL'N STD
mnemonic **FWDI**

Measure Forward Isolation
Measurement Calibration Standard.

---

MAIN MENU CAL

SEE ALSO ISOLATION

---

**Manual Sequence**

*See* ISOLATION.

**Program Sequence**

*See* ISOLATION.

---

Isolation always uses a single standard to measure transmission signal path crosstalk. The isolation calibration is most effective when at least as much averaging is used as during the measurement (see ISOLATION).

$S_{21}$ is selected, the standard is measured, and the class label is annotated as complete.

*continued* →

*Table 10. Select Standard Class*

| Mnemonic | Standard Class |
|---|---|
| CLASS11A | ($S_{11}$) : <$S_{11}$ 1st standard class label> |
| CLASS11B | ($S_{11}$) : <$S_{11}$ 2nd standard class label> |
| CLASS11C | ($S_{11}$) : <$S_{11}$ 3rd standard class label> |
| CLASS22A | ($S_{22}$) : <$S_{22}$ 1st standard class label> |
| CLASS22B | ($S_{22}$) : <$S_{22}$ 2nd standard class label> |
| CLASS22C | ($S_{22}$) : <$S_{22}$ 3rd standard class label> |
| FWDT | FWD. TRANS. <standard class label> |
| REVT | REV.TRANS. <standard class label> |
| FWDM | FWD. MATCH <standard class label> |
| REVM | REV. MATCH <standard class label> |
| FWDI | FWD. ISOL'N <standard class label> |
| REVI | REV. ISOL'N <standard class label> |
| TRLT | THRU <standard class label> |
| TRLR1 | $S_{11}$ REFLECT <standard class label> |
| TRLR2 | $S_{22}$ REFLECT <standard class label> |
| TRLL | LINE <standard class label> |

softkey FULL PAGE
mnemonic **FULP**

Select Full Page Plot of Measurement Display
on Digital Plotter Connected to HP 8510 System Bus.

---

| | |
|---|---|
| MAIN MENU | COPY |
| PRIOR MENU | COPY |
| NEXT MENU | COPY |
| PRESET | FULL PAGE |
| COUPLED | ALWAYS COUPLED |
| SEE ALSO | SELECT QUADRANT |

---

**Manual Sequence**

COPY
SELECT QUADRANT
FULL PAGE

**Program Sequence**

FULP;

---

Softkey label annotation is updated; the next PLOT: <plot type> selection will be plotted on full page.

softkey FWD. MATCH <class label>
mnemonic **FWDM**

Measure Forward Match Measurement Calibration Standard.

---

**MAIN MENU** CAL

**SEE ALSO** TRANSMISSION

---

**Manual Sequence**

*See* TRANSMISSION.

**Program Sequence**

*See* TRANSMISSION.

---

In the 2-PORT measurement calibration sequence, $S_{11}$ of the Forward Match standard (usually the thru) is measured to produce the error coefficient data for the Forward Load Match error coefficient, $E_{LF}$. Since the label for the standard class and standard(s) are user-definable, the FWDM mnemonic is used to select the standard class for measurement.

If a single standard comprises the class, $S_{11}$ is selected, the standard is measured, logic checks that the standard covers the complete current frequency range, and the class label is annotated as complete. When TRANS. DONE is selected, the single standard does not cover the complete current frequency range then the message "CAUTION: ADDITIONAL STANDARDS NEEDED" is displayed and bit 1 of the Primary Status byte is set.

If the FWD. MATCH standard class uses more than one standard, then the mnemonic selects $S_{11}$ and presents the standard selection menu. See STANA-STANG to specify which standard to measure.

*continued* →

*Table 11. Select Standard Class*

| Mnemonic | Standard Class |
|---|---|
| CLASS11A | ($S_{11}$) : <$S_{11}$ 1st standard class label> |
| CLASS11B | ($S_{11}$) : <$S_{11}$ 2nd standard class label> |
| CLASS11C | ($S_{11}$) : <$S_{11}$ 3rd standard class label> |
| CLASS22A | ($S_{22}$) : <$S_{22}$ 1st standard class label> |
| CLASS22B | ($S_{22}$) : <$S_{22}$ 2nd standard class label> |
| CLASS22C | ($S_{22}$) : <$S_{22}$ 3rd standard class label> |
| FWDT | FWD. TRANS. <standard class label> |
| REVT | REV.TRANS. <standard class label> |
| FWDM | FWD. MATCH <standard class label> |
| REVM | REV. MATCH <standard class label> |
| FWDI | FWD. ISOL'N <standard class label> |
| REVI | REV. ISOL'N <standard class label> |
| TRLT | THRU <standard class label> |
| TRLR1 | $S_{11}$ REFLECT <standard class label> |
| TRLR2 | $S_{22}$ REFLECT <standard class label> |
| TRLL | LINE <standard class label> |

softkey FWD. TRANS. <class label>
mnemonic **FWDT**

Measure Forward Transmission Measurement Calibration Standard.

---

MAIN MENU CAL

SEE ALSO TRANSMISSION

---

**Manual Sequence**

*See* TRANSMISSION.

**Program Sequence**

*See* TRANSMISSION.

---

In the 2-PORT measurement calibration sequence, $S_{21}$ of the Forward Transmission standard (usually the thru) is measured to produce the error coefficient data for the Transmission Signal Path Frequency Response error coefficient, $E_{TF}$. (Isolation, Source Match and Load Match are also used in developing the 2-Port $E_{TF}$.) Since the label for the standard class and standard(s) are user-definable, the FWDT mnemonic is used to select the standard class for measurement.

If a single standard comprises the class, $S_{21}$ is selected, the standard is measured, logic checks that the standard covers the complete current frequency range, and the class label is annotated as complete. When TRANS. DONE is selected, the single standard does not cover the complete current frequency range then the message "CAUTION: ADDITIONAL STANDARDS NEEDED" is displayed and bit 1 of the Primary Status byte is set.

If the FWD. TRANS standard class uses more than one standard, then the mnemonic selects $S_{21}$ and presents the standard selection menu. See STANASTANG to specify which standard to measure.

| | |
|---|---|
| softkey | GAIN: (MIN) 0 |
| mnemonic | **GAIN0** |
| softkey | GAIN: 1 |
| mnemonic | **GAIN1** |
| softkey | GAIN: 2 |
| mnemonic | **GAIN2** |
| softkey | GAIN: 3 |
| mnemonic | **GAIN3** |
| softkey | GAIN: (MAX) 4 |
| mnemonic | **GAIN4** |
| softkey | GAIN: AUTO |
| mnemonic | **GAINAUTO** |

Service Use Only.
Select Test or Reference IF Gain.

---

| | |
|---|---|
| **MAIN MENU** | SYSTEM |
| **PRIOR MENU** | SERVICE FUNCTIONS |
| **NEXT MENU** | NONE |
| **PRESET** | GAIN : AUTO, Test and Reference IF Gain |
| **COUPLED** | ALWAYS COUPLED |

---

**Manual Sequence**

SYSTEM
  SERVICE FUNCTIONS
    IF GAIN
      TEST AMP. GAIN *or*
      REFERENCE AMP. GAIN
        GAIN : (MIN) 0 *or*
        GAIN : 1 *or*
        GAIN : 2 *or*
        GAIN : 3 *or*
        GAIN : (MAX) 4 *or*
        GAIN : AUTO
          PRIOR MENU *to exit*

*continued* →

**Program Sequence**

TESA; *or*
REFA;
  GAIN *n*;  (*n* = 1 - 4 or AUTO)

---

Allows manual or program selection of IF gain setting or selection of normal automatic IF gain autoranging. Changes are executed immediately.

If the IF gain is set too high, the message

CAUTION : IF OVERLOAD

is displayed and bit 1 of the Primary Status Byte is set.

softkey GATE OFF
mnemonic **GATEOFF**

Turn Off Time Domain Gating
for Selected Channel.

---

**MAIN MENU** DOMAIN
**PRIOR MENU** DOMAIN
**NEXT MENU** NONE

**PRESET** GATE OFF
**COUPLED** ALWAYS UNCOUPLED
**RECALLED** YES

**TIME DOMAIN OPTION 010 ONLY**

**SEE ALSO** GATE ON

---

**Manual Sequence**

DOMAIN
SPECIFY GATE
GATE OFF

**Program Sequence**

GATEOFF;

---

The softkey label annotation is updated and the trace is updated. The Enhancement Annotation G disappears. The Gate Markers are turned off. See GATE ON.

softkey GATE ON
mnemonic **GATEON**

Turn On Time Domain Gating
for Selected Channel.

---

| | |
|---|---|
| MAIN MENU | DOMAIN |
| PRIOR MENU | DOMAIN |
| NEXT MENU | NONE |
| | |
| **PRESET** | GATE OFF |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | YES |

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN
SPECIFY GATE
GATE ON

**Program Sequence**

GATEON;

---

The message "COMPUTING GATE COEFFICIENTS" appears, the softkey label annotation is updated, all data for the selected parameter is acquired, the gating operation is applied, then the trace is updated. With GATE ON, only the time response within the current gate markers is used to generate the trace.

The gated data may be displayed in the Frequency domain or the Time domain. When Gating is turned on for a displayed channel, the Enhancement Annotation G is displayed on the CRT.

Gate markers move with ELECTRICAL DELAY, and PORT 1, PORT 2 PORT EXTENSIONS.

softkey GATE SHAPE

Present Gate Shape Select Menu.

---

| | |
|---|---|
| **MAIN MENU** | DOMAIN |
| **PRIOR MENU** | SPECIFY GATE |
| NEXT MENU | NONE |
| **SEE ALSO** | GATE SHAPE MAXIMUM |
| | GATE SHAPE MINIMUM |
| | GATE SHAPE NORMAL |
| | GATE SHAPE WIDE |

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN
SPECIFY GATE
GATE SHAPE
GATE SHAPE MAXIMUM *or*
GATE SHAPE WIDE *or*
GATE SHAPE NORMAL *or*
GATE SHAPE MINIMUM

**Program Sequence**

NONE

| | |
|---|---|
| softkey | GATE SHAPE MAXIMUM |
| mnemonic | **GATSMAXI** |
| softkey | GATE SHAPE MINIMUM |
| mnemonic | **GATSMINI** |
| softkey | GATE SHAPE NORMAL |
| mnemonic | **GATSNORM** |
| softkey | GATE SHAPE WIDE |
| mnemonic | **GATSWIDE** |

Select Gate Shape for Selected Channel.

---

| | |
|---|---|
| MAIN MENU | DOMAIN |
| **PRIOR MENU** | SPECIFY GATE |
| NEXT MENU | NONE |
| **PRESET** | GATE SHAPE NORMAL |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | YES |

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN
SPECIFY GATE
GATE SHAPE
GATE SHAPE MAXIMUM *or*
GATE SHAPE MAXIMUM *or*
GATE SHAPE WIDE *or*
GATE SHAPE NORMAL *or*
GATE SHAPE MINIMUM
PRIOR MENU to exit

**Program Sequence**

GATSMAXI; *or*
GATSMINI; *or*
GATSNORM; *or*
GATSWIDE;

*continued* →

The softkey annotation is updated, and if GATE ON, the specified gate shape is applied to the data and the trace is updated.

Each gate shape has a different passband flatness, cutoff rate, and sidelobe levels. T1 indicates the Gate span which is the time between the Gate start and stop indicators. T2 is the time between the edge of the Gate passband and the -6 dB Gate stop time. T3, equal to T2, is the time between the Gate stop time and the point where the filter first reaches the level of the highest Gate sidelobe. The Gate characteristics for each Gate shape are listed in Table 11.

*Table 12. Gate Characteristics*

| Gate Shape | Passband Ripple | Sidelobe Levels | Cutoff Time T2 = T3 | Minimum Gate Span |
|---|---|---|---|---|
| MINIMUM | ± 0.40 dB | −24 dB | $0.6 / f_{span}$ | $1.2 / f_{span}$ |
| NORMAL | ± 0.04 dB | −45 dB | $1.4 / f_{span}$ | $2.8 / f_{span}$ |
| WIDE | ± 0.02 dB | −52 dB | $4.0 / f_{span}$ | $8.0 / f_{span}$ |
| MAXIMUM | ± 0.01 dB | −80 dB | $11.2 / f_{span}$ | $22.4 / f_{span}$ |
| $f_{span}$ = GHz | | | | |

The passband ripple and sidelobe sevels describe the gate (filter) shape. The cutoff time indicates how fast the gate filter rolls off. For each gate shape, there is also a minimum gate span ($T1_{min} = 2 \times T2$) which gives a filter passband of zero. Entering a gate span smaller than minimum will produce a distorted filter shape that will have no passband, will not have a narrower shape, may have higher sidelobe levels, and will give an incorrect indication of gate START and STOP times. Therefore it is important to always select a Gate span that is higher than the minimum value. As Table 11 indicates, the Cutoff time and the minimum gate span are inversely proportional to the frequency span of the measurement.

For best results using gating, always center the gate around the response(s) that you want to retain in the measurement and make the gate span wide enough to include all of those responses. It is also desirable to use the widest gate shape possible.

softkey GATE: CENTER
mnemonic **GATECENT**

Select Center/Span Gate Markers;
Active Function is Current GATE CENTER Value.

---

**MAIN MENU** DOMAIN
**PRIOR MENU** DOMAIN
**NEXT MENU** NONE

**PRESET** GATE CENTER = 0 seconds
**COUPLED** MAY BE UNCOUPLED
**RECALLED** YES

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN
SPECIFY GATE
GATE CENTER [entry] (x1 = seconds)

**Program Sequence**

GATECENT [value [time suffix] ];

---

In any domain, the gate center marker value can be displayed. The gate markers are displayed only if a Time domain mode is selected. The gate center marker is the middle marker.

When the position of any gate marker is changed, and GATE ON is selected, the message "COMPUTING GATE COEFFICIENTS" is displayed and gate markers will not respond to the knob. The gate marker position is updated upon completion of the computation.

softkey GATE: SPAN
mnemonic GATESPAN

Select Center/Span Gate Markers;
Active Function is Current GATE SPAN Value.

---

| | |
|---|---|
| **MAIN MENU** | DOMAIN |
| **PRIOR MENU** | DOMAIN |
| **NEXT MENU** | NONE |
| **PRESET** | GATE SPAN = 1 ns |
| **RANGE** | MAXIMUM GATE SPAN = 1 ms |
| **COUPLED** | MAY BE UNCOUPLED |
| **RECALLED** | YES |

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN
SPECIFY GATE
GATE SPAN [entry] (x1 = seconds)

**Program Sequence**

GATESPAN [value [time suffix] ];

---

In any domain, the gate span marker value is displayed. The gate markers are displayed only if Time Domain is selected.

softkey GATE: START
mnemonic **GATESTAR**

Select Start/Span Gate Markers;
Active Function is Current GATE START Value.

---

**MAIN MENU** DOMAIN
**PRIOR MENU** SPECIFY GATE
**NEXT MENU** NONE

**PRESET** - 500 ps
**RANGE** +1 to -1 ms
**COUPLED** MAY BE UNCOUPLED
**RECALLED** YES

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN
SPECIFY GATE
GATE START [entry] (x1 = seconds)

**Program Sequence**

GATESTAR [value [time suffix] ];

---

In any domain, the gate start marker value is displayed. The gate markers are displayed only if Time Domain is selected.

| | |
|---|---|
| softkey | GATE: STOP |
| mnemonic | **GATESTOP** |

Select Start/Span Gate Markers;
Active Function is Current GATE STOP Value.

---

| | |
|---|---|
| **MAIN MENU** | DOMAIN |
| **PRIOR MENU** | SPECIFY GATE |
| **NEXT MENU** | NONE |
| **PRESET** | 500 ps |
| **RANGE** | +1 to -1 ms |
| **COUPLED** | MAY BE UNCOUPLED |
| **RECALLED** | YES |

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN
  SPECIFY GATE
    GATE START [entry]  (x1 = seconds)

**Program Sequence**

GATESTOP [value [time suffix] ];

---

In any domain, the gate stop marker value is displayed. The gate markers are displayed only if Time Domain is selected.

softkey HARDWARE STATE
mnemonic **HARS**

Tape/Disc Data Type Select
Complete Multiple Source Hardware State.

---

| | |
|---|---|
| **MAIN MENU** | TAPE/DISC |
| **PRIOR MENU** | DATA TYPE SELECT |
| **NEXT MENU** | FILE SELECT |
| **SEE ALSO** | MULT. SRCE. OFF/SAVE |
| | MULT. SRCE. ON/SAVE |
| | STORE |

---

**Manual Sequence**

<select channel>
TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
STORE *or* LOAD *or* DELETE
MORE
HARDWARE STATE
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter *or* select disc file>
STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

*See* STORE.

<select channel>
STOITAPE; *or* STOIDISC;
STOR; *or* LOAD; *or* DELE;
HARS;
FILE *n*; (*n* = 1 - 8) (for Tape) *or*
DISF "filename"; (for Disc)

*continued* →

The Hardware State consists of:

- All HP-IB Addresses
- System Phaselock Type
- Multiple Source Setup
- Beeper On/Off

Several hardware-dependent functions such as HP-IB Addresses, Disc Volume, Unit, Format inforamation, and the Multiple Source equations are stored in the Hardware State. Loading a Hardware State allows a particular hardware setup to be re-created.

Hardware States may be stored on tape or disc. Only eight Hardware States may be stored on tape.

softkey HOLD
mnemonic **HOLD**

Select Hold Mode for both Channels; Sweep Stopped.

---

| | | | |
|---|---|---|---|
| MAIN MENU | STIMULUS | | |
| PRIOR MENU | STIMULUS | | |
| NEXT MENU | NONE | | |
| PRESET | CONTINUAL | | |
| COUPLED | ALWAYS COUPLED | RECALLED | YES |

---

**Manual Sequence**

STIMULUS MENU
MORE
HOLD

**Program Sequence**

HOLD;

---

HOLD causes the raw data array(s) to be held (not updated) and the Enhancement Label **H** to appear in the enhancement label area of the CRT.

If any of the following is executed, the trace will be updated: FORMAT changes, RESPONSE changes, DOMAIN changes, DISPLAY changes, DOMAIN changes, and completion of INPU<data type> HP-IB operations.

If the CHANNEL or PARAMETER is changed and raw data for the new selection is not available, the trace is zeroed (x,y = 0,0). All basic parameter raw data is available when 2-Port correction is On, and at least one group of sweeps is taken prior to HOLD.

MEASUREMENT RESTART has no effect.

softkey HP-IB ADDRESSES

Present Address Menu.

| | |
|---|---|
| **MAIN MENU** | SYSTEM |
| **PRIOR MENU** | SYSTEM |
| **NEXT MENU** | HP-IB ADDRESSES MENU |
| **PRESET** | NOT CHANGED |
| **INITIALIZED** | SEE BELOW |
| **COUPLED** | ALWAYS COUPLED |
| **RECALLED** | NOT CHANGED |
| **SEE ALSO** | LOCAL<br>SYSTEM PARAMETERS |

**Manual Sequence**

SYSTEM
  HP-IB ADDRESSES
    ADDRESS of 8510 *or*
    ADDRESS of SYSTEM BUS *or*
    ADDRESS of SOURCE #1 *or*
    ADDRESS of TEST SET *or*
    ADDRESS of PLOTTER *or*
    ADDRESS of PRINTER *or*
    ADDRESS of DISC *or*
      MORE
        ADDRESS of SOURCE #2
    ADDRESS of PASS-THRU *or*
    ADDRESS of RF SWITCH
    PRIOR MENU *to exit*

*continued* →

Current addresses are shown in the System Parameters listing (see SYSTEM PARAMETERS). Pressing an ADDRESS of key makes the device address the active function. Enter a numeric and x1 to change the address. Address changes are accomplished the next time the device is addressed by the HP 8510. Address changes are not effective until PRESET.

Any time an HP-IB Address is changed, an instrument PRESET must be done.

Instrument addresses are initialized as follows:

| | | | |
|---|---|---|---|
| ADDRESS of 8510 | 16 | ADDRESS of PRINTER | 1 |
| ADDRESS of SYSTEM BUS | 17 | ADDRESS of DISC | 0 |
| ADDRESS of SOURCE #1 | 19 | ADDRESS of SOURCE #2 | 31 |
| ADDRESS of TEST SET | 20 | ADDRESS of PASS-THRU | 31 |
| ADDRESS of PLOTTER | 5 | ADDRESS of RF SWITCH | 31 |

softkey IF GAIN

Present IF Gain Select Menu.

---

| | |
|---|---|
| MAIN MENU | SYSTEM |
| PRIOR MENU | SERVICE FUNCTIONS |
| NEXT MENU | TEST AMP. GAIN *or* REF AMP. GAIN |
| PRESET | GAIN: AUTO |
| SEE ALSO | REFERENCE AMP. GAIN<br>TEST AMP. GAIN |

---

**Manual Sequence**

SYSTEM
SERVICE FUNCTIONS
IF GAIN
TEST AMP. GAIN *or*
REF AMP. GAIN

softkey IMAGINARY
mnemonic **IMAG**

Select Display of Imaginary Part of Complex Data
for Current Parameter on Selected Channel.

---

| | | | |
|---|---|---|---|
| MAIN MENU | FORMAT | | |
| **PRIOR MENU** | FORMAT | | |
| NEXT MENU | NONE | | |
| **PRESET** | REF VALUE = 0.0<br>SCALE = 10.0<br>REF POSN = 5 | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

<select channel>
<select parameter>
FORMAT MENU
IMAGINARY

**Program Sequence**

```
<select channel>
  <select parameter>
    IMAG;
```

---

Presents a cartesian display of the imaginary part of the measured data,

$$S_{ij} = R_{ij} + jX_{ij}$$

where $X_{ij}$ is the imaginary part and $_{ij}$ is the selected S-parameter.

For TIME LOW PASS the imaginary part is zero. (In some cases the trace may show a small non-zero offset, but this should be ignored.)

softkey INITIALIZE DISC

Initialize Disc in Disc Drive.

softkey INIT DISC: NO

softkey INIT DISC: YES
mnemonic **INID**

Start or Do Not Start Data Disc Initialization Process.

---

| | |
|---|---|
| MAIN MENU | TAPE/DISC |
| PRIOR MENU | INITIALIZE DISC |
| NEXT MENU | NONE |
| SEE ALSO | ADDRDISC |
| | DISCUNIT |
| | DISCVOL |
| | STORE |

---

**Manual Sequence**

```
TAPE/DISC
  STORAGE IS DISC
    SET UP DISC
      INITIALIZE DISC
        <disable write protect notch>
          <insert disc into active drive
            INIT DISC: YES
```

**Program Sequence**

```
INID;
```

---

INIT DISC: YES initializes the disc for HP 8510 operations. The disc is initialized as a Logical Interchange Format (LIF) disc.

The amount of time to initialize a disc will take 90 seconds to 20 minutes or more, depending on the size of the disc.

softkey INITIALIZE TAPE

Initialize Tape Cartridge in HP 8510 Tape Drive.

softkey INIT TAPE: NO

softkey INIT TAPE: YES
mnemonic **INIT**

Start or Do Not Start Data Tape Initialization Process.

---

**MAIN MENU** TAPE/DISC
**PRIOR MENU** TAPE/DISC
**NEXT MENU** NONE

---

**Manual Sequence**

<remove or disable write protect tab>
<insert tape cartridge>
TAPE/DISC
STORAGE IS TAPE
INITIALIZE TAPE
INIT TAPE: YES

**Program Sequence**

INIT;

---

INIT TAPE: YES initializes the tape for HP 8510 STORE/LOAD/DELETE operations, causing erasure of all existing data. The message "INITIALIZING TAPE" is displayed. Allow the process to complete before ejecting the tape cartridge (approximately 90 seconds for side 1, rewind, side 2, return to Tape Menu). Front panel hardkeys and softkeys are not monitored during initialization; commands are buffered for later execution.

INIT TAPE: NO returns to the Tape Menu with no effect on the tape contents.

If the tape cartridge is write protected, the message "WRITE PROTECT ERROR" is displayed and the Tape menu is presented.

| | | | |
|---|---|---|---|
| mnemonic | **INPUCALC01** | mnemonic | **INPUCALC07** |
| mnemonic | **INPUCALC02** | mnemonic | **INPUCALC08** |
| mnemonic | **INPUCALC03** | mnemonic | **INPUCALC09** |
| mnemonic | **INPUCALC04** | mnemonic | **INPUCALC10** |
| mnemonic | **INPUCALC05** | mnemonic | **INPUCALC11** |
| mnemonic | **INPUCALC06** | mnemonic | **INPUCALC12** |

Store Calibration Error Coefficient Set
Real/Imaginary Pairs into HP 8510 Cal Set Memory.

---

**MAIN MENU** NONE (HP-IB ONLY)

**SEE ALSO** OUTPCALC *n*

---

**Program Sequence**

```
CORROFF;
  <select appropriate instrument state>
    CAL1; or CAL2;
      <select cal type>
        HOLD;
         FORM n;   (n = 1 - 4)
            INPUCALC n;   (n = 01 - 12)
              <send data block to HP 8510 HP-IB>
                <repeat INPUCALC n for each term needed for cal type>
                  SAVC;
                    CALS n;   (n = 1 - 8)
                      CONT; or SING; or NUMG value;
```

---

Allows accuracy enhancement measurement calibration error coefficients to be transferred into HP 8510 Cal Set memory from an external controller via the HP-IB.

*continued* →

See OUTPCALC *n* for assignment of error coefficient sets to error terms in the accuracy enhancement math.

If inputting ONE-PATH 2-PORT cal coefficients, you must issue CALIFUL2; and then load all 12 error coefficient sets before SAVC;.

Memory space to accept cal coefficient sets is only available when a cal type has been selected. If not, the message "REQUESTED DATA NOT AVAILABLE" is displayed and the data will be treated as general instructions, causing a syntax error.

When all coefficient sets necessary for the accuracy enhancement error model in use are input, issue SAVC; CALS n; to store coefficients in Cal Set *n*. The trace is updated following the next group of sweeps. The cal set instrument state saved with the cal set reflects the instrument state at the time that SAVC; is issued.

Also see CAL SET *n* for listing of Cal Set Limited Instrument State.

mnemonic **INPUDATA**

Store Real/Imaginary Pairs Into Selected Channel Corrected Data Memory.

---

**MAIN MENU** NONE (HP-IB ONLY)

**SEE ALSO** OUTPDATA

---

**Program Sequence**

```
<select channel>
  HOLD;
    FORM n;    (n = 1 - 4)
      INPUDATA;
        <send data block to HP 8510 HP-IB>
```

---

Allows trace data to be transferred into HP 8510 selected channel Corrected Data memory from an external controller via the HP-IB.

HOLD avoids overwriting the data just input by the next sweep.

When input is complete, a processing cycle is initiated to update the CRT trace.

Use DATA → MEMORY to store Corrected Data trace into default trace memory.

mnemonic **INPUFREL**

Store Frequency List Previously Output by OUTPFREL

---

**MAIN MENU** NONE (HP-IB ONLY)

**SEE ALSO** OUTPFREL
EDIT LIST

---

**Program Sequence**

```
FORM n (n = 1 - 4)
  INPUFREL;
    <send data block to HP 8510 HP-IB>
      LISFREQ;
```

---

Allows input of a frequency list previously read from the HP 8510 using OUTPFREL;. When the frequency list is loaded in this manner, it cannot be edited or stored and recalled as part of an instrument state. If EDIT LIST is pressed, the list will be shown as EMPTY.

This is not the recommended method of creating a frequency list. For most applications, refer to EDIT LIST to define a frequency list.

mnemonic **INPUFORM**

Store Formatted Data Pairs Into Selected Channel Corrected Data Memory.

---

**MAIN MENU** NONE (HP-IB ONLY)

**SEE ALSO** OUTPFORM

---

**Program Sequence**

```
<select channel and appropriate FORMAT>
  HOLD;
    FORM n;  (n = 1 - 4)
      INPUFORM;
        <send data block to HP 8510 HP-IB>
```

---

Allows trace data to be transferred into HP 8510 selected channel Formatted Data memory from an external controller via the HP-IB.

Cartesian format: x = basic units
y = 0

Polar and Smith format: real/imaginary pairs

HOLD avoids overwriting the data just input by the next sweep.

When input is complete, a processing cycle is initiated to update the CRT trace.

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mnemonic **INPULEAS**

Store FORM1 HP 8510 Learn String Previously Output by OUTPLEAS. Set HP 8510 to Learn String State.

---

**MAIN MENU** NONE (HP-IB ONLY)

**SEE ALSO** OUTPLEAS

---

**Program Sequence**

```
INPULEAS;
  <send FORM1 binary data block to HP 8510 HP-IB>
```

---

Allows binary data block output using OUTPLEAS to be loaded into HP 8510 current Instrument State memory from an external contoller via the HP-IB. Upon completion, the HP 8510 system is set to the Instrument State represented by the learn string. Various errors could occur if the learn string has been modified or if the System Parameters have been changed.

mnemonic **INPURAW1**
mnemonic **INPURAW2**
mnemonic **INPURAW3**
mnemonic **INPURAW4**

Store Real/Imaginary Pairs Into Selected Channel Raw Data Memory.

---

MAIN MENU NONE (HP-IB ONLY)

SEE ALSO OUTPRAW *n*

---

**Program Sequence**

```
<select channel>
  CORRON;
    CALS n;
      HOLD;
        FORM n;    (n = 1 - 4)
          INPURAW n;   (n = 1 - 4)
            <send data block to HP 8510 HP-IB>
```

---

Allows trace data to be transferred into HP 8510 selected channel Raw Data memory from an external controller via the HP-IB. See also OUTPRAW *n* for a description of Raw Array allocation for various machine states.

If Raw 2, 3, or 4 is to be input, a 2-Port calibration must be turned on. If not, the message "REQUESTED DATA NOT AVAILABLE" is displayed and the data will be treated as general instructions, causing a syntax error.

HOLD avoids overwriting the data just input by the next group of sweeps.

When input is complete, a processing cycle is initiated to update the CRT trace.

| | | | |
|---|---|---|---|
| softkey | INST STATE 1 | softkey | INST STATE 5 |
| mnemonic | **RECA1** | mnemonic | **RECA5** |
| softkey | INST STATE 2 | softkey | INST STATE 6 |
| mnemonic | **RECA2** | mnemonic | **RECA6** |
| softkey | INST STATE 3 | softkey | INST STATE 7 |
| mnemonic | **RECA3** | mnemonic | **RECA7** |
| softkey | INST STATE 4 | softkey | INST STATE (POWER UP) 8 |
| mnemonic | **RECA4** | mnemonic | **RECA8** |

Recall Specified Instrument State.

---

| | |
|---|---|
| **MAIN MENU** | RECALL |
| **PRIOR MENU** | RECALL |
| **NEXT MENU** | ONE |
| **PRESET** | NOT CHANGED |
| **SEE ALSO** | RECALL<br>SAVE |

---

**Manual Sequence**

RECALL
INST STATE 1 *or*
INST STATE 2 *or*
INST STATE 3 *or*
INST STATE 4 *or*
INST STATE 5 *or*
INST STATE 6 *or*
INST STATE 7 *or*
INST STATE (POWER UP) 8

**Program Sequence**

RECA *n*; ($n$ = 1 - 8)

*continued* →

The HP 8510 system is set to the state stored in the specified instrument state memory. At the completion of the test sequence following line power on, instrument state 8 is recalled.

After loading the program tape, all registers 1-7 are initialized to the PRESET state and register 8 is initialized to the power-up state.

softkey INST STATE 1-8

Present Instrument State Select Menu
During Tape Data Type Selection.

---

| | |
|---|---|
| **MAIN MENU** | TAPE/DISC |
| **PRIOR MENU** | TAPE/DISC |
| NEXT MENU | FILE SELECTION |

---

**Manual Sequence**

<select channel>
TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
STORE *or* LOAD *or* DELETE
MORE
INST STATE 1-8
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter *or* select disc file>
STORE FILE *or* LOAD FILE *or* DELETE FILE

---

2 tape blocks/file.

| | | | |
|---|---|---|---|
| softkey | INST STATE 1 | softkey | INST STATE 5 |
| mnemonic | SAVE1 | mnemonic | SAVE5 |
| softkey | INST STATE 2 | softkey | INST STATE 6 |
| mnemonic | SAVE2 | mnemonic | SAVE6 |
| softkey | INST STATE 3 | softkey | INST STATE 7 |
| mnemonic | SAVE3 | mnemonic | SAVE7 |
| softkey | INST STATE 4 | softkey | INST STATE (POWER UP) 8 |
| mnemonic | SAVE4 | mnemonic | SAVE8 |

Save Current Instrument State in Specified Memory.

---

| | |
|---|---|
| **MAIN MENU** | SAVE |
| **PRIOR MENU** | SAVE |
| NEXT MENU | NONE |
| **PRESET** | NOT CHANGED |
| SEE ALSO | RECALL<br>SAVE |

---

**Manual Sequence**

SAVE
INST STATE 1 *or*
INST STATE 2 *or*
INST STATE 3 *or*
INST STATE 4 *or*
INST STATE 5 *or*
INST STATE 6 *or*
INST STATE 7 *or*
INST STATE (POWER UP) 8

**Program Sequence**

SAVE *n*; ($n$ = 1 - 8)

| | | | |
|---|---|---|---|
| softkey | INST STATE 1 | softkey | INST STATE 5 |
| mnemonic | **INSS1** | mnemonic | **INSS5** |
| softkey | INST STATE 2 | softkey | INST STATE 6 |
| mnemonic | **INSS2** | mnemonic | **INSS6** |
| softkey | INST STATE 3 | softkey | INST STATE 7 |
| mnemonic | **INSS3** | mnemonic | **INSS7** |
| softkey | INST STATE 4 | softkey | INST STATE (POWER UP) 8 |
| mnemonic | **INSS4** | mnemonic | **INSS8** |

Tape/Disc Data Type Select Single Instrument State.
(See SAVE and RECALL for Memory Operations.)

---

| | |
|---|---|
| **MAIN MENU** | TAPE/DISC |
| **PRIOR MENU** | DATA TYPE |
| **NEXT MENU** | FILE SELECT |
| **SEE ALSO** | RECALL |
| | SAVE |
| | STORE |

---

**Manual Sequence**

<select channel>
TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
STORE *or* LOAD *or* DELETE
MORE
INST STATE 1 *or*
INST STATE 2 *or*
INST STATE 3 *or*
INST STATE 4 *or*
INST STATE 5 *or*
INST STATE 6 *or*
INST STATE 7 *or*
INST STATE (POWER UP) 8
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter *or* select disc file>
STORE FILE *or* LOAD FILE *or* DELETE FILE

*continued* →

**Program Sequence**

*See* STORE.

```
<select channel>
STOITAPE; or STOIDISC;
  STOR; or LOAD; or DELE;
    INSS1 or
    INSS2 or
    INSS3 or
    INSS4 or
    INSS5 or
    INSS6 or
    INSS7 or
    INSS8
      FILE n; (n = 1 - 8) (for Tape) or
      DISF "filename"; (for Disc)
```

softkey INST STATE ALL
mnemonic INSSALL

Tape/Disc Data Type Select All Instrument States.

---

MAIN MENU TAPE/DISC
PRIOR MENU DATA TYPE SELECT

NEXT MENU FILE SELECTION

SEE ALSO RECALL
SAVE
STORE

---

**Manual Sequence**

<select channel>
TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
STORE *or* LOAD *or* DELETE
MORE
INST STATE ALL
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter or select disc file>
STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

*See* STORE.

<select channel>
STOITAPE; *or* STOIDISC;
STOR; *or* LOAD; *or* DELE;
INSSALL
FILE *n*; (*n* = 1 - 8) (for Tape) *or*
DISF "filename"; (for Disc)

---

Contents of all instrument state registers 1-8 on one tape or disc file.

13 tape blocks/file.

softkey INVERTED SMITH
mnemonic INVS

Select Inverted Smith Format
for Current Parameter on Selected Channel.

---

| | |
|---|---|
| MAIN MENU | FORMAT |
| PRIOR MENU | FORMAT |
| NEXT MENU | NONE |
| PRESET | REF VALUE = 1<br>SCALE = 0.2/<br>REF POSN is not meaningful |
| COUPLED | ALWAYS UNCOUPLED |
| RECALLED | YES |

---

**Manual Sequence**

<select channel>
<select parameter>
FORMAT MENU
INVERTED SMITH

**Program Sequence**

<select channel>
<select parameter>
INVS;

*continued* →

Sometimes termed an Admittance chart, the Inverted Smith Chart format changes the display and measurement marker readout to:

$$1/S_{ij} = G_{ij} + jB_{ij}$$

where $S_{ij}$ is the selected parameter.

Selection of REF VALUE of 0.05 or less changes the display format to a polar display.

The REF VALUE represents the correspondingly scaled polar display outer circle value.

Selecting INVERTED SMITH recalls the last selected RESPONSE selections on that channel.

softkey ISOLATION
mnemonic **ISOL**

After Selection of 2-Port Measurement Calibration,
Begin Isolation Calibration Sequence.

softkey ISOLATION DONE
mnemonic **ISOD**

2-Port Isolation Calibration Sequence is Complete.

---

**MAIN MENU** CAL
**PRIOR MENU** CAL
**NEXT MENU** DEPENDS ON CAL TYPE

**RECALLED** CAL COEFFICIENTS NOT SAVED/RECALLED UNTIL CALS *n* EXECUTED

**SEE ALSO** RESUME CAL SEQUENCE
FWD ISOL'N ISOL'N STD
REV ISOL'N ISOL'N STD

---

**Manual Sequence**

CAL
CAL 1 <cal kit 1 label> *or*
CAL 2 <cal kit 2 label>
FULL 2-PORT *or*
ONE-PATH 2-PORT *or*
TRL 2-PORT
ISOLATION
OMIT ISOLATION *or*
FWD ISOL'N ISOL'N STD *and*
REV ISOL'N ISOL'N STD
ISOLATION DONE
<other calibration steps>
SAVE 2-PORT CAL *or*
CAL SET *n* (*n* = 1 - 8)

*continued* →

**Program Sequence**

CAL1; *or*
CAL2;
  CALIFUL2; *or*
  CALIONE2; *or*
  CALITRL2;
    ISOL;
      OMII; *or*
      FWDI; *and*
      REVI;
        ISOD;
          <other calibration steps>
            SAV2; *or*
            SAVT;
              CALS *n*;  ($n$ = 1 - 8)

---

Forward and Reverse Isolation each require measurement of one standard to measure repeatable transmission signal path crosstalk. None of the standard class or standard characteristics are user-definable.

The usual standard used for isolation calibration is an open transmission signal path with fixed $Z_0$ terminations on the test and transmission return ports, however terminations with similar match to the device under test may be used. FORWARD ISOLATION selects $S_{21}$ and REVERSE ISOLATION selects $S_{12}$. This allows measurement of system crosstalk and the transmission noise floor.

Isolation calibration is most effective when a large averaging factor is used during this part of the measurement calibration (see sequence in RESUME CAL), and a similar averaging factor is used during measurement of low level signals. Since the transmission noise floor without averaging is mainly random noise, errors in the measurement of low level signals will result if no averaging or a small averaging factor is used during calibration.

softkey <FWD ISOLATION CLASS LABEL>
mnemonic **RAIISOL**

Measure Isolation Standard in Response and Isolation Cal.

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | CAL TYPE SELECT |
| NEXT MENU | NONE |
| SEE ALSO | CALIBRATE: RESPONSE & ISOL'N |

---

**Manual Sequence**

CAL
  CAL 1 <cal kit 1 label> *or*
  CAL 2 <cal kit 2 label>
    RESPONSE & ISOL'N
      RESPONSE
      <measure reflection or transmission response standard>
      DONE RESPONSE
        ISOL'N STD
        <measure reflection or transmission isolation standard>
        SAVE RESP & ISOL
          CAL SET *n* (*n* = 1 - 8)

**Program Sequence**

CAL1; or CAL2;
  CALIRAI;
    RAIRESP;
    <measure reflection or transmission response standard>
      RAISOL;
      <measure reflection or transmission isolation standard>
        RAID;
          CALS*n*; (*n* = 1 - 8)

---

Isolation always uses a single standard to measure transmission signal path crosstalk, $E_X$, or Directory $E_d$, depending upon the parameter selected. This step is most effective when averaging is used. The standard is measured and the class label is annotated as complete.

mnemonic **KEYC**

Press HP 8510 Front Panel Key.

---

MAIN MENU NONE (HP-IB ONLY)

---

**Program Sequence**

KEYC <value>; (value = 1 - 98 = single ASCII integer)

---

Allows selection of HP 8510 hardkey or softkey active function by inputting an integer number via the HP 8510 HP-IB. This method of controlling the HP 8510 is used for service functions and is not recommended for normal operation.

*Table 13. KEYC Selections (1 of 2)*

| KeyC | Key Name | KeyC | Key Name |
|---|---|---|---|
| 1 | CHANNEL 1 | 22 | FORMAT MENU |
| 4 | $S_{11}$ | 26 | PRESET |
| 5 | $S_{12}$ | 27 | LOCAL |
| 6 | LOG MAG | 28 | SAVE |
| 7 | PHASE | 29 | RECALL |
| 8 | CHANNEL 2 | 32 | SCALE |
| 12 | $S_{21}$ | 33 | AUTO |
| 13 | $S_{22}$ | 35 | START |
| 14 | DELAY | 36 | CENTER |
| 15 | SMITH | 40 | REF VALUE |
| 16 | CAL | 41 | REF POSN |
| 17 | DOMAIN | 43 | STOP |
| 18 | DISPLAY | 44 | SPAN |
| 19 | MARKER | 48 | RESPONSE MENU |
| 20 | PARAMETER MENU | 51 | STIMULUS MENU |

*continued* →

*Table 13. KEYC Selections (2 of 2)*

| KeyC | Key Name | KeyC | Key Name |
|---|---|---|---|
| 58 | COPY | 80 | k/m |
| 59 | TAPE | 81 | 3 |
| 60 | SYSTEM | 82 | 2 |
| 62 | MEASUREMENT | 83 | 1 |
| | RESTART | 84 | STEP (down) |
| 64 | G/n | 86 | SOFTKEY 3 |
| 65 | 9 | 87 | SOFTKEY 7 |
| 66 | 8 | 88 | x1 |
| 67 | 7 | 89 | +/- |
| 70 | SOFTKEY 1 | 90 | . |
| 71 | SOFTKEY 5 | 91 | 0 |
| 72 | M/μ | 92 | STEP (up) |
| 73 | 6 | 93 | PRIOR MENU |
| 74 | 5 | 94 | SOFTKEY 4 |
| 75 | 4 | 95 | SOFTKEY 8 |
| 76 | ENTRY OFF | 97 | = MARKER |
| 78 | SOFTKEY 2 | 98 | BACKSPACE |
| 79 | SOFTKEY 6 | | |

softkey KIT DONE (MODIFIED)
mnemonic **KITD**

The Cal Kit is Completely Specified;
Store Modified Cal Kit in Internal Non-Volatile Memory.

---

**MAIN MENU** CAL
**PRIOR MENU** MODIFY CAL KIT
**NEXT MENU** NONE

**SEE ALSO** MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
<modify characteristics and assignments>
KIT DONE (MODIFIED)

**Program Sequence**

MODI1; *or*
MODI2;
<modify characteristics and assignments>
KITD;

*continued* →

Characteristics of all standards, standard labels, standard class assignments, standard class labels, and the kit label are complete; replace the selected cal kit 1 or cal kit 2 in non-volatile memory with the with the current modified cal kit. Characteristics not changed during the modify cal kit sequence retain the existing values.

If KIT DONE (MODIFIED) is not selected, the current cal kit definition will be replaced with the existing cal kit 1 or cal kit 2 definition the next time CAL 1, CAL 2, MODIFY 1, or MODIFY 2 is selected.

softkey $L_0$
mnemonic **L0**

Short Circuit dc Inductance Model.
($x10^{-12}$H).

softkey $L_1$
mnemonic **L1**

Short Circuit Inductance Model.
($x10^{-24}$F/Hz).

softkey $L_2$
mnemonic **L2**

Short Circuit Inductance Model.
($x10^{-33}$F/Hz$^2$).

softkey $L_3$
mnemonic **L3**

Short Circuit Inductance Model.
($x10^{-42}$F/Hz$^3$).

Part of Short Circuit Cal Kit Definition.

---

| | | |
|---|---|---|
| **MAIN MENU** | CAL | |
| **PRIOR MENU** | STD TYPE: | |
| **NEXT MENU** | STD DONE (DEFINED) | |
| **PRESET** | NO EFFECT | |
| **INITIALIZED** | See 7mm and 3.5mm Cal Kits | **RANGE** ± 10,000, scaled by appropriate exponent |
| **SEE ALSO** | STD TYPE: SHORT | |

*continued* →

**Manual Sequence**

CAL
  MORE
    MODIFY 1 <cal kit 1 label> *or*
    MODIFY 2 <cal kit 2 label>
      DEFINE STANDARD entry x1 (entry = 1 - 21)
        STD TYPE: SHORT
          $L_0$ [entry x1] (x1 = $x10^{-12}$H)
          $L_1$ [entry x1] (x1 = $x10^{-24}$H/Hz)
          $L_2$ [entry x1] (x1 = $x10^{-33}$H/$Hz^2$)
          $L_3$ [entry x1] (x1 = $x10^{-42}$H/$Hz^3$)
          <other changes>
            STD DONE (DEFINED)
            <other changes>
              KIT DONE (DEFINED)

**Program Sequence**

MODI1; *or* MODI2;
  DEFS value;
    STDTSHOR;
      L0 [ value ]; (value = $x10^{-12}$H)
      L1 [ value ]; (value = $x10^{-24}$H/Hz)
      L2 [ value ]; (value = $x10^{-33}$H/$Hz^2$)
      L3 [ value ]; (value = $x10^{-42}$H/$Hz^3$)
      <other changes>
        STDD;
        <other changes>
          KITD;

*continued* →

Specify the series inductive phase shift of the short circuit standard using

$$L_{total} = L_0 + (L_1 \cdot f) + (L_2 \cdot f^2) + (L_3 \cdot f^3)$$

where f is the current frequency in Hz, $L_0$ = $x10^{-12}$ Henries, $L_1$ = $x10^{-24}$ Henries, $L_2$ = $x10^{-33}$ Henries, and $L_3$ = $x10^{-42}$ Henries.

Manual and program entries assume that the values are input in the specified units.

| | | | |
|---|---|---|---|
| softkey | LABEL: ADAPTER | softkey | LABEL: REV. MATCH |
| mnemonic | **LABEADAP** | mnemonic | **LABEREVT** |
| softkey | LABEL: FWD. ISOL'N | softkey | LABEL: $S_{11}A$ |
| mnemonic | **LABEFWDI** | mnemonic | **LABES11A** |
| softkey | LABEL: FWD. MATCH | softkey | LABEL: $S_{11}B$ |
| mnemonic | **LABEFWDM** | mnemonic | **LABES11B** |
| softkey | LABEL: FWD. TRANS. | softkey | LABEL: $S_{11}C$ |
| mnemonic | **LABEFWDT** | mnemonic | **LABES11C** |
| softkey | LABEL: RESPONSE | softkey | LABEL: $S_{22}A$ |
| mnemonic | **LABERESP** | mnemonic | **LABES22A** |
| softkey | LABEL: REV. ISOL'N | softkey | LABEL: $S_{22}B$ |
| mnemonic | **LABEREVI** | mnemonic | **LABES22B** |
| softkey | LABEL: REV. MATCH | softkey | LABEL: $S_{22}C$ |
| mnemonic | **LABEREVM** | mnemonic | **LABES22C** |

Label Standard Class.

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | MODIFY CAL KIT |
| NEXT MENU | MODIFY CAL KIT |
| SEE ALSO | MODIFY 1 <cal kit 1 label><br>MODIFY 2 <cal kit 2 label> |

*continued* →

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
LABEL CLASS
LABEL: $S_{11}A$ *or*
LABEL: $S_{11}B$ *or*
LABEL: $S_{11}C$ *or*
LABEL: $S_{22}A$ *or*
LABEL: $S_{22}B$ *or*
LABEL: $S_{22}C$ *or*
MORE
LABEL: FWD. TRANS. *or*
LABEL: REV. TRANS. *or*
LABEL: FWD. MATCH *or*
LABEL: REV. MATCH *or*
LABEL: FWD. ISOL'N *or*
LABEL: REV. ISOL'N *or*
MORE
LABEL: RESPONSE *or*
LABEL: TRL THRU *or*
LABEL: TRL REFLECT *or*
LABEL: TRL LINE *or*
LABEL: ADAPTER
<enter class label> (see TITLE)
LABEL DONE (SPEC'D)
<other changes>
KIT DONE (MODIFIED)

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

MODI1; *or* MODI2;
LABE <class> "*class label*"; (*class label* = ASCII string)
<other changes>
KITD;

---

This label is displayed on the Standard Class Selection menu only when two or more standards are assigned to the class. If only one standard is assigned to the class, then the standard label is displayed (see LABEL STD).

The string must be enclosed in quotation marks when input via the HP 8510 HP-IB.

softkey LABEL CLASS

Present Label Class Menu.

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | MODIFY CAL KIT |
| NEXT MENU | MODIFY CAL KIT |
| SEE ALSO | MODIFY 1 <cal kit 1 label> |
| | MODIFY 2 <cal kit 2 label> |
| | LABEL: <class> |

---

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
LABEL CLASS
LABEL : <class>
<enter class label> (see TITLE)
LABEL DONE (SPEC'D)
<other changes>
KIT DONE (MODIFIED)

**Program Sequence**

NONE

---

If there is only one standard in the class, then the standard label appears on the class select menu.

If there are two or more standards in the class, then the class label appears on the class select menu.

softkey LABEL DONE

All Standard Classes are labeled;
Return to Modify CAl Kit Menu.

---

MAIN MENU
PRIOR MENU
NEXT MENU

SEE ALSO MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>
LABEL: <class>

---

**Manual Sequence**

*See* LABEL: <class> .

**Program Sequence**

*See* LABEL: <class> .

---

softkey LABEL KIT
mnemonic **LABK**

Label Current Cal Kit.

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | CAL |
| NEXT MENU | TITLE |
| PRESET | NOT CHANGED |
| INITIALIZED | SEE BELOW |
| SEE ALSO | MODIFY 1 <cal kit 1 label><br>MODIFY 2 <cal kit 2 label> |

---

**Manual Sequence**

```
CAL
  MORE
    MODIFY 1 <cal kit 1 label> or
    MODIFY 2 <cal kit 2 label>
      LABEL KIT
        <enter kit label>    (see TITLE)
          <other changes>
            KIT DONE (MODIFIED)
```

**Program Sequence**

*See* MODIFY 1 and MODIFY 2.

```
MODI1; or MODI2;
  LABK "kit label";   (kit label = ASCII string)
    <other changes>
      KITD;
```

---

This label is displayed on the Cal menu with the CAL 1 or CAL 2 softkey labels.

*continued* →

If a cal standard has been modified and the LABEL CAL KIT operation is not done immediately prior to KIT DONE (MODIFIED) operation in the MODIFY 1 or MODIFY 2 sequence, an asterisk (*) replaces the last character in the cal kit label.

The string must be enclosed in quotation marks when input via the HP 8510 HP-IB.

The labels 7 mm and 3.5 mm name the connector family and the label B.1, for example, designates the revision of the characteristics of the calibration standards. If the letter in the revision label is different, the mechanical configuration of the kit differs; if the numeric is different, the characteristics of the standards or the standard class assignements have changed. Refer to the appropriate calibration kit operating and service manual for details.

softkey LABEL STD
mnemonic LABS

Label Current Calibration Standard.

---

MAIN MENU CAL
PRIOR MENU STANDARD TYPE
NEXT MENU TITLE

SEE ALSO MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

CAL
MORE
MODIFY 1 < cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
DEFINE STANDARD entry x1 (entry = stdno = 1 - 21)
STD TYPE: <std type>
LABEL STD
<enter new standard label> (see TITLE)
<other changes to current standard >
STD DONE (DEFINED)
<other changes>
KIT DONE (MODIFIED)

*continued* →

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

```
MODI1; or MODI2;
  DEFS n;     (n = stdno = 1 - 21)
    LABS "standard label";   (standard label = ASCII string)
      <other changes to current standard>
        STDD;
          <other changes>
            KITD;
```

---

If there is only one standard in the class, then the standard label appears on the class select menu.

The string must be enclosed in quotation marks when input via the HP 8510 HP-IB.

softkey LAST PAGE
mnemonic LASP

Display Last Page of Tape Directory
on HP 8510 CRT.

---

| | |
|---|---|
| MAIN MENU | TAPE |
| PRIOR MENU | TAPE |
| NEXT MENU | NONE |
| SEE ALSO | DIRECTORY |

---

**Manual Sequence**

*See* DIRECTORY.

**Program Sequence**

*See* DIRECTORY.

softkey LEFT LOWER
mnemonic **LEFL**

Select Lower Left Quadrant for Plot
Using Digital Plotter on HP 8510 System Bus.

softkey LEFT UPPER
mnemonic **LEFU**

Select Left Upper Quadrant for Plot
Using Digital Plotter on HP 8510 System Bus.

---

| | |
|---|---|
| MAIN MENU | COPY |
| PRIOR MENU | SELECT QUADRANT |
| NEXT MENU | NONE |
| PRESET | FULL PAGE |
| COUPLED | ALWAYS COUPLED |
| RECALLED | YES |
| SEE ALSO | SELECT QUADRANT |

---

**Manual Sequence**

COPY
SELECT QUADRANT
LEFT LOWER *or*
LEFT UPPER

**Program Sequence**

LEFL; *or*
LEFU;

softkey LIN mkr on POLAR
mnemonic **LINP**

Select Linear Marker Readout on Polar Display Format
for Current Parameter on Selected Channel.

---

| | |
|---|---|
| **MAIN MENU** | FORMAT |
| **PRIOR MENU** | FORMAT |
| **NEXT MENU** | NONE |
| **PRESET** | REF VALUE = 1<br>SCALE = 0.2/ |
| **COUPLED** | ALWAYS UNCOUPLED **RECALLED** YES |

---

**Manual Sequence**

<select channel>
  <select parameter>
    FORMAT MENU
      LIN mkr on POLAR

**Program Sequence**

<select channel>;
  <select parameter>;
    LINP;

---

The marker readout is a complex number consisting of the linear magnitude value (see LINEAR MAGNITUDE) and the phase angle (see PHASE).

Selecting LIN mkr on POLAR recalls the last selected RESPONSE selections on that channel.

softkey LINE <class or standard label>
mnemonic **TRLL**

Measure TRL Line Cal Standard Class.

---

**MAIN MENU** CAL

**SEE ALSO** CALIBRATE TRL 2-PORT

---

**Manual Sequence**

CAL
  CAL 1 <cal kit 1 label> *or*
  CAL 2 <cal kit 2 label>
    TRL 2-PORT
      THRU THRU *or*
      $S_{11}$ REFLECT SHORT *or*
      $S_{22}$ REFLECT SHORT *or*
      LINE 2-18 LINE
        DONE

**Program Sequence**

CAL1; or CAL2;
  CALITRL2;
    TRLT;
    TRLR1;
    TRLR2;
    ISOL;
      <measure isolation standards>
      TRLL;
        SAVT;
          CALS*n*; (*n* = 1 - 8)

---

The second line of the softkey name for these is user definable (standard label), if one standard is assigned to the TRL LINE class, or TRL LINE class label if only one standard is assigned.

These keys will cause the set of measurements needed to compute the error coefficients. They may be made in any order. TRLT and TRLL will cycle through a series of S-Parameter measurements, and then leave the system in $S_{11}$. TRLR1 and TRLR2 will measure and automatically select just one S-Parameter.

softkey LINEAR MAGNITUDE
mnemonic **LINM**

Select Linear Magnitude Display Format
For Current Parameter on Selected Channel.

---

| | |
|---|---|
| **MAIN MENU** | FORMAT |
| **PRIOR MENU** | FORMAT |
| **NEXT MENU** | NONE |
| **PRESET** | REF VALUE = 0<br>SCALE = 1<br>REF POSN = 0 |
| **COUPLED** | ALWAYS UNCOUPLED **RECALLED** YES |

---

**Manual Sequence**

<select channel>
<select parameter>
FORMAT MENU
LINEAR MAGNITUDE

**Program Sequence**

<select channel>
<select parameter>
LINM;

---

Allows display of linear magnitude on a Cartesian display using

$$\text{LINEAR MAGNITUDE} = (x^2 + y^2)^{0.5}$$

where x and y are the real and imaginary parts of the measured parameters.

Selecting LINEAR MAGNITUDE recalls the last selected RESPONSE selections on that channel.

softkey LIST TRACE VALUES
mnemonic **LIST**

List Trace Values for Current Parameter on Selected Channel to Printer on HP 8510 System Bus.

---

MAIN MENU COPY

SEE ALSO COPY
OUTPMARK

---

**Manual Sequence**

COPY
MORE
LIST TRACE VALUES

**Program Sequence**

LIST;

---

The trace value at each frequency point is listed in tabular form in the basic units of the selected format. See OUTPMARK.

softkey LOAD
mnemonic **LOAD**

Load Specified Data Type From Specified File
from Tape or Disc to HP 8510 Memory.

---

| | |
|---|---|
| MAIN MENU | TAPE/DISC |
| **PRIOR MENU** | TAPE/DISC |
| NEXT MENU | DATA TYPE SELECT |
| | |
| SEE ALSO | STORE |

---

**Manual Sequence**

TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
LOAD
INST STATE 1-8 *or*
INST STATE ALL *or*
MEMORY 1-8 *or*
MEMORY ALL *or*
CAL SET 1-8 *or*
CAL SET ALL *or*
CAL KIT 1-2 *or*
MORE
DATA: RAW *or*
DATA: DATA *or*
DATA: FORMATTED *or*
DELAY TABLE *or*
USER DISPLAY *or*
HARDWARE STATE *or*
MACHINE DUMP
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter or select disc file>
STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

*See* STORE.

---

CORRECTION OFF must be selected before loading cal sets. DISPLAY: DATA must be selected before loading memory traces.

softkey LOAD FILE
mnemonic **DISF**

Load Disc Filename.

---

MAIN MENU TAPE/DISC
PRIOR MENU DATA TYPE
NEXT MENU TAPE/DISC

SEE ALSO STORE FILE

---

**Manual Sequence**

```
TAPE/DISC
  STORAGE IS DISC
    LOAD
      <select data type>
        <select disc file name>
          LOAD FILE
```

**Program Sequence**

```
SEE STORE;

STOIDISC;
  LOAD;
    <select data type>
      DISF "<disc file name>";
```

---

The LOAD FILE directory consists only of files for the current selected file type. Use the knob to specify the file to be loaded.

softkey LOAD NO OFFSET
mnemonic LOAN

Measure Load With No Offset.

softkey LOAD OFFSET
mnemonic LOAO

Measure Load With Offset.

---

MAIN MENU CAL

---

**Manual Sequence (for $S_{11}$ 1-Port)**

CAL
CAL 1 <cal kit 1 label>
$S_{11}$ 1-PORT
$S_{11}$: LOADS
OFFSET
LOAD NO OFFSET
LOAD OFFSET
OFFSET LOAD DONE
<measure other 1-Port standards>
SAVE 1-PORT CAL
CAL SET *n* (*n* = 1 - 8)

continued →

**Program Sequence**

```
CAL1;
  CALIS111;
    CLASS11C;
      STAND;
        LOAN;
          LOAO;
            OFLD;
              DONE;
                <measure other 1-Port standards>
                  SAV1;
                    CALSn; (n = 1 - 8)
```

---

Offset LOAD is a standard type that requires two sets of measurements. One set of measurements is of a fixed load, and a second set of measurements of the same load offset by a section of precision line. From these measurements, a more ideal load is computed (dependent only on the quality of the precision line). Measurement can be made in either order.

hardkey LOCAL

Set HP 8510 System to Local (Front Panel) Control.
Present Address Menu.

---

MAIN MENU NONE (HARDKEY)

SEE ALSO HP-IB ADDRESSES

---

**Manual Sequence**

LOCAL
ADDRESS of 8510 *or*
ADDRESS of SYSTEM BUS *or*
ADDRESS of SOURCE #1 *or*
ADDRESS of TEST SET *or*
ADDRESS of PLOTTER *or*
ADDRESS of PRINTER *or*
ADDRESS of DISC *or*
MORE
ADDRESS of SOURCE #2 *or*
ADDRESS of PASS-THRU *or*
ADDRESS of RF SWITCH
PRIOR MENU (*to exit*)

**Program Sequence**

Use standard HP-IB conventions to set or change HP 8510 HP-IB Local/ Remote status. See HP-IB Commands GTL, REN, and LLO.

---

If not in Remote (R indicator not lighted), presents the HP-IB Addresses menu. See HP-IB ADDRESSES.

If in Remote (R indicator lighted), suspends HP-IB activity until the next HP-IB listen command is received, extinguishes the R indicator, and presents the HP-IB Addresses Menu. LOCAL does not change HP-IB Listen status (L indicator).

See HP-IB ADDRESSES for use of this menu.

softkey LOCK SPEED: FAST
mnemonic **LOCSFAST**

softkey LOCK SPEED: NORMAL
mnemonic **LOCSNORM**

Select System Phaselock Mode.

---

**MAIN MENU** SYSTEM
**PRIOR MENU** SYSTEM MORE

**PRESET** LOCK SPEED: NORMAL
**INITIALIZED** LOCK SPEED: NORMAL

**RECALLED** NO
(Part of Hardware State)

---

**Manual Sequence**

SYSTEM, MORE
SYSTEM PHASELOCK,
LOCK SPEED: NORMAL *or*
LOCK SPEED: FAST

**Program Sequence**

LOCSNORM; *or*
LOCKFAST;

---

This selection allows the user to increase stepped measurement speed with a tradeoff of decreased frequency accuracy. This selection has no effect on ramp mode. It does speed up step, single point, and frequency list modes.

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softkey LOCK to a1
mnemonic **LOCKA1**

Select $a_1$ as Phase Lock Input.

softkey LOCK to a2
mnemonic **LOCKA2**

Select $a_2$ as Phase Lock Input.

softkey LOCK to NONE
mnemonic **LOCKNONE**

Do Not Attempt Phase Lock.

---

| | |
|---|---|
| **MAIN MENU** | PARAMETER |
| **PRIOR MENU** | REDEFINE PARAMETER |
| **NEXT MENU** | REDEFINE PARAMETER |
| **PRESET** | STANDARD BASIC AND USER PARAMETERS |
| **COUPLED** | ALWAYS COUPLED |
| **RECALLED** | BASIC PARAMETERS: NO<br>USER PARAMETERS: YES |
| **SEE ALSO** | PHASE LOCK<br>REDEFINE PARAMETER |

---

**Manual Sequence**

*See* PHASE LOCK.

**Program Sequence**

*See* REDEFINE PARAMETER.

*continued* →

If Phase Lock is not found (except if LOCK to NONE is selected), then the message "CAUTION: NO IF FOUND" (or others) is displayed and bit 1 of the Primary Status byte is set.

Selected phase lock input must be greater than the level specified in the HP 8510 performance specifications.

Selecting LOCK to NONE causes the HP 8510 to skip the phase lock portion of the data acquisition cycle. The data to be measured is assumed to be present at the appropriate $a_1$, $b_1$, $a_2$, and $b_2$ 20 MHz IF inputs.

softkey LOCK TYPE: EXTERNAL
mnemonic **LOCTEXTE**

Select System First IF Phase Lock, External Source.

softkey LOCK TYPE: INTERNAL
mnemonic **LOCTINTE**

Select System First IF Phase Lock, Internal Source.

softkey LOCK TYPE: NONE
mnemonic **LOCTNONE**

Do Not Phase Lock First IF.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM | | |
| **PRIOR MENU** | SYSTEM MORE | | |
| **NEXT MENU** | SYSTEM PHASELOCK | | |
| **PRESET** | UNCHANGED | | |
| **INITIALIZED** | INTERNAL | | |
| **COUPLED** | ALWAYS | **RECALLED** | NO |

---

**Manual Sequence**

SYSTEM
  MORE
    SYSTEM PHASELOCK
      LOCK TYPE:
        INTERNAL *or*
        EXTERNAL *or*
        NONE

**Program Sequence**

LOCTINTE; *or*
LOCTEXTE; *or*
LOCTNONE

---

The selection defines the phase lock for the entire system. It works in combination with individual parameter definitions. If LOCK TYPE: NONE is selected, then no phaselock will be attempted. If external or internal is selected, then the phaselock definitions of the individual parameters will not be overridden.

This selection is part of the Hardware State definition. It is not changed by PRESET, Power on, or Instrument Preset.

hardkey LOG MAG
mnemonic **LOGM**

Select Cartesian Logarithmic (dB) Magnitude Display Format for Current Parameter on Selected Channel.

---

| | | | |
|---|---|---|---|
| MAIN MENU | NONE (HARDKEY) | | |
| **PRESET** | LOG MAG for Channel 1 and Channel 2<br>REF VALUE = 0 dB<br>SCALE = 10 dB/<br>REF POSN = 5 | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

<select channel>
<select parameter>
LOG MAG

**Program Sequence**

<select channel>
<select parameter>
LOGM;

---

Allows display of logarithmic magnitude on a cartesian display using

$$\text{LOG MAG} = 20 \log_{10} (x^2 + y^2)^{0.5}$$

where x and y are the real and imaginary parts of the measured data.

The MARKER readout is given in dB.

Selecting LOG MAG recalls the last selected RESPONSE selections on that channel.

softkey LOG mkr on POLAR
mnemonic **LOGP**

Select Logarithmic Marker Readout on Polar Format
for Current Parameter on Selected Channel.

---

| | |
|---|---|
| MAIN MENU | FORMAT |
| **PRESET** | REF VALUE = 0<br>SCALE = 0.2/ |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | YES |

---

**Manual Sequence**

<select channel>
<select parameter>
FORMAT MENU
LOG mkr on POLAR

**Program Sequence**

```
<select channel>
  <select parameter>
    LOGP;
```

---

The Marker readout is a complex number consisting of a logarithmic magnitude value (see LOG MAG) and the phase angle (see PHASE).

Selecting LOG mkr on POLAR recalls the last selected RESPONSE selections on that channel.

softkey LOW PASS: IMPULSE
mnemonic **LOWPIMPU**

Select Time Domain Low Pass Impulse Mode
for Selected Channel.

---

MAIN MENU DOMAIN
PRIOR MENU DOMAIN
NEXT MENU NONE

PRESET REAL FORMAT
COUPLED ALWAYS UNCOUPLED RECALLED YES

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN
TIME LOW PASS
SET FREQ. (LOW PASS)
SPECIFY TIME
LOW PASS: IMPULSE

**Program Sequence**

```
TIML;  (SETF is included in TIML)
  LOWPIMPU;
```

---

The trace will respond to impulse stimulus.

When TIME BAND PASS is selected, LOW PASS: IMPULSE and LOW PASS: STEP have no effect on the trace.

*continued* →

*Table 14. Approximate Formulas For Step Rise Time and Impulse Width*

| | | | |
|---|---|---|---|
| **Low Pass** | | | |
| STEP RISE TIME (10% to 90%) | $= \frac{0.45}{\text{FREQ SPAN}}$ | $\times$ | 1.0 MINIMUM WINDOW<br>2.2 NORMAL WINDOW<br>3.3 MAXIMUM WINDOW |
| IMPULSE WIDTH (50%) | $= \frac{0.60}{\text{FREQ SPAN}}$ | $\times$ | 1.0 MINIMUM WINDOW<br>1.6 NORMAL WINDOW<br>2.4 MAXIMUM WINDOW |
| **Band Pass** | | | |
| IMPULSE WIDTH (50%) | $= \frac{1.20}{\text{FREQ SPAN}}$ | $\times$ | 1.0 MINIMUM WINDOW<br>1.6 NORMAL WINDOW<br>2.4 MAXIMUM WINDOW |

softkey LOW PASS: STEP
mnemonic **LOWPSTEP**

Select Time Domain Low Pass Step Mode
for Selected Channel.

---

| | | | |
|---|---|---|---|
| MAIN MENU | DOMAIN | | |
| PRIOR MENU | DOMAIN | | |
| NEXT MENU | NONE | | |
| PRESET | LOW PASS: STEP<br>REAL FORMAT | | |
| COUPLED | ALWAYS UNCOUPLED | RECALLED | YES |

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN,
TIME LOW PASS,
SET FREQ. (LOW PASS),
SPECIFY TIME,
LOW PASS: STEP

**Program Sequence**

TIML; (SETF is included in TIML)
LOWPSTEP;

---

Trace shows response to Impulse stimulus.

When TIME BAND PASS is selected, LOW PASS: IMPULSE and LOW PASS: STEP have no effect on the trace.

softkey LOWBAND FREQUENCY
mnemonic **LOWF**

Maximum Low Frequency Value
to Use Lowband Reflect'n Process in TRL 2-Port.

---

| | |
|---|---|
| MAIN MENU | CAL |
| **PRIOR MENU** | MODIFY CAL KIT |
| **SEE ALSO** | TRL OPTION |
| | LOWBAND REFLECT'N |

---

**Manual Sequence**

```
CAL
  MORE
    MODIFY 1 or MODIFY 2
      TRL OPTION
        LOWBAND FREQUENCY [value] (x1 = Hz)
          <other option selections>
            TRL OPTION DEFINED
              <other changes>
                KIT DONE (MODIFIED)
```

**Program Sequence**

```
CAL1; or CAL2;
  LOWF [value];
    <other option selections>
      TRLO;
        <other changes>
          KITD;
```

---

Lowband frequency determines the maximum frequency that the lowband reflection calibration approach will be used during the TRL calibration process. This lowband calibration is optional and is done only if the frequencies chosen are not practical for TRL.

softkey LOWBAND REFLECT'N
mnemonic **LOWR**

Begin Optional Lowband Part of TRL 2-Oort Cal.

---

**MAIN MENU** CAL
**PRIOR MENU** TRL 2-PORT CAL

**SEE ALSO** CALIBRATE: FULL 2-PORT
CALIBREATE: TRL 2-PORT
REFLECTION

---

**Manual Sequence**

CAL 1 *or* CAL 2
CALIBRATE: TRL 2-PORT
<measure TRL Thru, Reflects, Line>
LOWBAND REFLECTION
<measure Full 2-Port Reflection Cal Stds>
REFLECT'N DONE
SAVE TRL 2-PORT
CAL SET *n* (*n* = 1 - 8)

**Program Sequence**

```
CAL1; or CAL2;
  CALITRL2;
    <measure TRL Thru, Reflects, Line>
      LOWR;
        <measure Full 2-Port Reflection Cal Stds.>
          REFD;
            SAVT;
              CALSn; (n = 1 - 8)
```

continued →

In the TRL calibration process, it may be desired to measurement frequency too low to be appropriately done. This optional process, lowband calibration, will be used in place of the TRL process up to the maximum frequency defined in the cal kit (lowband frequency). See FULL 2-PORT REFLECTION CAL menu.

It can only be done, after all the TRL measurements have been completed but before the "save TRL 2-Port." It will begin a conventional reflection process using class $S_{11}A$, $S_{11}B$, $S_{11}C$, $S_{22}A$, $S_{22}B$, and $S_{22}C$. Once completed, then execute SAVE TRL 2-Port.

Once this process has been started, the TRL standards cannot be measured, or it will cause the whole process to re-start, and all past measurements will be lost.

softkey MACHINE DUMP
mnemonic **MACD**

Disc Data Type Select Complete Machine Dump.

---

**MAIN MENU** TAPE/DISC
**PRIOR MENU** TAPE/DISC
**NEXT MENU** FILE SELECT

**SEE ALSO** STORE

---

**Manual Sequence**

TAPE/DISC
  STORAGE IS DISC
    STORE *or* LOAD *or* DELETE
      MORE
        MACHINE DUMP
          <enter or select disc file>
            STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

*See* STORE.

STOIDISC;
  STOR; *or* LOAD; *or* DELE;
    MACD;
      DISF "filename"; (for Disc)

*continued* →

A machine dump transfers all the HP 8510 data registers that are currently loaded. This includes the following:

Current Instrument State
Instrument States 1 - 8
Cal Sets 1 - 8
HP-IB Addresses
Cal Kits 1 - 2
Hardware State
Memories 1 - 8
User Graphics Display

HP 8510B Changes:

- Machine Dump is not available as a tape function, due to size restrictions.
- Machine Dump transfers are now "intelligent." Only registers which actually contain data are saved, and the saved size is the actual size of the register, not the largest possible size of the register.
- A Machine Dump is not guaranteed to purge all information from non-volatile memory, due to "intelligent" Machine Dump transfers. Loading a program tape or the non-volatile memory read/write test will purge all of non-volatile memory.

softkey MAGNITUDE OFFSET
mnemonic **MAGO**

Set Magnitude Offset for Current Paramater on Selected Channel.

---

| | |
|---|---|
| **MAIN MENU** | RESPONSE |
| **PRIOR MENU** | RESPONSE |
| NEXT MENU | NONE |
| **PRESET** | MAGNITUDE OFFSET = 0 dB<br>CHANNEL 1 AND CHANNEL 2 |
| **RANGE** | -500 dB to 500 dB |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | YES |

---

**Manual Sequence**

RESPONSE MENU
  MORE
    MAGNITUDE OFFSET [entry]

**Program Sequence**

MAGO [value];

---

MAGNITUDE OFFSET adds a constant magnitude offset across the frequency range. There is a separate entry for each parameter on each channel.

Non-zero magnitude offset causes the D enhancement annotation to be displayed.

softkey MAGNITUDE SLOPE
mnemonic **MAGS**

Set Magnitude Slope for Current Parameter on Selected Channel.

---

| | |
|---|---|
| **MAIN MENU** | RESPONSE |
| **PRIOR MENU** | RESPONSE |
| **NEXT MENU** | NONE |
| **PRESET** | MAGNITUDE SLOPE = 0 dB/GHz |
| **RANGE** | -500 dB/GHz to 500 dB/GHz |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | YES |
| **SEE ALSO** | MAGNITUDE OFFSET |

---

**Manual Sequence**

RESPONSE MENU
  MORE
    MAGNITUDE SLOPE [entry]

**Program Sequence**

MAGS [value];

---

Magnitude slope adds a linear offset to the displayed trace. Its value is zero at the start frequency and is the value selected at the stop frequency. All line stretcher functions (electrical delay, phase offset, magnitude slope, magnitude offset) are applied after error correction but before time domain. Therefore, they affect both the data arrays and the formatted arrays. There is a separate value for each parameter on each channel.

Non-zero magnitude slope causes the D enhancement annotation to be displayed.

hardkey MARKER
mnemonic **MENUMARK**

Present Marker Menu;
Turn On Last Selected Marker.

---

| | |
|---|---|
| MAIN MENU | NONE (HARDKEY) |
| **PRESET** | MARKER all OFF |
| **COUPLED** | ALWAYS COUPLED if Domain is same for both channels |
| **RECALLED** | YES |
| SEE ALSO | MARKER *n* (*n* = 1 - 8) |

---

**Manual Sequence**

MARKER
MARKER 1 *or*
MARKER 2 *or*
MARKER 3 *or*
MARKER 4 *or*
MARKER 5 *or*
all OFF *or*
Δ MODE MENU *or*
MORE

**Program Sequence**

MENUMARK;

---

Pressing MARKER with all markers off turns on the last marker that was turned on (1 if after PRESET). The Marker menu is displayed, and Marker becomes the active function. The knob moves the marker from point to point, while STEP moves the marker by one x-axis division. A numeric entry from the front panel or via HP-IB moves the active marker to the point nearest to the specified stimulus value and the stimulus value is displayed.

If another active function is selected, the marker and the marker value continues to be displayed in the channel identification area.

With DUAL CHANNEL selected, the marker active function value pertains to the selected channel.

| | | | |
|---|---|---|---|
| softkey mnemonic | MARKER 1<br>**MARK1** | softkey mnemonic | MARKER 4<br>**MARK4** |
| softkey mnemonic | MARKER 2<br>**MARK2** | softkey mnemonic | MARKER 5<br>**MARK5** |
| softkey mnemonic | MARKER 3<br>**MARK3** | | |

Select Active Stimulus Marker.

---

| | |
|---|---|
| MAIN MENU | MARKER |
| **PRESET** | MARKER all OFF |
| **COUPLED** | ALWAYS COUPLED if Domain is the same for both channels |
| **RECALLED** | YES |

---

**Manual Sequence**

MARKER,
MARKER 1 *or*
MARKER 2 *or*
MARKER 3 *or*
MARKER 4 *or*
MARKER 5 [entry] (x1 = Hz *or* seconds *or* volts)

**Program Sequence**

MARK *n* [stimulus value [suffix] ]; (*n* = 1 - 5)

*continued* →

Pressing one of the marker selection keys makes the selected marker the active function, and updates the softkey annotation. The marker readout in the Channel Identification area shows the measured value at the marker position and the Active Function display shows the stimulus value. If the Δ marker mode is selected (see Δ REF = *n*), then the readouts show the difference between the active marker and the reference marker.

The knob moves the active marker from point to point, while STEP moves the active marker by one x-axis division. A numeric entry from the front panel or via HP-IB moves the active marker to the point nearest to the specified stimulus value and the stimulus value is displayed.

In Δ marker mode, the knob, STEP keys, and numeric entries move the Active marker relative to the Reference marker. If another active function is selected, the marker value continues to be displayed in the channel identification area.

With DUAL CHANNEL selected, the marker active function value pertains to the selected channel.

Markers are positioned by the stimulus value. The marker stimulus value may be entered using the numeric keys or via HP-IB with full resolution, but the stimulus value in the Active Function area is displayed to the data measurement resolution (the stimulus value of the closest actual data point).

For DUAL CHANNEL, COUPLED CHANNELS displays with the same domain selected, markers on both traces will move simultaneously. If different domains are selected, only the marker for the selected channel is moved.

For DUAL CHANNEL, UNCOUPLED CHANNEL displays and for DUAL CHANNEL, COUPLED CHANNELS with Time domain on both channels, both markers will be positioned to the same stimulus value (closest actual data point). If the stimulus value is out of range on one channel, then the marker for that channel will be positioned at the appropriate end of the trace.

If AVERAGING ON, the marker value is the averaged value.

If SMOOTHING ON, the marker value is the smoothed value.

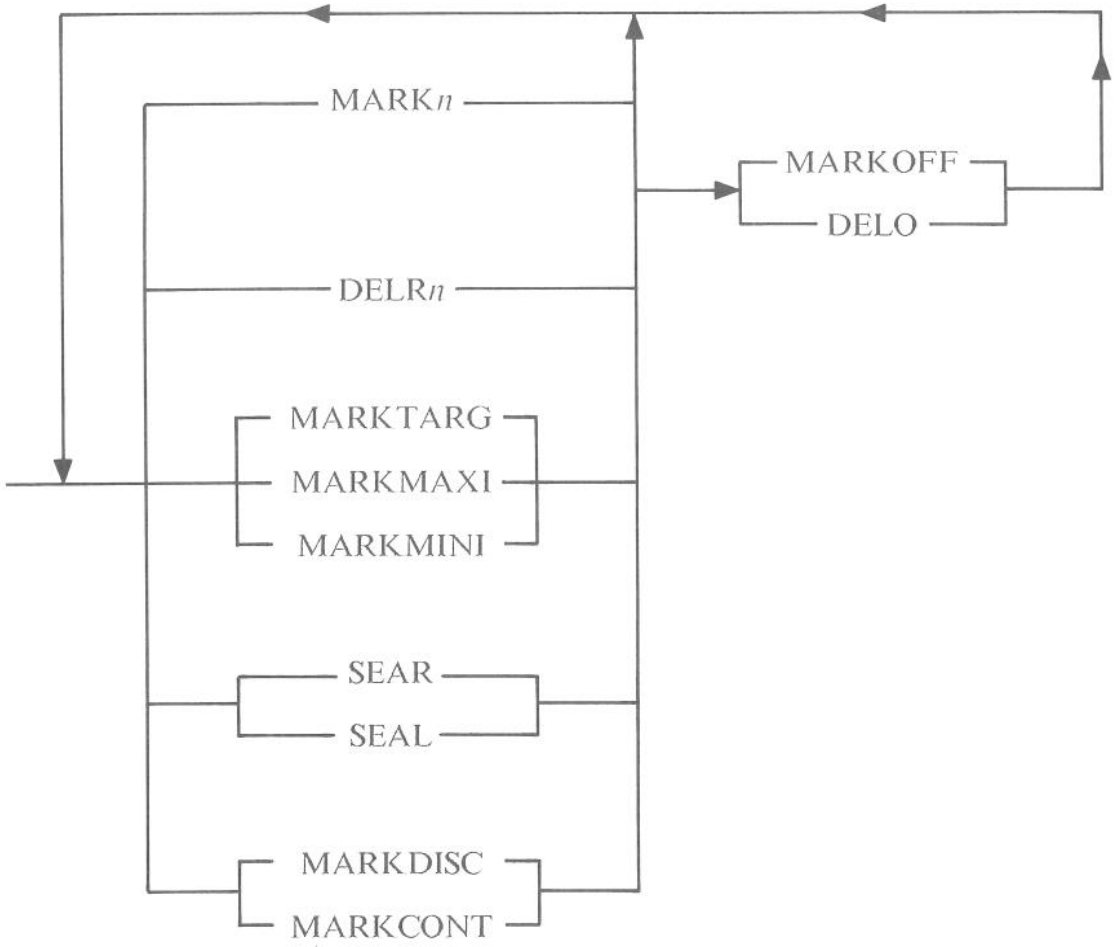



*Figure 10. Marker Sequence*

softkey MARKER all OFF
mnemonic **MARKOFF**

Turn All Measurement Markers Off.

---

| | |
|---|---|
| MAIN MENU | MARKER |
| **PRESET** | MARKER all OFF |
| **COUPLED** | ALWAYS COUPLED if Domain is the same for both channels |
| **RECALLED** | YES |
| **SEE ALSO** | MARKER *n* (*n* = 1 - 8) |

---

**Manual Sequence**

MARKER
all OFF

**Program Sequence**

MARKOFF;

---

All measurement marker annotations are turned off.

softkey MARKER to MAXIMUM
mnemonic **MARKMAXI**

Move Active Marker to Maximum Trace Value
on Selected Channel.

---

| | |
|---|---|
| **MAIN MENU** | MARKER |
| **PRESET** | MARKER all OFF |
| **COUPLED** | ALWAYS COUPLED if Domain is the same for both channels |
| **RECALLED** | YES |
| **SEE ALSO** | MARKER *n* |

---

**Manual Sequence**

MARKER
<select marker>
MORE
MARKER to MAXIMUM

**Program Sequence**

MARK *n*; (*n* = 1 - 5)
MARKMAXI;

---

For Cartesian displays, the active (or last active) marker moves to maximum x-axis value; in polar and Smith formats, to maximum magnitude value.

softkey MARKER to MINIMUM
mnemonic **MARKMINI**

Move Active Marker to Minimum Trace Value
of Selected Channel.

---

| | |
|---|---|
| MAIN MENU | MARKER |
| **PRESET** | MARKER all OFF |
| **COUPLED** | ALWAYS COUPLED if Domain is the same for both channels |
| **RECALLED** | YES |
| SEE ALSO | MARKER *n* |

---

**Manual Sequence**

MARKER
<select marker>
MORE
MARKER to MINIMUM

**Program Sequence**

```
MARK n;    (n = 1 - 5)
  MARKMINI;
```

---

For Cartesian displays, the active (or last active) marker moves to the minimum x-axis value; in polar and Smith formats, to the minimum magnitude value.

softkey MARKER TO TARGET
mnemonic **MARKTARG**

Active Marker to Target Trace Value. Search Starts from Lowest Stimulus Value.

---

**MAIN MENU** MARKER
**PRIOR MENU** MARKER MORE
**NEXT MENU** NO

---

**Manual Sequence**

MARKER
MORE
TARGET VALUE [entry]
MARKER TO TARGET

**Program Sequence**

MARKTARG;

---

Place marker at the trace point nearest to target value (as set by TARV).

In discrete marker mode, the marker will be placed at the trace point closest to the target value. In continuous mode, the marker will use linear interpolation to get as close as possible to the target value.

If delta marker mode is not selected, the search starts at the lowest stimulus value and stops at the first occurrance of the target value. If the delta marker mode is selected, the search starts at the stimulus value of the reference marker and stops at the first occurrance of the target value.

The message "TARGET VALUE NOT FOUND" is displayed if the target value does not exist in the specified search region.

softkey MARKERS: CONTINUOUS
mnemonic **MARKCONT**

Select Continuous Markers.

softkey MARKERS: DISCRETE
mnemonic **MARKDISC**

Select Discrete Markers.

---

**MAIN MENU** MARKER
**PRIOR MENU** MARKER MORE
**NEXT MENU** NONE

**PRESET** MARKDISC
**INITIALIZED** MARKDISC
**COUPLED** ALWAYS COUPLED **RECALLED** YES

---

**Manual Sequence**

MARKER
MORE
MARKERS:
DISCRETE *or*
CONTINUOUS

**Program Sequence**

MARKDISC *or* MARKCONT

---

Discrete markers are positioned only at measured data points. Therefore, all readouts are actual measured data. Continuous markers use a linear interpolation between points. Readouts are not always of measured data, and must be treated accordingly.

softkey MATH OPERATIONS

Present Math Operations Select Menu.

---

| | |
|---|---|
| **MAIN MENU** | DISPLAY |
| **PRIOR MENU** | SELECT DEFAULTS |
| **NEXT MENU** | NONE |
| **PRESET** | DIVIDE ( / )<br>CHANNEL 1 AND CHANNEL 2 |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | YES |
| **SEE ALSO** | PLUS (+)<br>MINUS (-)<br>MULTIPLY (·)<br>DIVIDE (/) |

---

**Manual Sequence**

<select channel>
DISPLAY
SELECT DEFAULTS
MATH OPERATIONS
PLUS (+) *or*
MINUS (-) *or*
MULTIPLY (·) *or*
DIVISION (/)

softkey MAXIMUM FREQUENCY
mnemonic **MAXF**

Specify Maximum Frequency
of Current Calibration Standard (Hz).

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | STANDARD DEFINITION |
| NEXT MENU | STANDARD DEFINITION |
| SEE ALSO | MODIFY 1 <cal kit 1 label> |
| | MODIFY 2 <cal kit 2 label> |

---

**Manual Sequence**

*See* MODIFY 1 *and* MODIFY 2.

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

Each calibration standard is specified as to the maximum and minimum frequencies over which its characteristics apply.

hardkey MEASUREMENT RESTART
mnemonic **REST**

Restart Measurement.

---

MAIN MENU NONE (HARDKEY)

---

**Manual Sequence**

MEASUREMENT RESTART

**Program Sequence**

REST;

---

The measurement to produce the displayed data for the current parameter(s) is restarted by aborting the sweep in progress, then restarting data acquisition at the beginning of the group (see NUMBER of GROUPS). Restarts averaging.

No effect if HOLD is selected.

| | | | |
|---|---|---|---|
| softkey | MEMORY 1 | softkey | MEMORY 5 |
| mnemonic | **MEMO1** | mnemonic | **MEMO5** |
| softkey | MEMORY 2 | softkey | MEMORY 6 |
| mnemonic | **MEMO2** | mnemonic | **MEMO6** |
| softkey | MEMORY 3 | softkey | MEMORY 7 |
| mnemonic | **MEMO3** | mnemonic | **MEMO7** |
| softkey | MEMORY 4 | softkey | MEMORY 8 |
| mnemonic | **MEMO4** | mnemonic | **MEMO8** |

Tape/Disc Data Type Select Single Trace Memory.

---

| | |
|---|---|
| **MAIN MENU** | TAPE/DISC |
| **PRIOR MENU** | DATA TYPE SELECT |
| **NEXT MENU** | FILE SELECT |
| **SEE ALSO** | STORE |

---

**Manual Sequence**

TAPE/DISC
  STORAGE IS TAPE *or*
  STORAGE IS DISC
    STORE *or* LOAD *or* DELETE
      MEMORY 1 - 8
        MEMORY 1 *or*
        MEMORY 2 *or*
        MEMORY 3 *or*
        MEMORY 4
          FILE *n* (*n* = 1 - 8) (for Tape) *or*
            <enter *or* select disc file>
              STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

*See* STORE.

STOITAPE; *or*
STOIDISC;
  STOR; *or* LOAD; *or* DELE;
    MEMO *n*; (*n* = 1 - 8)
      FILE *n*; (*n* = 1 - 8) (Tape) *or*
        DISF "filename"; (for Disc)

---

Store/Load single trace memory from a tape or disc file. Select DISPLAY: DATA before loading memory.

Tape information: Files are a maximum of 2 tape blocks per file.

softkey MEMORY 1-8

Present Trace Memory Select Menu
During Tape/Disc Data Type Select.

---

| | |
|---|---|
| MAIN MENU | TAPE/DISC |
| PRIOR MENU | DATA TYPE SELECT |
| NEXT MENU | FILE SELECT |
| SEE ALSO | MEMORY 1 . . . 8 |

---

**Manual Sequence**

*See* MEMORY 1 . . . 8.

**Program Sequence**

NONE

softkey MEMORY ALL
mnemonic **MEMOALL**

Tape/Disc Data Type Select All Trace Memories 1 through 8.

---

**MAIN MENU** TAPE/DISC
**PRIOR MENU** DATA TYPE SELECT
**NEXT MENU** FILE SELECTION

**SEE ALSO** STORE

---

**Manual Sequence**

<select channel>
TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
STORE *or* LOAD *or* DELETE
MORE
MEMORY ALL
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter *or* select disc file>
STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

*See* STORE.

```
<select channel>
STOITAPE; or STOIDISC;
  STOR; or LOAD; or DELE;
    MEMOALL;
      FILE n; (n = 1 - 8) (for Tape)
      DISF "filename"; (for Disc)
```

---

Store/Load/Delete all eight trace memories using a single tape or disc file. Select DISPLAY: DATA before loading memories from Tape/Disc.

For tape, there are 16 tape blocks/file. For disc, only registers containing data are saved.

mnemonic **MENUOFF**

Turn Off Display of Softkey Menus.

mnemonic **MENUON**

Turn On Display of Softkey Menus.

---

| | |
|---|---|
| MAIN MENU | NONE (HP-IB ONLY) |
| **PRESET** | MENUON |
| **COUPLED** | ALWAYS COUPLED |
| **RECALLED** | YES |

---

**Program Sequence**

```
MENUOFF; or
MENUON;
```

---

Disable or enable generation of menus.

softkey MINIMUM FREQUENCY
mnemonic MINF

Specify Mimimum Frequency of Current Calibration Standard (Hz).
($F_{co}$ for Waveguide Standards.)

---

MAIN MENU CAL
PRIOR MENU STANDARD DEFINITION
NEXT MENU STANDARD DEFINITION

SEE ALSO MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

*See* MODIFY 1 *and* MODIFY 2.

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

Each calibration standard is specified as to the maximum and minimum frequencies over which its characteristics apply.

For waveguide type standards, this entry is used to compute dispersion using

$$\lambda_g = \lambda_f / (1 - (f_{co} / f)^2)^{0.5}$$

where $f_{co}$ is the $TE_{10}$ propagation mode cutoff frequency. It is the same as the cutoff frequency for waveguide standards. See WAVEGUIDE.

softkey MINUS (-)
mnemonic **MINU**

Select Complex Subtraction Trace Math
for Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | DISPLAY | | |
| **PRIOR MENU** | MATH OPERATIONS | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | MATH ( / ) | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |
| **SEE ALSO** | MATH OPERATIONS | | |

---

**Manual Sequence**

```
<select channel>
  DISPLAY
    SPECIFY DEFAULTS
      MATH OPERATIONS
        MINUS (-)
```

**Program Sequence**

```
<select channel>
  MINU;
```

---

Selects vector subtraction for trace math, providing crosstalk or baseline removal for detailed repeatablity tests.

Softkey becomes MATH (-).

softkey MODIFY 1 <cal kit 1 label>
mnemonic **MOD11**

softkey MODIFY 2 <cal kit 2 label>
mnemonic **MOD12**

Begin Modify Cal Kit Sequence.

---

MAIN MENU CAL
PRIOR MENU CAL
NEXT MENU DEFINE STANDARD

---

**Manual Sequence**

```
CAL
  MORE
    MODIFY 1 <cal kit 1 label> or
    MODIFY 2 <cal kit 2 label>
      DEFINE STANDARD entry x1   (entry = stdno = 1 - 22)
        STD TYPE: <standard type>
          <specify standard characteristics> (see STD TYPE: <std type>)
            LABEL STD
              <enter std label>  (see TITLE)
                STD DONE (DEFINED)
                (repeat for each modified standard)
              SPECIFY CLASS
                SPECIFY: <class> stanAno x1   [stanBno x1] . . .
                                                [stanGno x1]
                  (standA-Gno = stdno = 1 - 22)  (1 to 7 stds/class)
                  CLASS DONE (SPEC'D)
                  (repeat for each modified class)
                    LABEL CLASS
                      LABEL: <class>
                        <enter class label>  (see TITLE)
                          LABEL DONE (SPEC'D)
                          (repeat for each modified class label)
                              LABEL KIT
                                <enter modified cal kit label>
                                (see TITLE)
                                  KIT DONE (MODIFIED)
```

*continued* →

**Program Sequence**

*See* Figure 11.

---

Used to change the configuration of an existing cal kit. Selecting KIT DONE (MODIFIED) replaces the presently selected cal kit 1 or cal kit 2 in network analyzer non-volatile memory. Characteristics and assignments not modified during the sequence between MODIFY 1 or MODIFY 2 and KIT DONE (MODIFIED) are maintained.

Selecting STD DONE (MODIFIED) followed by KIT DONE (MODIFIED) without labeling the kit automatically replaces the last letter of the cal kit label with an asterisk ( * ) to indicate that the kit has been modified. Thus, the LABEL KIT operation should be done last.

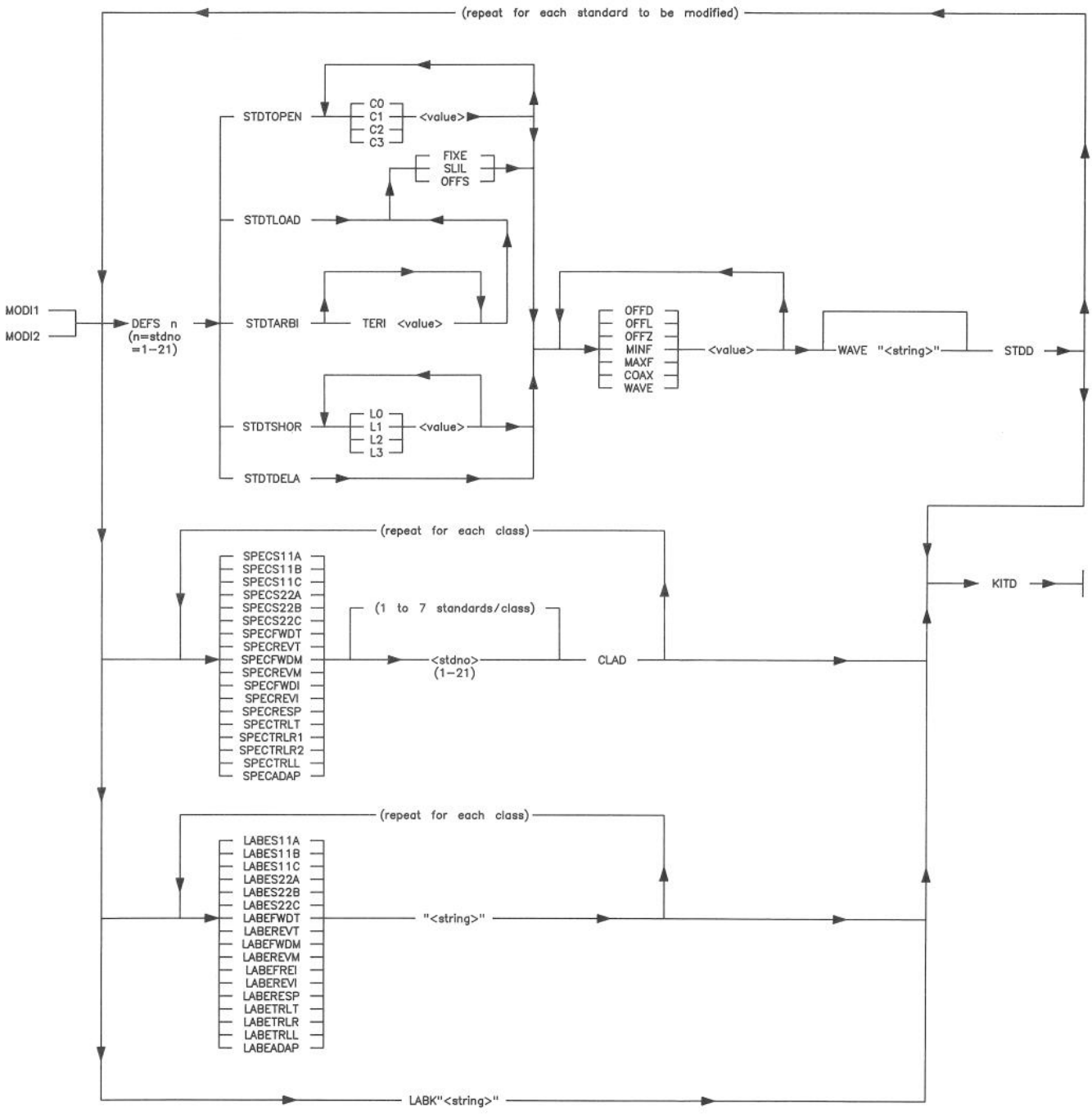



*Figure 11. Modify Cal Kit Sequence*

softkey MODIFY CAL SET

Present Cal Set Modification Procedure.

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | CAL MORE |
| NEXT MENU | MODIFY CAL SET TYPE |
| SEE ALSO | ADAPTER REMOVAL |

---

**Manual Sequence**

See ADAPTER REMOVAL.

**Program Sequence**

See ADAPTER REMOVAL.

This starts the post-calibration process to modify existing cal sets.

softkey MODIFY & SAVE
mnemonic **MODS**

Adapter Removal. Modify Cal Set and Save.
Follow with CALSn.

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | MODIFY CAL SET TYPE |
| NEXT MENU | CAL SET SELECT |
| SEE ALSO | ADAPTER REMOVAL |

---

After the two cal sets containing the data with the adapter and the adapter class have been selected, MODS will combine the data to form a new cal set. Must be followed by CAL SET *n* or error coefficients will be lost.

The limited instrument state of the new cal set will be the same as the cal set selected for port 1. (CAL SET for PORT 1).

mnemonic **MONI**

For Service Use Only.

---

MAIN MENU NONE (HP-IB ONLY)

---

**Program Sequence**

MONI:

---

Must cycle line power to exit.

softkey MORE

Present Next Page of Current Menu.

---

**Manual Sequence**

MORE

**Program Sequence**

Not Programmed.

softkey MULT. SRC: OFF / SAVE
mnemonic **MULSOFF**

Turn Off Multiple Source and Save Hardware State.

softkey MULT. SRC: ON / SAVE
mnemonic **MULSON**

Turn On Multiple Source and Save Hardware State.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM | | |
| **PRIOR MENU** | SYSTEM MORE MENU | | |
| **NEXT MENU** | SYSTEM MORE MENU | | |
| **PRESET** | NO CHANGE | | |
| **INITIALIZED** | OFF | | |
| **COUPLED** | ALWAYS | **RECALLED** | NO |
| **SEE ALSO** | EDIT MULT. SRC | | |

---

**Manual Sequence**

SYSTEM
MORE
EDIT MULT. SRC
<edit equations>
MULT. SRC: OFF/SAVE *or*
MULT. SRC: ON/SAVE

**Program Sequence**

EDITMULS;
<define equations>

---

Before leaving the multiple source menus, one of these two keys must be pressed. If not, all definition changes will be lost.

As well as turning the function on or off, these keys save the equation definitions in the hardware state. Note that changes can be made and saved with the mode off (using MULSOFF). This means that at Power-up the equations are defined but not active.

As with other items in the hardware state, the equation definitions here are not modified by Preset, Power-on, or Instrument State Recall.

softkey MULTIPLIER DENOMINATOR
mnemonic **MULD**

Multiple Source Multiplier Denominator.

softkey MULTIPLIER NUMERATOR
mnemonic **MULN**

Multiple Source Multiplier Numerator.

---

**MAIN MENU** SYSTEM
**PRIOR MENU** MULTIPLE SOURCE MENU

**PRESET** NO CHANGE

**INITIALIZED** SOURCE 1=1
SOURCE 2=0
RECEIVER=1

**RANGE** 0 TO 199

**COUPLED** ALWAYS

**SEE ALSO** CONSTANT FREQUENCY
DEFINE: SOURCE 1
EDIT MULTIPLE SOURCE
OFFSET FREQUENCY

---

**Manual Sequence**

SYSTEM
MORE
EDIT MULT. SRC
DEFINE:
SOURCE 1 *or*
SOURCE 2 *or*
RECEIVER
MULTIPLIER NUMER. [entry] *or*
MULTIPLIER DENOM. [entry] *or*
DONE
MULT. SRC: OFF/SAVE *or*
MULT. SRC: ON/SAVE

**Program Sequence**

EDITMULS;
DEFISOUR1;
MULN [value];
MULD [value];
<define other equations>
MULSOFF; *or*
MULSON

*continued* →

The numerator or denominator of the equation multiplier is modified. The equation to be modified is chosen before this point.

The general equation format is:

A/B (Freq. + C)

where,

A is the numerator of the equation multiplier.

B is the denominator of the equation multiplier.

These values are part of the hardware State and are not changed by Preset, Power-on or Instrument State Recall.

softkey MULTIPLY ( · )
mnemonic **MULT**

Select Complex Vector Multiplication Trace Math
for Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | DISPLAY | | |
| **PRIOR MENU** | MATH OPERATIONS | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | MATH (/) | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |
| **SEE ALSO** | MATH OPERATIONS | | |

---

**Manual Sequence**

<select channel>
DISPLAY
SPECIFY DEFAULTS
MATH OPERATIONS
MULTIPLY ( · )

**Program Sequence**

<select channel>
MULT;

---

Selects vector multiplication for trace math.

Softkey becomes MATH ( · ).

softkey NEXT PAGE
mnemonic **NEXP**

Display Next Page of Tape Directory
on HP 8510 CRT.

---

| | |
|---|---|
| MAIN MENU | TAPE |
| PRIOR MENU | TAPE |
| NEXT MENU | NONE |
| SEE ALSO | DIRECTORY |

---

**Manual Sequence**

*See* DIRECTORY.

**Program Sequence**

*See* DIRECTORY.

---

Does not change display if tape directory is only one page.

If present page is last page, then NEXT PAGE presents the first page.

softkey NUMBER of GROUPS
mnemonic **NUMG**

Measurement Restart,
Take the Specified Number of Groups of Sweeps,
Then Hold.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | STIMULUS | | |
| **PRIOR MENU** | STIMULUS | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | CONTINUAL | | |
| **COUPLED** | ALWAYS COUPLED | RECALLED | YES |

---

**Manual Sequence**

STIMULUS MENU
MORE
NUMBER of GROUPS entry x1 (entry = 1 - 4096)

**Program Sequence**

NUMG value; (value = 1 - 4096)

---

One group of sweeps is required to present new data for the present instrument state. For example, if a dual channel display with different parameters is selected, then a minimum of two sweeps constitute one group of sweeps. For a single channel display with 2-Port correction on, a minimum of four sweeps constitute one group because all four parameters must be measured.

When x1 is pressed, the specified number of groups of sweeps is executed. When the groups are complete, bit 4 of the Primary Status Byte is set.

*continued* →

After NUMBER of GROUPS is manually selected, and the groups are in progress, MEASUREMENT RESTART will restart with the first group. Exit NUMBER of GROUPS by selecting CONTINUAL, SING, or HOLD.

After NUMG is issued to the HP 8510 HP-IB, HP-IB activity is held off until the specified number of groups is complete.

softkey NUMBER of POINTS

Present Specify Number of Points Menu.

---

| | | | |
|---|---|---|---|
| MAIN MENU | STIMULUS | | |
| PRIOR MENU | STIMULUS | | |
| NEXT MENU | NONE | | |
| PRESET | 201 POINTS | | |
| COUPLED | ALWAYS COUPLED | RECALLED | YES |
| SEE ALSO | POINTS: *n* | | |

---

**Manual Sequence**

STIMULUS
  NUMBER of POINTS
    POINTS: 51 *or*
    POINTS: 101 *or*
    POINTS: 201 *or*
    POINTS: 401 *or*
    POINTS: 801

softkey NUMERATOR

Present Numerator Menu to Select Numerator
for Current Basic or User Parameter.

---

| | |
|---|---|
| MAIN MENU | PARAMETER |
| PRIOR MENU | REDEFINE PARAMETER |
| NEXT MENU | REDEFINE PARAMETER |
| PRESET | STANDARD BASIC AND USER PARAMETERS |
| COUPLED | ALWAYS COUPLED |
| RECALLED | BASIC PARAMETERS: NO<br>USER PARAMETERS: YES |
| SEE ALSO | REDEFINE PARAMETER |

---

**Manual Sequence**

<select basic or user parameter>,
PARAMETER MENU
REDEFINE PARAMETER
NUMERATOR
NUMERATOR: $a_1$ *or*
NUMERATOR: $a_2$ *or*
NUMERATOR: $b_1$ *or*
NUMERATOR: $b_2$ *or*
SERVICE SELECTIONS
<other changes>
REDEFINE DONE

**Program Sequence**

*See* REDEFINE PARAMETER.

---

See REDEFINE PARAMETER for standard Basic and User parameter definitions. PRESET selects standard basic and user parameter definitions. Not all combinations of Numerator and Denominator are possible. Use CONVERT to 1/S for the cases not otherwise available.

Parameter definition changes are executed immediately.

REDEFINE DONE stores current parameter selection.

softkey NUMERATOR: $a_1$
mnemonic **NUMEA1**

Select $a_1$ as the Numerator.

softkey NUMERATOR: $a_2$
mnemonic **NUMEA2**

Select $a_2$ as the Numerator.

softkey NUMERATOR: $b_1$
mnemonic **NUMEB1**

Select $b_1$ as the Numerator.

softkey NUMERATOR: $b_2$
mnemonic **NUMEB2**

Select $b_2$ as the Numerator.

---

| | |
|---|---|
| MAIN MENU | PARAMETER |
| PRIOR MENU | REDEFINE PARAMETER |
| NEXT MENU | REDEFINE PARAMETER |
| PRESET | STANDARD BASIC AND USER PARAMETERS |
| COUPLED | ALWAYS COUPLED |
| RECALLED | BASIC PARAMETERS: NO<br>USER PARAMETERS: YES |
| SEE ALSO | REDEFINE PARAMETER |

---

**Manual Sequence**

*See* NUMERATOR.

**Program Sequence**

*See* REDEFINE PARAMETER.

---

If NUMERATOR: $a_1$ is selected, no DENOMINATOR is allowed. Use convert to 1/S to get $a_1$ as the numerator.

softkey OFFSET
mnemonic OFFS

Define Load or Arbitrary Impdance Standard Type as Offset Type.

---

**MAIN MENU** CAL
**PRIOR MENU** DEFINE STANDARD

**SEE ALSO** LOAN

---

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
DEFINE STANDARD
STD TYPE: LOAD
FIXED *or*
SLIDING *or*
OFFSET *or*
LABEL STD *or*
STD DONE (DEFINED)
<other changes>
KIT DONE (MODIFIED)

**Program Sequence**

See MODIFY1 or MODIFY2.

---

See text for LOAN. During a modify cal kit sequence, OFFSET is used to specify that when this load standard is selected during a calibration sequence, it is to be treated as an offset load. The offset load then requires two sets of measurements to compute an ideal load.

The offset defined in the offset portion of the standard is used as the value of offset between load with offset and load with no offset.

softkey OFFSET DELAY
mnemonic **OFFD**

Specify Offset Delay (ps)
of Current Calibration Standard.

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | STANDARD DEFINITION |
| NEXT MENU | STANDARD DEFINITION |
| SEE ALSO | MODIFY 1 <cal kit 1 label> |
| | MODIFY 2 <cal kit 2 label> |

---

**Manual Sequence**

*See* MODIFY 1 *and* MODIFY 2.

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

If the calibration standard is offset from the reference plane, enter its offset delay in picoseconds:

$$\text{delay} = \text{physical length} \quad \epsilon_r$$

where the speed of light in free space = 299.79 Mm/second.

$\epsilon_r$ = Propogation Constant = 1.00064 in standard air.

For all standard types, enter the one-way travel time. This value is used to model the phase response of the standard using a linear (COAX type) or standard rectangular waveguide (WAVEGUIDE type; see MINIMUM FREQUENCY) model.

A value for offset delay can be approximated using the PORT EXTENSIONS function. Select CAL, MORE, PORT EXTENSIONS, PORT 1, then use the knob to adjust the reference plane extension value until the supplementary length display matches the physical length of the offset device. Enter the primary time display value (in picoseconds) as the value for offset delay.

softkey OFFSET FREQUENCY
mnemonic **OFFF**

Multiple Source Offset Frequency.

---

**MAIN MENU** SYSTEM
**PRIOR MENU** MULTIPLE SOURCE MENU

**PRESET**
**INITIALIZED** NO CHANGE
SOURCE 1 = 0
SOURCE 2 = 0
RECEIVER = 0

**RANGE** -2.147483648 to +40 GHz

**COUPLED** YES

**SEE ALSO** EDIT MULT. SRC
CONSTANT FREQUENCY
DEFINE: SOURCE 1
MULTIPLIER NUMERATOR

---

**Manual Sequence**

SYSTEM
MORE
EDIT MULT. SRC
DEFINE:
SOURCE 1 *or*
SOURCE 2 *or*
RECEIVER
OFFSET FREQUENCY [entry]
<input value>
DONE
MULT. SRC: OFF/SAVE *or*
MULT. SRC: ON/SAVE

**Program Sequence**

```
EDITMULS;
  DEFISOUR1;
    OFFF [value];
      <define other equations>
        MULSOFF; or
        MULSON;
```

*continued* →

Used to modify the offset frequency of the selected equation.

The general equation is:

A/B (Freq + C)

where C is the offset frequency.

This value is part of the hardware state and is not changed by Power-on, Preset, or Instrument State Recall.

softkey OFFSET LOAD DONE
mnemonic **OFLD**

Offset Load Done.

---

MAIN MENU CAL

SEE ALSO $S_{11}$ 1-PORT

---

**Manual Sequence ($S_{11}$ 1-Port)**

CAL
CAL 1 <cal kit 1 label>
$S_{11}$ 1-PORT
$S_{11}$: LOADS
OFFSET
LOAD NO OFFSET
LOAD OFFSET
OFFSET LOAD DONE
<measure other standards>
SAVE 1-PORT CAL
CALS*n* (*n* = 1 - 8)

**Program Sequence**

See $S_{11}$ 1-PORT

softkey OFFSET LOSS
mnemonic **OFFL**

Offset Loss (G ohms/s) of current Calibration Standard.

---

| | |
|---|---|
| **MAIN MENU** | CAL |
| **PRIOR MENU** | STANDARD DEFINITION |
| **NEXT MENU** | STANDARD DEFINITION |
| **SEE ALSO** | MODIFY 1 <cal kit 1 label> |
| | MODIFY 2 <cal kit 2 label> |

---

**Manual Sequence**

*See* MODIFY 1 *and* MODIFY 2.

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

If the calibration standard is offset from the reference plane, enter its offset loss in G ohms/second (ohms/nanosecond) at 1 GHz. If the standard type is coaxial short or an open, enter the one-way skin loss. This value is used to model the magnitude response of the coaxial type standard; this value is not used (assummed zero) for waveguide type standards.

The algorithm assumes that the loss varies as the square root of the frequency.

$$\text{LOSS IN G}\Omega/\text{s at 1 GHz} = 10^{d} - 100$$

where

$$d = \frac{40 - \text{loss (dB / unit length)}}{20}$$

(d is a negitive value)

softkey OFFSET $Z_0$
mnemonic **OFFZ**

Impedance (ohms) of Transmission Line
between Reference Plane and Termination of
Current Offset Calibration Standard.

---

| | |
|---|---|
| MAIN MENU | CAL |
| PRIOR MENU | STANDARD DEFINITION |
| NEXT MENU | STANDARD DEFINITION |
| SEE ALSO | MODIFY 1 <cal kit 1 label> |
| | MODIFY 2 <cal kit 2 label> |

---

**Manual Sequence**

*See* MODIFY 1 *and* MODIFY 2.

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

For coaxial type standards, specify the real (resistive) part of the impedance of the transmission line preceeding the termination. For waveguide type standards, always specify the terminating impedance as 1 ohm.

Calibration coefficient errors will result if SET $Z_0$ and OFFSET $Z_0$ are not equal (but actually are), as in the case of a waveguide offset short.

softkey OMIT ISOLATION
mnemonic **OMII**

Omit Isolation Calibration Step.

---

MAIN MENU CAL

SEE ALSO ISOLATION

---

**Manual Sequence**

*See* ISOLATION.

**Program Sequence**

*See* ISOLATION.

---

Omits both Forward and Reverse Isolation calibration steps, followed by ISOLATION DONE. Useful to speed up the measurement calibration sequence when measuring low forward and reverse insertion loss devices.

softkey OPERATING PARAMETERS
mnemonic **OPEP**

Display First Page of Operating Parameters
on HP 8510 CRT.

---

MAIN MENU COPY
PRIOR MENU COPY
NEXT MENU NONE

---

**Manual Sequence**

COPY
MORE
OPERATING PARAMETERS
RESTORE DISPLAY *or*
PRINT PARAMETERS *or*
PLOT PARAMETERS *or*
PAGE PARAMETERS

**Program Sequence**

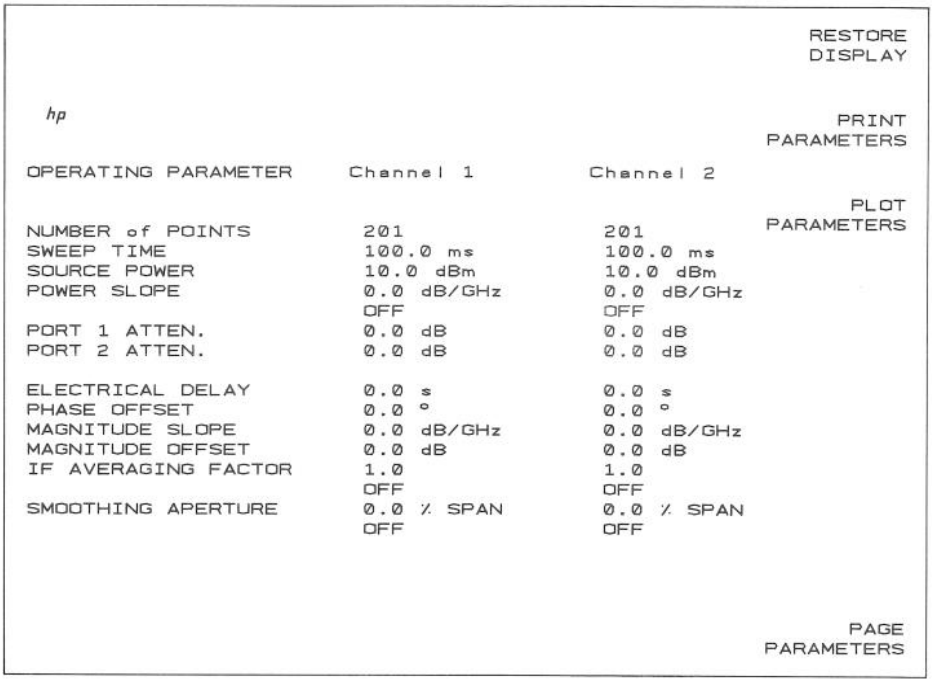
OPEP;
RESD; *or*
PRIP; *or*
PLOP; *or*
PAGP;

---

Provides two pages of documentation for the present system state. Refer to Figure 12.

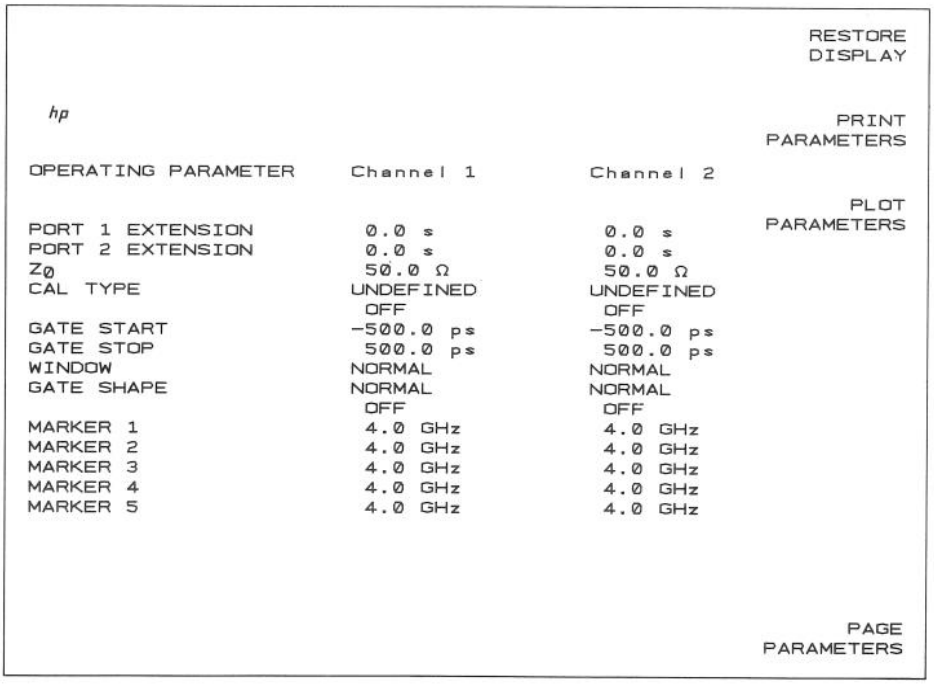
*continued* →

## FIRST PAGE




| OPERATING PARAMETER | Channel 1 | Channel 2 |
|---|---|---|
| NUMBER of POINTS | 201 | 201 |
| SWEEP TIME | 100.0 ms | 100.0 ms |
| SOURCE POWER | 10.0 dBm | 10.0 dBm |
| POWER SLOPE | 0.0 dB/GHz | 0.0 dB/GHz |
| | OFF | OFF |
| PORT 1 ATTEN. | 0.0 dB | 0.0 dB |
| PORT 2 ATTEN. | 0.0 dB | 0.0 dB |
| ELECTRICAL DELAY | 0.0 s | 0.0 s |
| PHASE OFFSET | 0.0 ° | 0.0 ° |
| MAGNITUDE SLOPE | 0.0 dB/GHz | 0.0 dB/GHz |
| MAGNITUDE OFFSET | 0.0 dB | 0.0 dB |
| IF AVERAGING FACTOR | 1.0 | 1.0 |
| | OFF | OFF |
| SMOOTHING APERTURE | 0.0 % SPAN | 0.0 % SPAN |
| | OFF | OFF |

## SECOND PAGE




| OPERATING PARAMETER | Channel 1 | Channel 2 |
|---|---|---|
| PORT 1 EXTENSION | 0.0 s | 0.0 s |
| PORT 2 EXTENSION | 0.0 s | 0.0 s |
| $Z_0$ | 50.0 Ω | 50.0 Ω |
| CAL TYPE | UNDEFINED | UNDEFINED |
| | OFF | OFF |
| GATE START | −500.0 ps | −500.0 ps |
| GATE STOP | 500.0 ps | 500.0 ps |
| WINDOW | NORMAL | NORMAL |
| GATE SHAPE | NORMAL | NORMAL |
| | OFF | OFF |
| MARKER 1 | 4.0 GHz | 4.0 GHz |
| MARKER 2 | 4.0 GHz | 4.0 GHz |
| MARKER 3 | 4.0 GHz | 4.0 GHz |
| MARKER 4 | 4.0 GHz | 4.0 GHz |
| MARKER 5 | 4.0 GHz | 4.0 GHz |

*Figure 12. Typical Operating Parameters Displays*

mnemonic **OUTPACTI**

Output Current Value of Current Active Function
in Basic Units of the Function.

---

MAIN MENU NONE (HP-IB ONLY)

SEE ALSO FORM4

---

**Program Sequence**

```
<select active function>
  OUTPACTI;
    <read one ASCII number from HP 8510 HP-IB>
```

---

Allows the value of the active function to be transferred to an external controller via the HP 8510 HP-IB.

See FORM4. A single ASCII format number terminated with a line feed with EOI asserted on last byte.

If no active function is displayed, then a blank string is output.

| | |
|---|---|
| mnemonic | **OUTPCALC01**<br>**OUTPCALC02**<br>**OUTPCALC03**<br>**OUTPCALC04**<br>**OUTPCALC05**<br>**OUTPCALC06**<br>**OUTPCALC07**<br>**OUTPCALC08**<br>**OUTPCALC09**<br>**OUTPCALC10**<br>**OUTPCALC11**<br>**OUTPCALC12** |

Output Calibration Error Coefficient Set
Real/Imaginary Pairs.

---

| | |
|---|---|
| MAIN MENU | NONE (HP-IB ONLY) |
| SEE ALSO | INPUCALC *n* |

---

**Program Sequence**

```
<select channel>
  CORRON;  (turn correction on before outputting coefficients)
    CALS n;  (n = 1 - 8)
      HOLD;
        FORM n;  (n = 1 - 4)
          OUTPCALCn;  (n = 01 - 12)
            <read data block from HP 8510 HP-IB>
              <repeat for each error coefficient set used for cal type>
```

*continued* →

Allows accuracy enhancement measurement calibration error coefficients to be output from HP 8510 cal set memory to an external controller via the HP 8510 HP-IB. Each of the 12 error coefficient sets are used as error terms for the selected error model as shown in Table 15.

If the cal coefficient set is not assigned for the current error model, the FORM1, FORM2, and FORM3 block length will be zero and the message "REQUESTED DATA NOT AVAILABLE" is displayed.

*Table 15. Internal Calibration Error Coefficient Storage*

| Input/Output Mnemonic | Calibration Type | | | |
|---|---|---|---|---|
| | Response | Response and Isolation | 1-Port | 2-Port |
| CALC01 | $E_R$ or $E_T$ | $E_R$ or $E_T$ | $E_D$ | $E_{DF}$ |
| CALC02 | | $E_D$ or $E_X$ | $E_S$ | $E_{SF}$ |
| CALC03 | | | $E_R$ | $E_{RF}$ |
| CALC04 | | | | $E_{XF}$ |
| CALC05 | | | | $E_{LF}$ |
| CALC06 | | | | $E_{TF}$ |
| CALC07 | | | | $E_{DR}$ |
| CALC08 | | | | $E_{SR}$ |
| CALC09 | | | | $E_{RR}$ |
| CALC10 | | | | $E_{XR}$ |
| CALC11 | | | | $E_{LR}$ |
| CALC12 | | | | $E_{TR}$ |

"$E_{XX}$" terms in these models are error terms, and the subscripts indicate the source of the error:

$$E_{XX}$$

**First subscript**

D = Directivity
S = Source match
L = Load match
X = Isolation (crosstalk)
R = Reflection signal-path tracking
T = Transmission signal-path tracking

**Second Subscript**

F = Forward
R = Reverse

mnemonic **OUTPDATA**

Output Real/Imaginary Pairs
from Selected Channel Corrected Data Memory.

---

MAIN MENU NONE (HP-IB ONLY)

SEE ALSO INPUDATA

---

**Program Sequence**

```
<select channel>
  <select parameter>
    HOLD;
      FORM n;  (n = 1 - 4)
        OUTPDATA;
          <read data block from HP 8510 HP-IB>
```

---

Allows data to be output from the HP 8510 corrected data array for the selected channel to an external controller via the HP 8510 HP-IB.

mnemonic **OUTPERRO**

Output Error Number and Message.

---

MAIN MENU NONE (HP-IB ONLY)

---

**Program Sequence**

```
<select active function>
  OUTPERRO;
    <read one positive integer ASCII number
      and 50 character string from HP 8510 HP-IB>
```

---

Allows the error number and message to be transferred to an external controller via the HP 8510 HP-IB. Clears Caution/Tell message from CRT.

The string is enclosed in quotation marks, terminated with a line feed, with EOI asserted on last byte. A blinking message will include the blink on and blink off characters.

ASCII format number, "50 char max. ASCII format string"

Tell and Caution messages are listed in a seperate section at the end of this Keyword Dictionary.

Note that during Remote operation caution messages are not cleared until at least one character of the string is read. Caution messages are overwritten only by "fatal" error messages, in which system operation is halted completely.

mnemonic **OUTPFORM**

Output from Selected Channel Formatted Data Memory.

---

MAIN MENU NONE (HP-IB ONLY)

SEE ALSO INPUFORM, FORM *n*

---

**Program Sequence**

```
<select channel>
  <select parameter>
    HOLD;
      FORM n;    (n = 1 - 4)
        OUTPFORM;
          <read data block from HP 8510 HP-IB>
```

---

Allows data to be output from the HP 8510 formatted data array for the selected channel to an external controller via the HP 8510 HP-IB.

Cartesian format: x = basic units
y = 0

Polar and Smith format: real/imaginary pairs

mnemonic **OUTPFREL**

Output Current Frequency List via HP-IB

---

**MAIN MENU** None (HP-IB Only)

**SEE ALSO** INPUFREL

---

**Program Sequence**

```
DIM FREL (1: No_of_Points)
  FORM n; (n = 1 - 4)
    OUTPFREL;
      <read data block from HP-IB>
```

---

Allows the complete frequency list to be output to an external controller via the HP-IB. The data block consists of the Preamble (#A), Size value (FORM 1,2,3) and the list of frequencies in the current frequency list in the order of measurement.

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mnemonic **OUTPIDEN**

Output HP 8510 HP-IB Identification Code.

---

**MAIN MENU** NONE (HP-IB ONLY)

---

**Program Sequence**

```
OUTPIDEN;
  <read ASCI FORMAT string from HP 8510 HP-IB>
```

---

Output specific identification code via HP 8510 HP-IB.

The string

HP8510B . <revision> . <release>; <date>

is available terminated by line feed with EOI asserted on last byte. This string is identical to the string displayed in the active entry area after line power up sequence, or displayed by pressing SYSTEM, SERVICE FUNCTIONS, SOFTWARE REVISION.

mnemonic **OUTPKEY**

Output Integer Number for Last Key Pressed.

---

MAIN MENU NONE (HP-IB ONLY)

---

**Program Sequence**

```
OUTPKEY;
  <read one positive integer ASCII number from HP 8510 HP-IB>
```

---

When an HP 8510 hardkey or softkey is pressed, bit 2 of the Extended Status byte is set. OUTPKEY allows determination of which key was last pressed by reading its assigned number.

See KEYC for list of key assignments.

A single ASCII format integer number terminated with a line feed with EOI asserted on last byte.

mnemonic **OUTPLEAS**

Output HP 8510 Learn String.

---

| | |
|---|---|
| **MAIN MENU** | NONE (HP-IB ONLY) |
| **SEE ALSO** | INPULEAS<br>FORM1 |

---

**Program Sequence**

```
OUTPLEAS;
  <read binary data block from HP 8510 HP-IB>
```

---

Allows binary data block representing the current Instrument State to be output to an external controller via the HP 8510 HP-IB.

This string is not intended for manipulation or modification; FORM 1 is always selected.

4698 bytes, terminated with line feed, with EOI asserted on last byte.

mnemonic **OUTPMARK**

Output Active Marker Trace Value.

---

| | |
|---|---|
| MAIN MENU | NONE (HP-IB ONLY) |
| SEE ALSO | MARKER *n*<br>FORM4 |

---

**Program Sequence**

```
<select active marker>
  OUTPMARK;
    <read two ASCII numbers from HP 8510 HP-IB>
```

---

Allows the value of the current active marker, or the last marker turned on if MARKER all OFF, to be transferred to an external controller via the HP 8510 HP-IB.

Two ASCII format numbers, separated by a comma, terminated with a line feed, with EOI asserted on last byte.

*continued* →

*Table 16. Marker Units for all Display Formats*

| Format | Marker Basic Units | Outpmark A, B Value |
|---|---|---|
| LOG MAG | dB | dB, 0 |
| PHASE | degrees (°) | degrees, 0 |
| DELAY | seconds (s) | seconds, 0 |
| SMITH CHART | R ± jX (Ω) | ohms, ohms |
| SWR | (unitless) | SWR, 0 |
| LINEAR MAGNITUDE | ρ (unitless) (reflection) | lin mag, 0 |
| | τ (unitless) (transmission) | lin mag, 0 |
| LIN mkr on POLAR | ρ ∠ φ° (reflection) | lin mag, degrees |
| | τ ∠ θ° (transmission) | lin mag, degrees |
| LOG mkr on POLAR | dB ∠ φ° | log mag, degrees |
| Re/Im mkr on POLAR | x ± jy (unitless) | real, imag |
| INVERTED SMITH | G ± jB | Siemens, Siemens |
| REAL | x (unitless) | real, 0 |
| IMAGINARY | jy (unitless) | real, 0 |

mnemonic **OUTPMEMO**

Output Currently Selected Trace Memory
Real/Imaginary Pairs.

---

**MAIN MENU** NONE (HP-IB ONLY)

---

**Program Sequence**

```
DEFM n;  (n = 1 - 4)  (select default memory)
  DISPMEMO or DISPDATM;  (turn on memory)
    FORM n;  (n = 1 - 4)
      OUTPMEMO;
        <read data block from HP 8510 HP-IB>
```

---

Allows data to be output from the default memory for the selected channel to an external controller via the HP 8510 HP-IB.

If memory is not turned on (see DISPLAY: MEMORY and DISPLAY: DATA and MEMORY), then a zero length data block is output and the message "REQUESTED DATA NOT AVAILABLE" is displayed. Data from Corrected Data array will be output. See OUTPDATA.

See DEFN *n* and INPUDATA to write HP-IB data to the selected memory.

mnemonic **OUTPPLOT**

Output Complete Screen Including Menu in Plotter Format to HP-IB.

---

MAIN MENU NONE (HP-IB ONLY)

---

**Program Sequence**

```
OUTPPLOT;
```

---

See PLOT: ALL for standard plot outputs. In addition to the measurement display and user display areas, the menu labels are plotted.

Outputs variable length strings of HP-GL commands, terminated by a line feed, with EOI asserted on last byte of the last command string. The last string output consists of the PU command followed by a line feed.

| | | | |
|---|---|---|---|
| mnemonic | **OUTPRAW1** | mnemonic | **OUTPRAW3** |
| mnemonic | **OUTPRAW2** | mnemonic | **OUTPRAW4** |

Output Real/Imaginary Pairs
from Selected Channel Specified Raw Data Memory.

---

**MAIN MENU** NONE (HP-IB ONLY)

**SEE ALSO** INPURAW *n*

---

**Program Sequence**

```
<select channel>
  HOLD;
    FORM n;    (n = 1 - 4)
        OUTPRAW n;   (n = 1 - 4)
        <read data block from HP 8510 HP-IB>
```

---

Allows trace data to be transferred from HP 8510 selected channel Raw Data memory to an external controller via the HP-IB.

With CORRECTION OFF, or with CORRECTION ON using RESPONSE or 1-PORT accuracy enhancement, Raw Data array 1 holds data for the current parameter for the selected channel.

With CORRECTION ON using 2-PORT accuracy enhancement:

| | |
|---|---|
| Raw Data Array 1 | $S_{11}$ data |
| Raw Data Array 2 | $S_{21}$ data |
| Raw Data Array 3 | $S_{12}$ data |
| Raw Data Array 4 | $S_{22}$ data |

If UNCOUPLED CHANNELS is selected, then there are separate raw arrays for each channel; the specified array for the selected channel is output.

mnemonic **OUTPSTAT**

Output HP 8510 Status Bytes; Clear Status Bytes.

---

MAIN MENU NONE (HP-IB ONLY)

SEE ALSO SRQM

---

**Program Sequence**

```
OUTPSTAT;
  <read two positive integer ASCII numbers from HP 8510 HP-IB>
```

---

See SRQM for Primary and Extended Status byte assignments.

Two ASCII format integers, the first for the Primary Staus byte, the second for the Extended Status byte, each 0-255, separated by a comma, terminated with line feed, with EOI asserted on last byte.

mnemonic OUTPTITL

Output Current Title String.

---

MAIN MENU NONE (HP-IB ONLY)

SEE ALSO TITLE

---

**Program Sequence**

```
TITL;    (selects title to be output)
  OUTPTITL;
    <read ASCII character string from HP 8510 HP-IB>
```

---

Allows any user-definable title or label to be output from HP 8510 memory via the HP 8510 HP-IB.

To select the title to be output, make it the active function.

Any title or label function may be used. See TITL, PARL, LABK, LABS, LABE <std class> , and others.

Up to 50 character string, enclosed in quotation marks, terminated by line feed, with EOI asserted on last byte.

softkey OVERLAY
mnemonic **OVER**

Select Overlay Dual Channel Display.

---

| | |
|---|---|
| **MAIN MENU** | DISPLAY |
| **PRIOR MENU** | DUAL CHANNEL |
| NEXT MENU | NONE |
| | |
| **PRESET** | SINGLE CHANNEL |
| **RECALLED** | YES |

---

**Manual Sequence**

DISPLAY
DUAL CHANNEL
OVERLAY

**Program Sequence**

OVER;

---

The current Channel 1 and Channel 2 measurement displays are presented, in full size in the same display area. Uncoupled functions apply to the currently selected channel.

softkey PAGE PARAMETERS
mnemonic **PAGP**

Display Next Page of Operating Parameters on HP 8510 CRT.

---

MAIN MENU COPY
**PRIOR MENU** COPY

SEE ALSO OPERATING PARAMETERS

---

**Manual Sequence**

*See* OPERATING PARAMETERS.

**Program Sequence**

*See* OPERATING PARAMETERS.

---

If the last page is displayed, PAGE PARAMETERS presents the first page.

softkey PARAMETER LABEL
mnemonic **PARL**

Label Current User Parameter.

---

**MAIN MENU** PARAMETER
**PRIOR MENU** PARAMETER
NEXT MENU TITLE

---

**Manual Sequence**

PARAMETER MENU
<select user parameter>
REDEFINE PARAMETER
PARAMETER LABEL
<enter parameter label> (see TITLE)
<other changes>
REDEFINE DONE

**Program Sequence**

*See* REDEFINE PARAMETER.

---

Labels for the Basic parameters, $S_{11}$, $S_{21}$, $S_{12}$, and $S_{22}$ cannot be changed.

hardkey PARAMETER MENU
mnemonic **MENUPARA**

Present Parameter Menu.

---

MAIN MENU NONE (HARDKEY)

---

**Manual Sequence**

PARAMETER MENU
USER 1 $a_1$ *or*
USER 2 $b_2$ *or*
USER 3 $a_2$ *or*
USER 4 $b_1$ *or*
REDEFINE PARAMETER

**Program Sequence**

MENUPARA;

softkey PEEK
mnemonic **PEEK**

Examine HP 8510 Memory Location Contents.

---

**MAIN MENU** SYSTEM
**PRIOR MENU** SYSTEM
**NEXT MENU** NONE

**SEE ALSO** PEEK/POKE LOCATION

---

**Manual Sequence**

```
SYSTEM
  SERVICE FUNCTIONS
    PEEK/POKE LOCATION entry x1
    (entry = memory address)
      PEEK   (memory contents are displayed.)
```

**Program Sequence**

```
PEEL value;      (value = memory address)
  PEEK;
```

---

**CAUTION**

PEEK is intended for service applications. Changing contents of a memory location, or, in certan circumstances, inspecting the contents, can lead to unpredictable operation.

Active Function is current contents of specified memory location.

softkey PEEK/POKE LOCATION
mnemonic **PEEL**

Specify Peek and Poke HP 8510 Memory Location.

---

MAIN MENU SYSTEM
PRIOR MENU SYSTEM
NEXT MENU NONE

SEE ALSO PEEK
POKE

---

**Manual Sequence**

SYSTEM
SERVICE FUNCTIONS
PEEK/POKE LOCATION entry x1
(entry = memory address)

**Program Sequence**

PEEL value; (value = memory address)

---

CAUTION

PEEK and POKE are intended for service applications. Changing contents of a memory location, or, in certain circumstances inspecting the contents, can lead to unpredictable operation.

Active Function is current memory address.

| | | | |
|---|---|---|---|
| softkey | PEN 1 | softkey | PEN 5 |
| mnemonic | **PEN1** | mnemonic | **PEN5** |
| softkey | PEN 2 | softkey | PEN 6 |
| mnemonic | **PEN2** | mnemonic | **PEN6** |
| softkey | PEN 3 | softkey | PEN 7 |
| mnemonic | **PEN3** | mnemonic | **PEN7** |
| softkey | PEN 4 | softkey | PEN 8 |
| mnemonic | **PEN4** | mnemonic | **PEN8** |

Select Pen for Next Plot Type
for Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | COPY | | |
| **PRIOR MENU** | SELECT PEN COLOR | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | PEN 1 for Channel 1<br>PEN 2 for Channel 2 | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

COPY
SELECT PEN COLOR

PEN 1 *or* PEN 2 *or*
PEN 3 *or* PEN 4 *or*
PEN 5 *or* PEN 6 *or*
PEN 7 *or* PEN 8

**Program Sequence**

PEN *n*; ($n$ = 1 - 8)

---

Refer to plotter operating manual for plotter response to selection of a non-existent pen.

hardkey PHASE
mnemonic **PHAS**

Select Cartesian Phase Display for Current Parameter on Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | NONE (HARDKEY) | | |
| **PRESET** | REF VALUE = 0° | SCALE = 100°/ | |
| | REF POSN = 5 | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

<select channel>
<select parameter>
PHASE

**Program Sequence**

<select channel>
<select parameter>
PHAS;

---

The trace is presented as module 180

Degrees = ATN (Imag/Real)

The phase trace is affected by ELECTRICAL DELAY, PORT EXTENSIONS, and PHASE OFFSET.

softkey PHASE LOCK

Present Phase Lock Menu to Select Reference used for Phase Lock of Current Basic or User Parameter.

---

| | |
|---|---|
| **MAIN MENU** | PARAMETER |
| **PRIOR MENU** | REDEFINE PARAMETER |
| **NEXT MENU** | REDEFINE PARAMETER |
| **PRESET** | STANDARD BASIC AND USER PARAMETERS |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | BASIC PARAMETERS: NO<br>USER PARAMETERS: YES |
| **SEE ALSO** | REDEFINE PARAMETER<br>LOCK to a1<br>LOCK to a2<br>LOCK to NONE |

---

**Manual Sequence**

<select basic or user parameter>
PARAMETER MENU
REDEFINE PARAMETER
PHASE LOCK
LOCK to $a_1$ *or*
LOCK to $a_2$ *or*
LOCK to NONE
<other changes>
REDEFINE DONE

**Program Sequence**

*See* REDEFINE PARAMETER.

---

Parameter definition changes are executed immediately.

REDEFINE DONE stores current parameter definition.

softkey PHASE OFFSET
mnemonic **PHAO**

Phase Offset for the Current Parameter on the Selected Channel.

---

| | |
|---|---|
| MAIN MENU | RESPONSE |
| PRIOR MENU | RESPONSE |
| NEXT MENU | NONE |
| PRESET | PHASE OFFSET = 0<br>CHANNEL 1 AND CHANNEL 2 |
| RANGE | -360° to +360° |
| COUPLED | SEPARATE FOR EACH PARAMETER<br>ON EACH CHANNEL |
| RECALLED | YES |

---

**Manual Sequence**

RESPONSE MENU
PHASE OFFSET [entry]
(x1 = degrees; entry = +/-360 degrees)

**Program Sequence**

<select channel>
PHAO [value]; (value = -360 to +360)

---

The phase offset value is added to the current phase value for each point of the current trace on the selected channel prior to the modulo 180 computation.

In Time Domain Low Pass Step mode, do not use PHASE OFFSET, or limit use to 0, 180, or 360 degree values.

Non-zero Phase Offset causes the D enhancement anotation to be displayed.

softkey PLOT PARAMETERS
mnemonic **PLOP**

Plot Operating Parameters or System Parameters
on Digital Plotter Connected to HP 8510 System Bus.

---

MAIN MENU COPY
PRIOR MENU COPY
NEXT MENU NONE

SEE ALSO COPY
OPERATING PARAMETERS
SYSTEM PARAMETERS

---

**Manual Sequence**

*See* OPERATING PARAMETERS *or* SYSTEM PARAMETERS.

**Program Sequence**

*See* OPERATING PARAMETERS *or* SYSTEM PARAMETERS.

softkey PLOT: ALL
mnemonic **PLOTALL**

Plot Measurement Display Including User Display
on Digital Plotter Connected to HP 8510 System Bus.

---

**MAIN MENU** COPY

**PRESET** PLOT: ALL

**SEE ALSO** COPY

---

**Manual Sequence**

```
COPY
  <select quadrant>
    <select pen>
      PLOT: ALL
```

**Program Sequence**

```
<select quadrant>
  <select pen>
    PLOTALL;
```

---

The complete current Measurement display (except for the softkey menu) is plotted, using the current quadrant and pen selections, on the Digital Plotter connected to the HP 8510 System Bus.

If Dual Channel display is selected, then both channels are plotted using the independent pen selections.

PLOTALL accomplishes:

| | |
|---|---|
| PLOT: GRATICULE | PLOT: MARKER(S) |
| PLOT: TEXT | PLOT: TRACE. |

softkey PLOT: GRATICULE
mnemonic **PLOTGRAT**

Plot Graticule Only
on Digital Plotter Connected to HP 8510 System Bus.

---

| | |
|---|---|
| MAIN MENU | COPY |
| **PRESET** | PLOT: ALL |
| SEE ALSO | COPY |

---

**Manual Sequence**

COPY
<select pen>
<select quadrant>
PLOT: GRATICULE

**Program Sequence**

<select pen>
<select quadrant>
PLOTGRAT;

---

The Graticule (Cartesian, Polar, or Smith) only is plotted using the current quadrant and pen selections on the Digital Plotter connected to the HP 8510 System Bus.

If Dual Channel display is selected, then both channels are plotted using the independent pen selections.

softkey PLOT: MARKER(S)
mnemonic **PLOTMARK**

Plot Markers Only
on Digital Plotter Connected to HP 8510 System Bus.

---

**MAIN MENU** COPY

**PRESET** PLOT: ALL

**SEE ALSO** COPY

---

**Manual Sequence**

```
COPY
  <select pen>
    <select quadrant>
      PLOT: MARKER(S)
```

**Program Sequence**

```
<select pen>
  <select quadrant>
    PLOTMARK;
```

---

The Marker(s) are plotted using the current quadrant and pen selections on the Digital Plotter connected to the HP 8510 System Bus.

If Dual Channel display is selected, then both channels are plotted using the independent pen selections.

softkey PLOT: TEXT
mnemonic **PLOTTEXT**

Plot Text Only
on Digital Plotter Connected to HP 8510 System Bus.

---

MAIN MENU COPY

PRESET PLOT: ALL

SEE ALSO COPY

---

**Manual Sequence**

```
COPY
  <select pen>
    <select quadrant>
      PLOT: TEXT
```

**Program Sequence**

```
<select pen>
  <select quadrant>
    PLOTTEXT;
```

---

The Text of the measurement display is plotted using the current quadrant and pen selections on the Digital Plotter connected to the HP 8510 System Bus.

If Dual Channel display is selected, then both channels are plotted using the independent pen selections.

softkey PLOT: TRACE
mnemonic **PLOTTRAC**

Plot Trace Only
on Digital Plotter Connected to HP 8510 System Bus.

---

MAIN MENU COPY

**PRESET** PLOT: ALL

SEE ALSO COPY

---

**Manual Sequence**

```
COPY
  <select pen>
    <select quadrant>
      PLOT: TRACE
```

**Program Sequence**

```
<select pen>
  <select quadrant>
    PLOTTRAC;
```

---

The Trace is plotted using the current quadrant and pen selections on the Digital Plotter connected to the HP 8510 System Bus.

If Dual Channel display is selected, then both channels are plotted using the independent pen selections.

softkey PLUS (+)
mnemonic **PLUS**

Select Complex Addition Trace Math
for Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | DISPLAY | | |
| **PRIOR MENU** | MATH OPERATIONS | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | MATH (/) | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

<select channel>
DISPLAY
SPECIFY DEFAULTS
MATH OPERATIONS
PLUS (+)

**Program Sequence**

<select channel>
PLUS;

---

Selects vector addition for trace math.

Softkey becomes MATH (+).

| | | | |
|---|---|---|---|
| softkey mnemonic | POINTS: 51<br>**POIN51** | softkey mnemonic | POINTS: 401<br>**POIN401** |
| softkey mnemonic | POINTS: 101<br>**POIN101** | softkey mnemonic | POINTS: 801<br>**POIN801** |
| softkey menmonic | POINTS: 201<br>**POIN201** | | |

Select Number of Points for Both Channels.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | STIMULUS | | |
| **PRIOR MENU** | NUMBER of POINTS | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | 201 POINTS<br>CHANNEL 1 AND CHANNEL 2 | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |

---

| **Manual Sequence** | **Program Sequence** |
|---|---|
| STIMULUS MENU<br>NUMBER of POINTS<br>POINTS: 51 *or*<br>POINTS: 101 *or*<br>POINTS: 201 *or*<br>POINTS: 401 *or*<br>POINTS: 801 | POIN *n*; (*n* = 51 *or* 101 *or* 201 *or* 401 *or* 801) |

---

POINTS: [number] is part of the Cal Set Limited Instrument State.

POINTS: [number] changes the number of points measured in a sweep for ramp or stepped mode operation. In frequency list mode, the number of points for the current segment is specified. After calibration, the number of points may be reduced. Increasing the number of points causes automatic selection of:

| | |
|---|---|
| CORRECTION OFF | if CORRECTION ON |
| DISPLAY: DATA | if DISPLAY: MATH (<operator>, DISPLAY: DATA and MEMORY, or DISPLAY: MEMORY) |
| FREQUENCY domain | if TIME LOW PASS. |

softkey POKE
mnemonic **POKE**

Change HP 8510 Memory Location Contents.

---

MAIN MENU SYSTEM
PRIOR MENU SERVICE FUNCTIONS
NEXT MENU NONE

SEE ALSO PEEK/POKE LOCATION

---

**Manual Sequence**

```
SYSTEM
  SERVICE FUNCTIONS
    PEEK/POKE LOCATION entry x1  (entry = memory address)
      POKE  entry x1     (entry = new memory contents)
```

**Program Sequence**

```
PEEL value;  (value = memory address)
  POKE value;  (value = new memory contents)
```

---

CAUTION

POKE is intended for service applications. Use of this function can damage the HP 8510 operating system, making it necessary to reload the system program.

Active Function is current contents of specified memory location. See PEEK/POKE LOCATION.

softkey PORT EXTENSIONS

Present Port Extensions Menu.

---

| | | | |
|---|---|---|---|
| MAIN MENU | CAL | | |
| PRESET | PORT 1 = 0 seconds<br>PORT 2 = 0 seconds | | |
| RANGE | -1 second to +1 second<br>with femtosecond resolution | | |
| COUPLED | ALWAYS COUPLED | RECALLED | YES |
| SEE ALSO | PORT 1<br>PORT 2 | | |

---

**Manual Sequence**

CAL
MORE
PORT EXTENSIONS
PORT 1 *or* PORT 2

softkey PORT 1
mnemonic **PORT1**

softkey PORT 2
mnemonic **PORT2**

Linear Phase Reference Plane Extensions
for Both Channels.

---

| | | | |
|---|---|---|---|
| MAIN MENU | CAL | | |
| **PRESET** | PORT 1 = 0 seconds<br>PORT 2 = 0 seconds | | |
| **RANGE** | -1 second to +1 second<br>with femtosecond resolution | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |
| **SEE ALSO** | ELECTRICAL DELAY | | |

---

CAL
MORE
PORT EXTENSIONS
PORT 1 [entry] (x1 = seconds)
PORT 2 [entry] (x1 = seconds)

**Program Sequence**

PORT1 [value [time suffix] ]; *or*
PORT2 [value [time suffix] ];

---

Used during the measurement sequence to effectively move the reference plane away from the calibration plane. Does not effect measurement calibration.

*continued* →

Linear (coaxial) phase shift is independent of ELECTRICAL DELAY. See ELECTRICAL DELAY.

PORT 1 extends $S_{11}$ (x2 displayed value), $S_{21}$, $S_{12}$

PORT 2 extends $S_{22}$ (x2 displayed value), $S_{12}$, $S_{21}$

Port extensions produce an effect upon phase, delay, and time domain traces in all formats.

When the sum of PORT EXTENSIONS and ELECTRICAL DELAY is non-zero for any displayed parameter, the Enhancement Annotation D is displayed in the Enchancement Labels area of the CRT.

For the standard User Parameters definitions:

PORT 1 *or* PORT 2 *extends* $a_1$;

PORT 1 *and* PORT 2 *extend* $b_2$;

PORT 1 *or* PORT 2 *do not extend* $a_2$;

PORT 1 *extends* $b_1$;

PORT 2 *does not extend* $b_1$.

For redefined user parameters, the reference extension is x2 displayed value if the numerator and denominator are the same port, and x1 displayed value if the numerator and denominator are different ports.

softkey **POWER LEVELING**

Present Source Power Leveling Menu

---

| | |
|---|---|
| **MAIN MENU** | SYSTEM |
| **PRIOR MENU** | SYSTEM MORE |
| **SEE ALSO** | SOURCE 1: EXT. LEVEL<br>SOURCE 2: EXT. LEVEL |

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softkey POWER MENU

Present Power Menu to Select
Source Power, Power Slope, and Test Port Attenuation.

---

MAIN MENU STIMULUS

SEE ALSO STIMULUS MENU

---

**Manual Sequence**

STIMULUS MENU
POWER MENU
POWER SOURCE 1 *or*
POWER SOURCE 2
SLOPE ON *or*
SLOPE OFF *or*
ATTENUATOR PORT: 1 *or*
ATTENUATOR PORT: 2

---

The power level can be independently set for either of the two sources the HP 8510 is capable of controlling. However, only the slope of source 1 can be adjusted.

softkey POWER SOURCE 1
mnemonic **POWE**

Set Source Power dBm.

---

| | | | |
|---|---|---|---|
| MAIN MENU | STIMULUS | | |
| PRIOR MENU | SOURCE POWER | | |
| NEXT MENU | NONE | | |
| **PRESET** | +10 dBm | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |
| **SEE ALSO** | POWER MENU | | |

---

**Manual Sequence**

STIMULUS MENU
POWER MENU
POWER SOURCE 1 [entry] (x1 = dB)

**Program Sequence**

POWE [value]; (value = dB)

---

Range and resolution are dependent upon the source. Entries beyond the range of the source are set to the appropriate minimum or maximum value.

Momentary phase lock errors may occur as the source changes its output power level.

softkey POWER SOURCE 2
mnemonic **POW2**

Set Source #2 Power dBm.

---

| | | | |
|---|---|---|---|
| MAIN MENU | STIMULUS | | |
| PRIOR MENU | POWER MENU | | |
| NEXT MENU | NONE | | |
| **PRESET** | +10.0 dBm | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |

---

**Manual Sequence**

STIMULUS MENU
POWER MENU
POWER SOURCE 2 [entry] (x1 = dB)

**Program Sequence**

POW2 [value]; (value = dB)

---

Range and resolution are dependent upon the source. Entries beyond the range of the source are set to the appropriate minimum or maximum value.

Momentary phase lock errors may occur as the source changes its output power level.

hardkey PRESET
mnemonic **PRES**

Set HP 8510, Test Set, and Source to Standard Preset State.

---

MAIN MENU NONE (HARDKEY)

COUPLED ALWAYS COUPLED

---

**Manual Sequence**

PRESET

**Program Sequence**

PRES;

---

Issues Instrument Preset to all instruments on the HP 8510 System Bus.

softkey PRESS to CONTINUE
mnemonic **PREC**

Continue Measurement After Reversing Device Under Test.

---

MAIN MENU NONE

SEE ALSO CALIBRATE: ONE-PATH 2-PORT

---

**Manual Sequence**

<device reversal>
PRESS to CONTINUE

**Program Sequence**

Detect HP 8510 Primary Status Byte Bit 3 Set.
Use HP-IB Addressed Command GET
(GROUP EXECUTE TRIGGER)
to continue measurement.

---

Used in ONE-PATH 2-PORT manual measurement sequence. Bit 3 of Primary Status Byte is set to indicate that manual device reversal is required.

MEASUREMENT RESTART prepares the system to restart the first group, ready to measure forward parameters, then sets Bit 3 of the Primary Status Byte.

RAMP mode averaging cannot be used practically with ONE-PATH 2-PORT accuracy enhancement. Averaging in Ramp Sweep requires multiple sweeps to reach the fully averaged value. PRESS to CONTINUE takes only two sweeps to acquire forward data, one for reflection and one for transmission, then the device is reversed and data for the reverse signal path is taken. Thus, averaging would require n+1 device reversals.

STEP mode averaging may be used because only one group of sweeps is required to produce fully averaged data.

softkey PREVIOUS PAGE
mnemonic **PREP**

Display Previous Page of Tape Directory
on HP 8510 CRT.

---

**MAIN MENU** TAPE
**PRIOR MENU** TAPE

**SEE ALSO** DIRECTORY

---

**Manual Sequence**

*See* DIRECTORY.

**Program Sequence**

*See* DIRECTORY.

---

If the first page of tape directory is displayed, then PREVIOUS PAGE presents the last page.

softkey PRINT PARAMETERS
mnemonic **PRIP**

Print System Parameters or Operating Parameters on Line Printer Connected to HP 8510 System Bus.

---

MAIN MENU COPY
PRIOR MENU COPY
NEXT MENU NONE

SEE ALSO OPERATING PARAMETERS
SYSTEM PARAMETERS

---

**Manual Sequence**

*See* OPERATING PARAMETERS *or* SYSTEM PARAMETERS.

**Program Sequence**

*See* OPERATING PARAMETERS *or* SYSTEM PARAMETERS.

hardkey PRIOR MENU
mnemonic **MENUPRIO**

Present Prior Menu.

---

MAIN MENU NONE (HARDKEY)

---

**Manual Sequence**

PRIOR MENU

**Program Sequence**

MENUPRIO;

---

Provides a means to "back up" through the menu levels to the main menu. If the current menu displayed is the top level (main) menu, then pressing PRIOR MENU blanks the Menu area of the CRT. If the Menu area is blank, pressing PRIOR MENU presents the last main menu.

softkey RAMP
mnemonic **RAMP**

Select Ramp Sweep Mode
for Both Channels.

---

| | | | |
|---|---|---|---|
| MAIN MENU | STIMULUS | | |
| PRESET | RAMP | | |
| COUPLED | ALWAYS COUPLED | **RECALLED** | YES |
| SEE ALSO | SWEEP TIME | | |

---

**Manual Sequence**

STIMULUS MENU
RAMP

**Program Sequence**

RAMP;

---

Selects continuous linear analog sweeps beginning at the START frequency and ending at the STOP frequency at the rate determined by SWEEP TIME, measuring data at frequency intervals set by NUMBER of POINTS.

As the frequency sweep is narrowed, internal HP 8510 logic changes the source band switch points to, when possible, move the band switch points outside of the frequency range being swept.

TRIM SWEEP requires different settings for each different frequency range to obtain best frequency accuracy.

softkey REAL
mnemonic **REAL**

Select Display of Real Part of Complex Data
for Current Parameter on Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | FORMAT | | |
| **PRIOR MENU** | FORMAT | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | REF VALUE = 0<br>SCALE = 10/<br>REF POSN = 5 | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

<select channel>
  <select parameter>
    FORMAT MENU
      REAL

**Program Sequence**

<select channel>
  <select parameter>
    REAL;

---

Presents a cartesian display of the real part of the measured data,

$$S_{ij} = R_{ij} + jX_{ij}$$

Where Real = $R_{ij}$ is the imaginary part and ij is the selected parameter.

hardkey RECALL
mnemonic **MENURECA**

Present Recall Instrument State Menu.

---

MAIN MENU NONE (HARDKEY)

SEE ALSO INST STATE *n*

---

=

**Manual Sequence**

RECALL
INST STATE 1 *or*
INST STATE 2 *or*
INST STATE 3 *or*
INST STATE 4 *or*
INST STATE 5 *or*
INST STATE 6 *or*
INST STATE 7 *or*
INST STATE (POWER UP) 8

**Program Sequence**

MENURECA;

---

If correction was turned on when the instrument state was saved, then the instrument state is recalled and the correction is turned on after completion of the first group of sweeps. If the cal set(s) have been changed and no longer apply to the instrument state, then various messages are displayed and correction is not turned on. Recall automatically selects DISPLAY: DATA.

Includes all Parameter/Format/Response selections, except Basic parameter redefinitions (see REDEFINE PARAMETER). Not saved, but are recalled according to the present test set capabilities.

| | |
|---|---|
| softkey | REDEFINE DONE |
| mnemonic | **REDD** |

Redefine Parameter Sequence for Current Parameter is Complete.
Store New Parameter Definition.

---

| | |
|---|---|
| MAIN MENU | PARAMETER |
| PRIOR MENU | REDEFINE PARAMETER |
| NEXT MENU | PARAMETER |
| SEE ALSO | REDEFINE PARAMETER |

---

**Manual Sequence**

*See* REDEFINE PARAMETER.

**Program Sequence**

*See* REDEFINE PARAMETER.

softkey REDEFINE PARAMETER

Change Definition of Current Basic or User Parameter.

---

| | |
|---|---|
| **MAIN MENU** | PARAMETER |
| **PRIOR MENU** | REDEFINE PARAMETER |
| **NEXT MENU** | NONE |
| **PRESET** | STANDARD BASIC AND USER PARAMETER DEFINITIONS |
| **COUPLED** | ALWAYS COUPLED |
| **RECALLED** | BASIC PARAMETERS: NO (EXCEPT CONVERSION)<br>USER PARAMETERS: YES |

---

**Manual Sequence**

<select basic or user parameter>
PARAMETER MENU
REDEFINE PARAMETER
<select drive port>
<select phase lock>
<select numerator>
<select denominator>
<select conversion>
<label parameter> (user parameters only)
REDEFINE DONE

*continued* →

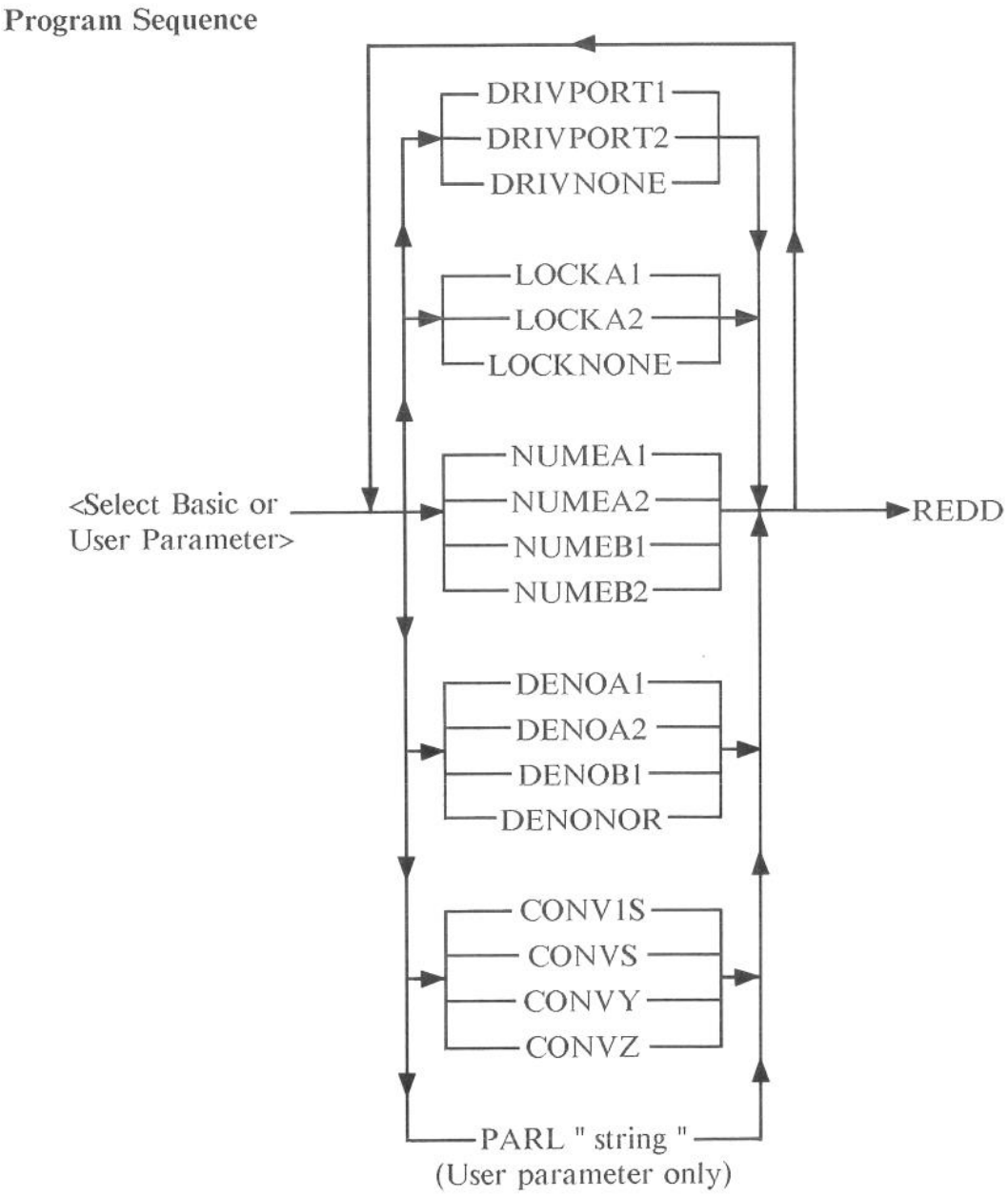


*Figure 13. Redefine Parameter Key Sequence*

*continued* →

REDEFINE PARAMETER presents a menu which allows selection of signal path, ratio, and data conversion conditions for the currently selected Basic ($S_{11}$, $S_{21}$, $S_{12}$, $S_{22}$) parameter or User ($a_1$, $b_1$, $a_2$, $b_2$) parameter.

Parameter changes are executed immediately, and can be selected in any sequence.

REDEFINE DONE stores current parameter definition. Selecting another Basic or User parameter prior to REDEFINE DONE restores the standard parameter definition.

Basic parameter redefinitions (except CONVERSION) are not Saved/Recalled as part of Instrument State. RECALL restores standard Basic parameter definitions.

Table 16 lists the standard parameter definitions selected by PRESET when an S-parameter test set responds on the 8510 system bus. If a reflection/transmission test set (or no test set) responds, these standard definitions are set so that $S_{22} = S_{11}$ and $S_{12} = S_{21}$.

*Table 17. Standard Parameter Definitions (S-Parameter Test Sets)*

| | **Parameters** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Basic** | | | | **User** | | | |
| | **$S_{11}$** | **$S_{21}$** | **$S_{12}$** | **$S_{22}$** | **$a_1$** | **$b_2$** | **$a_2$** | **$b_1$** |
| DRIVE PORT | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 |
| PHASE LOCK | $a_1$ | $a_1$ | $a_2$ | $a_2$ | $a_1$ | $a_1$ | $a_1$ | $a_1$ |
| NUMERATOR | $b_1$ | $b_2$ | $b_1$ | $b_2$ | $a_1$ | $b_2$ | $a_2$ | $b_1$ |
| DENOMINATOR | $a_1$ | $a_1$ | $a_2$ | $a_2$ | <--NO RATIO--> | | | |
| CONVERSION | S | S | S | S | S | S | S | S |

Note: For Reflection/Transmission Test Sets, or no test set, $S_{22} = S_{11}$ and $S_{12} = S_{21}$.

hardkey REF POSN
mnemonic **REFP**

Cartesian Display Reference Position.

---

| | | | |
|---|---|---|---|
| MAIN MENU | NONE (HARDKEY) | | |
| **PRESET** | SEE BELOW | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

REF POSN [entry x1] (entry = 0 - 10)

**Program Sequence**

REFP [value]; (value = 0 to 10)

---

The Reference Position is the point about which SCALE expands or contracts the trace.

For Cartesian displays, the current REF POSN for Channel 1 is indicated by the > symbol at the left side of the graticule, and the REF POSN for Channel 2 is indicated by the < symbol at the right side of the graticule.

For Polar and Smith displays, the REF POSN is the outer circle and this function has no meaning.

Use the knob, STEP keys, or numeric x1 (bottom horizontal grid line = 0; top = 10) to move the reference position line. To return the line to an integer location, either enter an integer or use a STEP key repeatedly to move the reference position to the top or bottom graticule line.

PRESET selects the appropriate REF POSN location for each format.

hardkey REF VALUE
mnemonic **REFV**

Cartesian, Smith, or Polar Reference Position Value.

---

| | |
|---|---|
| **MAIN MENU** | NONE (HARDKEY) |
| **PRESET** | SEE BELOW |
| **RANGE** | DEPENDS UPON FORMAT |
| **COUPLED** | ALWAYS UNCOUPLED |
| **RECALLED** | YES |

---

**Manual Sequence**

REF VALUE [entry] (x1 = basic units for format)

**Program Sequence**

REFV [value]; (value = basic units for format)

---

The trace is positioned relative to the Reference Position, so changing REF VALUE causes the trace to move but does not change the marker value.

For Polar and Smith displays, changing REF VALUE also changes SCALE/ division.

For Smith and Inverted Smith displays, REF VALUE and SCALE values are given in units of the LIN mkr on POLAR format.

The sequence REF VALUE, = MARKER sets the REF VALUE equal to the marker value, thus moving the trace so that the marker data point is at the reference position.

PRESET selects the appropriate REF VALUE values for each format.

softkey REFERENCE AMP. GAIN
mnemonic **REFA**

Service Only.
Manually Select Reference IF Amplifier Gain.

---

| | | | |
|---|---|---|---|
| MAIN MENU | SYSTEM | | |
| PRIOR MENU | SERVICE FUNCTIONS | | |
| NEXT MENU | GAIN SELECTION | | |
| **PRESET** | REFERENCE AMP. GAIN,<br>GAIN AUTO | | |
| **RANGE** | 1, 2, 3, 4, AUTO | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |

---

**Manual Sequence**

SYSTEM
IF GAIN
REFERENCE AMP. GAIN
GAIN: *n* (*n* = 1 - 4 or AUTO)

**Program Sequence**

REFA;
GAIN *n*; (*n* = 1 - 4 or AUTO)

softkey REFLECT'N
mnemonic **REFL**

After Selection of 2-PORT Measurement Calibration,
Begin Reflection Calibration Sequence.

softkey REFLECT'N DONE
mnemonic **REFD**

2-Port Reflection Calibration Sequence is Complete.
Compute Reflection Error Coefficients.

---

MAIN MENU CAL

SEE ALSO CALIBRATE: $S_{11}$ 1-PORT

---

**Manual Sequence**

```
CAL
  CAL 1 <cal kit 1 label> or
  CAL 2 <cal kit 2 label>
    FULL 2-PORT or
    ONE-PATH 2-PORT
      REFLECT'N
        <measure 1-PORT standards>
          REFLECT'N DONE
            <transmission and isolation calibration steps>
              SAVE 2-PORT CAL
                CAL SET n    (n = 1 - 8)
```

**Program Sequence**

```
CAL1; or CAL2;
  CALIFUL2; or CALIONE2;
    REFL;
      <measure 1-PORT standards>
        REFD;
          <transmission and isolation calibration steps>
            SAV2;
              CALS n;   (n = 1 - 8)
```

*continued* →

REFLECT'N and REFLECT'N DONE begin and terminate the 1-Port calibration sequences in the FULL 2-PORT and ONE-PATH 2-PORT calibration. Reflection calibration requires three classes of standards to measure directivity, source match, and reflection signal path frequency response for each port using identical techniques as the $S_{11}$ 1-PORT and $S_{22}$ 1-PORT calibrations.

If REFLECT'N DONE is pressed before all classes are measured, then the message "CAUTION: ADDITIONAL STANDARDS NEEDED" is displayed and bit 1 of the Primary Status byte is set.

softkey Re/Im mkr on POLAR
mnemonic **REIP**

Select Real/Imaginary Marker Readout
on Polar Display Format
for Current Parameter on Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | FORMAT | | |
| **PRESET** | REF VALUE = 1<br>SCALE 0.2/ | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

```
<select channel>
  <select parameter>
    FORMAT MENU
      Re/Im mkr on POLAR
```

**Program Sequence**

```
<select channel>
  <select parameter>
    REIP;
```

softkey REPLACE FILE

Replace Disc File.

---

| | |
|---|---|
| **MAIN MENU** | TAPE/DISC |
| **PRIOR MENU** | STORE DISC FILE |
| **NEXT MENU** | TAPE/DISC |
| **SEE ALSO** | STORE |

---

**Manual Sequence**

```
TAPE/DISC
  STORAGE IS DISC
    STORE
      <select data type>
        REPLACE MENU
          <select disc file name>
            REPLACE FILE
```

**Program Sequence**

```
SEE STORE;

STOIDISC;
  STOR;
    <select data type>
      DISF "<disc file name>";
```

---

Under program control, if the disc file name is the same as a file already on the disc, the file is replaced. If the file doesn't currently exist, a new file will be created.

For manual operation, the replace file directory consists only of files for the current selected file type. Use the knob to select the file to be replaced.

softkey REPLACE MENU

Present Directory for Data Type.

---

| | |
|---|---|
| MAIN MENU | TAPE/DISC |
| PRIOR MENU | DATA TYPE SELECT |
| NEXT MENU | DISC FILE SELECT |
| SEE ALSO | REPLACE FILE<br>STORE |

---

**Manual Sequence**

See REPLACE FILE

**Program Sequence**

See REPLACE FILE

---

The displayed directory consists only of files for the current selected data type.

softkey RESET IF CORRECTION
mnemonic **RESI**

Initiate Automatic IF Gain Calibration Sequence
Before Starting Next Group of Sweeps.

---

**MAIN MENU** SYSTEM
**NEXT MENU** NONE

**PRESET** NORMAL TIME-DEPENDENT BASIS

---

**Manual Sequence**

SYSTEM
RESET IF CORRECTION

**Program Sequence**

RESI;

---

IF gain calibration sequence normally occurs on a time-dependent basis, but this resets the 5-minute timer, causing the next IF cal sequence to occur at the start of the next group.

softkey <RESPONSE CLASS LABEL>
mnemonic **RAIRESP**

Select Response Class of Response and Isolation Cal.
Measure if Single Standard in Class.

---

**MAIN MENU** CAL
**SEE** CALIBRATE: RESPONSE & ISOL'N

---

There are two standard classes, each of which can have multiple standard elements, for the response and isolation calibrations. The actual labels on the softkeys are user defined. The standard class for RAIRESP is the same as the response class (also used for response only cal), and the RAIISOL standard class is the forward isolation class.

If more than one standard element has been defined for either class, another additional menu will occur with these choices.

hardkey RESPONSE MENU
mnemonic **MENURESP**

Present Response Menu.

---

MAIN MENU NONE (HARDKEY)

---

**Manual Sequence**

RESPONSE MENU
ELECTRICAL DELAY *or*
PHASE OFFSET *or*
AVERAGING ON/restart *or*
AVERAGING OFF *or*
SMOOTHING ON *or*
SMOOTHING OFF

**Program Sequence**

MENURESP;

softkey RESTORE DISPLAY
mnemonic **RESD**

Restore Measurement Display
After Tape Directory, Disc Directory,
Operating Parameters, or System Parameters Listing.

---

MAIN MENU COPY *or* TAPE/DISC
**PRIOR MENU** DIRECTORY *or* SYSTEM PARAMETERS
NEXT MENU COPY *or* TAPE/DISC *or* COPY MORE

SEE ALSO SYSTEM PARAMETERS,
OPERATING PARAMETERS,
DIRECTORY

---

**Manual Sequence**

*See* SYSTEM PARAMETERS *or* OPERATING PARAMETERS *or* DIRECTORY.

**Program Sequence**

*See* SYSTEM PARAMETERS *or* OPERATING PARAMETERS *or* DIRECTORY.

---

Pressing any front panel key or RESTORE DISPLAY restores the normal measurement display.

softkey RESUME CAL SEQUENCE
mnemonic **RESC**

Resume Measurement Calibration Sequence
After Leaving CAL Menu Structure
to Invoke or Change any Function.

---

MAIN MENU CAL
PRIOR MENU SEE BELOW
NEXT MENU SEE BELOW

---

**Manual Sequence: Example Using Full 2-Port Calibration**

CAL
CAL 1 *or* CAL 2
CALIBRATE: FULL 2-PORT
REFLECT'N
<measure standards>
REFLECT'N DONE
TRANSMISSION
<measure standards>
TRANS. DONE,
RESPONSE MENU
AVERAGING ON/restart 1024 x1
CAL
RESUME CAL SEQUENCE
ISOLATION
<measure standards>
ISOLATION DONE
SAVE 2-PORT CAL
CAL SET *n* (*n* = 1 - 8)

*continued* →

**Program Sequence: Example Using Full 2-Port Calibration**

```
CAL1; or CAL2;
  CALIFUL2;
    REFL;
      <measure standards>
        REFD;
          TRAN;
            <measure standards>
              TRAD;
                AVERON 1024;
                  RESC;
                    ISOL;
                      <measure standards>
                        ISOD;
                          SAV2;
                            CALS n;   (n = 1 - 8)
```

---

The measurement calibration sequence is reentered at the class selection level. Classes which are complete are not affected. If all necessary standards in the class have not been measured, measurement data for the partially completed class is lost.

For this reason, always complete measurement of all standards in the currently selected class before leaving the Cal menu structure.

softkey REV ISOL'N ISOL'N STD
mnemonic **REVI**

Measure Reverse Isolation Measurement Calibration Standard.

---

MAIN MENU CAL

SEE ALSO ISOLATION

---

**Manual Sequence**

*See* ISOLATION.

**Program Sequence**

*See* ISOLATION

---

Isolation always uses a single standard to measure transmission signal path crosstalk, $E_{XR}$. The isolation calibration is most effective when averaging is used (see ISOLATION). $S_{12}$ is selected, the standard is measured, and the class label is annotated as complete.

*Table 18. Select Standard Class*

| Mnemonic | Standard Class |
|---|---|
| CLASS11A | ($S_{11}$) : <$S_{11}$ 1st standard class label> |
| CLASS11B | ($S_{11}$) : <$S_{11}$ 2nd standard class label> |
| CLASS11C | ($S_{11}$) : <$S_{11}$ 3rd standard class label> |
| CLASS22A | ($S_{22}$) : <$S_{22}$ 1st standard class label> |
| CLASS22B | ($S_{22}$) : <$S_{22}$ 2nd standard class label> |
| CLASS22C | ($S_{22}$) : <$S_{22}$ 3rd standard class label> |
| FWDT | FWD. TRANS. <standard class label> |
| REVT | REV.TRANS. <standard class label> |
| FWDM | FWD. MATCH <standard class label> |
| REVM | REV. MATCH <standard class label> |
| FWDI | FWD. ISOL'N <standard class label> |
| REVI | REV. ISOL'N <standard class label> |
| TRLT | THRU <standard class label> |
| TRLR1 | $S_{11}$ REFLECT <standard class label> |
| TRLR2 | $S_{22}$ REFLECT <standard class label> |
| TRLL | LINE <standard class label> |

softkey REV. MATCH <class label>
mnemonic **REVM**

Measure Reverse Match
Measurement Calibration Standard.

---

MAIN MENU CAL

SEE ALSO TRANSMISSION

---

**Manual Sequence**

*See* TRANSMISSION.

**Program Sequence**

*See* TRANSMISSION.

---

In the 2-PORT measurement calibration sequence, $S_{22}$ of the Reverse Match standard (usually the thru) is measured to produce the error coefficient data for the Reverse Load Match error coefficient, $E_{LR}$. Since the label for the standard class and standard(s) are user-definable, the REVM mnemonic is used to select the standard class for measurement.

If a single standard comprises the class, $S_{22}$ is selected, the standard is measured, logic checks that the standard covers the complete current frequency range, and the class label is annotated as complete.

When TRANS. DONE is selected, the single standard does not cover the complete current frequency range then the message "CAUTION: ADDITIONAL STANDARDS NEEDED" is displayed and bit 1 of the Primary Status byte is set.

If the REV. MATCH standard class uses more than one standard, then the mnemonic selects $S_{22}$ and presents the standard selection menu. See STANASTANG to specify which standard to measure.

softkey REV. TRANS. <class label>
mnemonic **REVT**

Measure Reverse Transmission
Measurement Calibration Standard.

---

MAIN MENU CAL

SEE ALSO TRANSMISSION

---

**Manual Sequence**

*See* TRANSMISSION.

**Program Sequence**

*See* TRANSMISSION.

---

In the 2-PORT measurement calibration sequence, $S_{12}$ of the Forward Transmission standard (usually the thru) is measured to produce the error coefficient data for the Reverse Transmission Signal Path Frequency Response error coefficient, $E_{TR}$. (Isolation, Source Match and Load Match are also used in developing 2-PORT $E_{TR}$.) Since the label for the standard class and standard(s) are user-definable, the REVT mnemonic is used to select the standard class for measurement.

If a single standard comprises the class, $S_{12}$ is selected, the standard is measured, logic checks that the standard covers the complete current frequency range, and the class label is annotated as complete.

When TRANS. DONE is selected, the single standard does not cover the complete current frequency range then the message "CAUTION: ADDITIONAL STANDARDS NEEDED" is displayed and bit 1 of the Primary Status byte is set.

If the REV. TRANS. standard class uses more than one standard, then the mnemonic selects $S_{12}$ and presents the standard selection menu. See STANA - STANG to specify which standard to measure.

softkey RIGHT LOWER
mnemonic **RIGL**

Select Right Lower Quadrant for Plot
Using Digital Plotter on HP 8510 System Bus.

softkey RIGHT UPPER
mnemonic **RIGU**

Select Right Upper Quadrant for Plot
Using Digital Plotter on HP 8510 System Bus.

---

| | | | |
|---|---|---|---|
| MAIN MENU | COPY | | |
| PRIOR MENU | COPY | | |
| NEXT MENU | COPY | | |
| PRESET | FULL PAGE | | |
| COUPLED | ALWAYS COUPLED | RECALLED | YES |
| SEE ALSO | SELECT QUADRANT | | |

---

**Manual Sequence**

COPY
SELECT QUADRANT
RIGHT LOWER *or* RIGHT UPPER

**Program Sequence**

RIGL; *or* RIGU;

| | | | |
|---|---|---|---|
| hardkey | $S_{11}$ | hardkey | $S_{21}$ |
| mnemonic | **S11** | mnemonic | **S21** |
| hardkey | $S_{12}$ | hardkey | $S_{22}$ |
| mnemonic | **S12** | mnemonic | **S22** |

Select Basic S-Parameter on Selected Channel.

| | | | |
|---|---|---|---|
| MAIN MENU | NONE (HARDKEYS) | | |
| **PRESET** | CHANNEL 1: $S_{11}$<br>CHANNEL 2: $S_{21}$ | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |
| **SEE ALSO** | REDEFINE PARAMETER | | |

**Manual Sequence**

$S_{11}$ *or*
$S_{12}$ *or*
$S_{21}$ *or*
$S_{22}$

**Program Sequence**

S11; *or*
S21; *or*
S12; *or*
S22;

Selecting a parameter recalls the last selected FORMAT and RESPONSE characteristics for that parameter on the selected channel.

See REDEFINE PARAMETER for standard Basic parameter definitions.

Redefined Basic Parameters (except CONVERSION) cannot be saved or recalled.

softkey $S_{11}$ REFLECT <class label>
mnemonic **TRLR1**

Measure TRL Port 1 Reflection Standard.

softkey $S_{22}$ REFLECT <class label>
mnemonic **TRLR2**

Measure TRL Port 2 Reflection Standard.

softkey LINE <class or standard label>
mnemonic **TRLL**

Measure TRL Line Cal Standard Class.

---

**MAIN MENU** CAL

**SEE ALSO** CALIBRATE TRL 2-PORT

---

**Manual Sequence**

CAL
CAL 1 <cal kit 1 label> *or*
CAL 2 <cal kit 2 label>
TRL 2-PORT
THRU THRU *or*
$S_{11}$ REFLECT SHORT *or*
$S_{22}$ REFLECT SHORT *or*
LINE 2-18 LINE
DONE

**Program Sequence**

```
CAL1; or CAL2;
  CALITRL2;
    TRLT;
    TRLR1;
    TRLR2;
    ISOL;
      <measure isolation standards>
      TRLL;
        SAVT;
          CALSn; (n = 1 - 8)
```

---

The second line of the softkey name for these is user definable (standard label), if one standard is assigned to the TRL LINE class, or TRL LINE class label if only one standard is assigned.

These keys will cause the set of measurements needed to compute the error coefficients. They may be made in any order. TRLT and TRLL will cycle through a series of S-Parameter measurements, and then leave the system in $S_{11}$. TRLR1 and TRLR2 will measure and automatically select just one S-Parameter.

| | |
|---|---|
| softkey | ($S_{11}$): <$S_{11}$A class label> |
| mnemonic | **CLASS11A** |
| softkey | ($S_{11}$): <$S_{11}$B class label> |
| mnemonic | **CLASS11B** |
| softkey | ($S_{11}$): <$S_{11}$C class label> |
| mnemonic | **CLASS11C** |
| softkey | ($S_{22}$): <$S_{22}$A class label> |
| mnemonic | **CLASS22A** |
| softkey | ($S_{22}$): <$S_{22}$B class label> |
| mnemonic | **CLASS22B** |
| softkey | ($S_{22}$): <$S_{22}$C class label> |
| mnemonic | **CLASS22C** |

Select Calibration Standard Class;
if Single Standard in Class, Measure Standard.

---

**MAIN MENU** CAL

**SEE ALSO**
MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>
CALIBRATE: <cal type>

*continued* →

**Manual Sequence: $S_{11}$ 1-Port, 7 mm Cal Kit Example**

CAL
CAL 1 <cal kit 1 label> *or*
CAL 2 <cal kit 2 label>
$S_{11}$ 1-PORT
$S_{11}$: OPEN
$S_{11}$: SHORT
$S_{11}$: LOADS
BROADBAND
DONE: LOADS
SAVE 1-PORT CAL
CAL SET *n* (*n* = 1 - 8)

**Program Sequence: $S_{11}$ 1-Port, 7 mm Cal Kit Example**

CAL1; *or* CAL2;
CALIS111;
CLASS11A;
CLASS11B;
CLASS11C;
STANA;
DONE;
SAV1;
CALS *n*; (*n* = 1 - 8)

---

In the $S_{11}$ 1-PORT, $S_{22}$ 1-PORT, and 2-PORT REFLECTION measurement calibration sequences, three classes of standards (usually a short, an open, and a load) are measured at each port to produce the error coefficient data. Since the labels for each standard are user-definable, these mnemonics are used to select the standard class for measurement.

*continued* →

If a class uses more than one standard, then selecting the softkey or the mnemonic only presents the standard selection menu. See STANA-STANG to specify which standard to measure.

If a single standard comprises the class, the standard is measured, logic checks that the standard covers the complete current frequency range, and the class label is annotated as complete. If the single standard does not cover the complete current frequency range then the message "CAUTION: ADDITIONAL STANDARDS NEEDED" is displayed and bit 1 of the Primary Status byte is set.

*Table 19. Select Standard Class*

| Mnemonic | Standard Class |
|---|---|
| CLASS11A | ($S_{11}$) : <$S_{11}$ 1st standard class label> |
| CLASS11B | ($S_{11}$) : <$S_{11}$ 2nd standard class label> |
| CLASS11C | ($S_{11}$) : <$S_{11}$ 3rd standard class label> |
| CLASS22A | ($S_{22}$) : <$S_{22}$ 1st standard class label> |
| CLASS22B | ($S_{22}$) : <$S_{22}$ 2nd standard class label> |
| CLASS22C | ($S_{22}$) : <$S_{22}$ 3rd standard class label> |
| FWDT | FWD. TRANS. <standard class label> |
| REVT | REV.TRANS. <standard class label> |
| FWDM | FWD. MATCH <standard class label> |
| REVM | REV. MATCH <standard class label> |
| FWDI | FWD. ISOL'N <standard class label> |
| REVI | REV. ISOL'N <standard class label> |
| TRLT | THRU <standard class label> |
| TRLR1 | $S_{11}$ REFLECT <standard class label> |
| TRLR2 | $S_{22}$ REFLECT <standard class label> |
| TRLL | LINE <standard class label> |

mnemonic SAVC

Store Calibration Error Coefficients Sets
Loaded via HP 8510 HP-IB.

---

| | |
|---|---|
| **MAIN MENU** | NONE (HP-IB ONLY) |
| **SEE ALSO** | INPUCALC *n*<br>CAL SET *n* |

---

Select Cal Type, load error coefficient sets into HP 8510 memory using INPUCALC*n*, then issue SAVC and CALS*n*. Follow with CORRON; CALS *n*; to turn correction on. Correction is turned on and corrected data is displayed.

The Cal Set Limited Instrument State saved with the cal set reflects the instrument state at the time that SAVC is issued.

hardkey SAVE
mnemonic **MENUSAVE**

Present Save Instrument State Menu.

---

**MAIN MENU** NONE (HARDKEY)

**SEE ALSO** INST STATE *n*
SAVE *n*

---

**Manual Sequence**

SAVE
INST STATE 1 *or*
INST STATE 2 *or*
INST STATE 3 *or*
INST STATE 4 *or*
INST STATE 5 *or*
INST STATE 6 *or*
INST STATE 7 *or*
INST STATE (POWER UP) 8

**Program Sequence**

MENUSAVE;

---

If correction is turned on, then the references to the cal set(s) are saved, but not the actual contents of the cal sets.

Includes all Parameter/Format/Response selections, except that Basic Parameter redefinitions are not saved (see REDEFINE PARAMETER).

softkey SAVE 1-PORT CAL
mnemonic **SAV1**

1-Port Measurement Calibration Sequence is Complete.
Compute Reflection Calibration Errors Coefficients.

---

MAIN MENU CAL

---

**Manual Sequence**

*See* CALIBRATE: $S_{11}$ 1-PORT *and* CALIBRATE: $S_{22}$ 1-PORT.

**Program Sequence**

*See* CALIS111 *and* CALIS221.

---

Must be followed by CAL SET *n* or error coefficients will be lost.

softkey SAVE 2-PORT CAL
mnemonic **SAV2**

2-Port Measurement Calibration Sequence is Complete.
Compute Remaining Calibration Error Coefficients.

---

MAIN MENU CAL

---

**Manual Sequence**

*See* CALIBRATE: FULL 2-PORT *and*
CALIBRATE: ONE-PATH 2-PORT.

**Program Sequence**

*See* CALIFUL2 *and* CALIONE2 .

---

Must be followed by CAL SET *n* or error coefficients will be lost.

softkey SAVE RESP&ISOL
mnemonic **RAID**

Response and Isolation Cal Done. Followed by CALS*n*.

---

**MAIN MENU** CAL
**PRIOR MENU** CAL TYPE

**SEE ALSO** CALIBRATE: RESPONSE & ISOL'N

---

**Manual Sequence**

See CALIRAI

**Program Sequence**

See CALIRAI

---

"RAID" causes the error terms to be computed and prepared for saving into a calibration set. It must be followed by Cal Set *n*, or error coefficients will be lost.

softkey SAVE TRL 2-PORT
mnemonic SAVT

Save TRL 2-Port Measurement Calibration. Followed by CALSv.

---

| | |
|---|---|
| **MAIN MENU** | CAL |
| **PRIOR MENU** | CAL TYPE |
| **NEXT MENU** | CAL SET SELECT |
| **SEE** | CALIBRATE: TRL 2-PORT |
| | LOWBAND REFLECTION |

---

Error terms will be computed (if all needed measurements have been made), and prepared for storage in a cal set.

Must be followed by CAL SET n or error coefficients will be lost.

softkey SAVE USING ASCII
mnemonic SAVUASCI

Select ASCII Format for Disc Operation.

softkey SAVE USING BINARY
mnemonic SAVUBINA

Select Binary Format for Disc Operation.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | TAPE/DISC | | |
| **PRIOR MENU** | SET UP DISC | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | NOT CHANGED | | |
| **INITIALIZED** | BINARY | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | NO |

---

**Manual Sequence**

TAPE/DISC
  STORAGE IS DISC
    SET UP DISC
      SAVE USING BINARY *or*
      SAVE USING ASCII

**Program Sequence**

SAVUBINA or SAVUASCI

*continued* \

The HP 8510 Binary file format is intended for fast, compact disc data storage. ASCII format is intended for transferring data from the HP 8510 to an external computer. The following files are affected when either of these commands are executed:

DISPLAY MEMORIES
CAL SETS
RAW DATA
DATA DATA
FORMATTED DATA
DELAY TABLE

All other file types are stored in the Binary format, regardless of whether Binary or ASCII is selected.

ASCII files are stored as the "ASCII" file type of the logical interchange format (LIF). The data stored in an ASCII file is stored as "Common Instrumentation Transfer and Interchange File" (CITIFILE) format.

hardkey SCALE
mnemonic SCAL

Select Cartesian Y-axis and Polar Scale/division.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | NONE (HARDKEY) | | |
| **PRESET** | SEE BELOW | | |
| **RANGE** | DEPENDS UPON FORMAT | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

SCALE [entry] (x1 = basic units of format)

**Program Sequence**

SCAL [value]; (value = basic units of format)

---

For Polar displays, SCALE and REF VALUE interact.

For Smith and Inverted Smith displays, SCALE and REF VALUE are given in units of the LIN mkr on POLAR format.

PRESET selects appropriate SCALE values for each format.

It is used with the S-parameter test sets which provide automatic forward and reverse signal path switching.

For S-parameter test sets, the correct parameter is automatically selected during the measurement calibration and measurement sequences.

The order in which the standards are measured is not important.

This procedure cannot be used with reflection/transmisstion (one-path) test sets.

softkey SEARCH: LEFT
mnemonic **SEAL**

Active Marker Search Left from Curent Position for Selected Min, Max, or Target.

softkey SEARCH: RIGHT
mnemonic **SEAR**

Active Marker Search Right from Current Position for Selected Min, Max, or Target.

---

**MAIN MENU** MARKER
**PRIOR MENU** MARKER MORE
**NEXT MENU** NO

**PRESET** MARKER TO TARGET SEARCH
**COUPLED** N/A

**SEE ALSO** MARKMAXI
MARKMINI
MARKTARG

---

**Manual Sequence**

MARKER
MORE
TARGET VALUE
<input value>
SEARCH:
LEFT *or*
RIGHT

**Program Sequence**

SEAL *or* SEAR

*continued* →

Search left/right pertains to one of the following: Marker to target, marker to minimum, or marker to maximum. The search mode is highlighted, and can be different for channel 1 and channel 2. The mode is selected by pressing the associated softkey.

Pressing MARKER to TARGET searches for the first target value as discussed in MARKTARG. Search left or right then searches for the target value starting at the current stimulus value for the marker, and moving in the appropriate direction.

Pressing MARKER to MAXIMUM finds the global maximum value as discussed in MARKMAXI. Search left or right then searches for the local maximum in the region specified (e.g. from the current marker stimulus value to the lowest or highest stimulus value).

Note that a local maximum is defined as a point on the trace that is greater than its left and right neighbor points. In other words, it is a peak in its immediate region.

MARKER to MINIMUM functions in a similar manner.

softkey: SEGMENT
mnemonic: **SEGM**

Choose the Active Segment.

---

**MAIN MENU** STIMULUS

**SEE ALSO** EDITLIST

---

**Manual Sequence**

```
STIMULUS MENU
  MORE
    EDIT LIST
      SEGMENT numeric x1
        EDIT or
        DELETE
          <define segment>
        DONE
```

**Programming Sequence** Editlist:

```
EDITLIST:
  SEGM [value.]
    SDEL;
      EDITDONE;
```

---

This key allows the user to specify the active segment (shown by the arrow). This is the segment that is edited if EDIT is selected, and is the segment that is deleted when DELETE is pressed.

Selecting this as the active function also turns on the knob, STEP ↑, and STEP ↓ keys for scrolling through the list.

softkey: SEGMENT: CENTER
mnemonic: **CENT**

Specify the Center Frequency Value of the Current Segment.

softkey: SEGMENT: CW
mnemonic: **CWFREQ**

Change the Current Segment to a Single Frequency and Specify That Frequency.

softkey: SEGMENT: DONE
mnemonic: **SDON**

Incorporate the New Segment into the Frequency List.

softkey: SEGMENT: NUMBER of POINTS
mnemonic: **POIN**

Specify the Number of Segment Points in the Current Segment.

softkey: SEGMENT: SPAN
mnemonic: **SPAN**

Specify the Frequency Span of the Current Segment.

softkey: SEGMENT: START
mnemonic: **STAR**

Specify the Start Frequency of the Current Segment.

softkey: SEGMENT: STEP SIZE
mnemonic: **STPSIZE**

Specify the Current Frequency List Segment Step Size.

softkey: SEGMENT: STOP
mnemonic: **STOP**

Specify the Stop Frequency of the Current Segment.

---

**MAIN MENU** STIMULUS

**SEE ALSO** FREQUENCY LIST
SEGMENT

*continued* →

**Manual Sequence**

STIMULUS
MORE
EDIT LIST
EDIT *or*
ADD
SEGMENT: START [entry] (x1 = Hz) *or*
SEGMENT: STOP [entry] (x1 = Hz) *or*
SEGMENT: CENTER [entry] (x1 = Hz) *or*
SEGMENT: SPAN [entry] (x1 = Hz) *or*
SEGMENT: NUMBER of POINTS [entry] (x1 = integer # of points) *or*
SEGMENT: STEP SIZE [entry] (x1 = Hz) *or*
SEGMENT: CW [entry] (x1 = Hz) *or*
DONE
DONE

**Program Sequence**

```
EDITLIST;
  SADD;
    STAR [value];
    STOP [value];
    POIN [value];
  SDON;
  SADD
    CENT [value];
    SPAN [value];
    STPSIZE [value];
      SDON;
        EDITDONE
```

continued →

These are the keys and commands used to edit the active segment:

SEGMENT: DONE

This command completes the segment editing process. When received, the new frequency values from the segment are sorted into the frequency list. If Frequency List mode is currently selected, the new segment is measured.

SEGMENT: NUMBER OF POINTS

Use specify instead of modify.

SEGMENT: SPAN

Use specify instead of modify.

SEGMENT: START

Use specify instead of modify.

SEGMENT: STEP SIZE

This command changes the stepsize of the current segment. Changing the stepsize will alter the stop value of the segment and the number of poits so that the segment is divided into an integral number of steps.

SEGMENT: STOP

Preset clears frequency list.

softkey SELECT DEFAULTS

Present Select Trace Math Defaults Menu.

---

**MAIN MENU** DISPLAY

**PRESET** DEFAULT to MEMORY: 1 *and* MATH (/) for Channel 1
DEFAULT to MEMORY: 2 *and* MATH (/) for Channel 2

**COUPLED** ALWAYS UNCOUPLED **RECALLED** YES

**SEE ALSO** DISPLAY: MATH (<operator>)

---

**Manual Sequence**

DISPLAY
SELECT DEFAULTS
DEFAULT to MEMORY: 1 *or*
DEFAULT to MEMORY: 2 *or*
DEFAULT to MEMORY 3 *or*
DEFAULT to MEMORY: 4 *or*
MATH OPERATIONS *or*
MORE
ADD MEMORY 5-8
DATA from CHANNEL 1 *or*
DATA from CHANNEL 2

softkey SELECT LETTER

Current Selected Character is Added to Title.

---

MAIN MENU TITLE

---

Current selected character is indicated by the up arrow (↑) beneath the character. The up arrow position is controlled by the knob.

softkey SELECT PEN COLOR

Present Pen Color Select Menu.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | COPY | | |
| **PRIOR MENU** | SELECT PEN COLOR | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | PEN 1 for Channel 1<br>PEN 2 for Channel 2 | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |
| **SEE ALSO** | PEN 1 - PEN 8 | | |

---

**Manual Sequence**

COPY
SELECT PEN COLOR
PEN 1 *or*
PEN 2 *or*
PEN 3 *or*
PEN 4 *or*
PEN 5 *or*
PEN 6 *or*
PEN 7 *or*
PEN 8

**Program Sequence**

PEN *n* (*n* = 1 - 8)

---

Refer to plotter operating manual for plotter response to selection of non-existent pen.

softkey SELECT QUADRANT

Present Plot Quadrant Select Menu.

| | | | |
|---|---|---|---|
| **MAIN MENU** | COPY | | |
| **PRESET** | FULL PAGE | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |

**Manual Sequence**

COPY
SELECT QUADRANT *or*
LEFT UPPER *or*
LEFT LOWER *or*
RIGHT UPPER *or*
RIGHT LOWER *or*
FULL PAGE

softkey SERVICE FUNCTIONS

Present Service Functions Select Menu.

---

MAIN MENU SYSTEM

---

**Manual Sequence**

SYSTEM
SERVICE FUNCTIONS
SOFTWARE REVISION *or*
SYSTEM BUS "LOCAL" *or*
SYSTEM BUS "REMOTE" *or*
IF GAIN *or*
PEEK/POKE LOCATION *or*
PEEK *or*
POKE *or*
TEST MENU

softkey SERVICE SELECTIONS

Service Use Only.
Selects Display of Various Internal Test Points.

---

**MAIN MENU** PARAMETER
**PRIOR MENU** REDEFINE PARAMETER
**NEXT MENU** NONE

---

**Manual Sequence**

<select Basic or User parameter>
PARAMETER MENU
REDEFINE PARAMETER
NUMERATOR
SERVICE SELECTIONS
SERVICE: TEST CAL *or*
SERVICE: REF CAL *or*
SERVICE: DETECTOR GROUND *or*
SERVICE: ADC GROUND *or*
SERVICE: VCAL *or*
SERVICE: VREF
SERVICE: TEMP. 1 *or*
SERVICE: TEMP. 2 *or*
<other changes>
REDEFINE DONE

*continued* →

Program Sequence

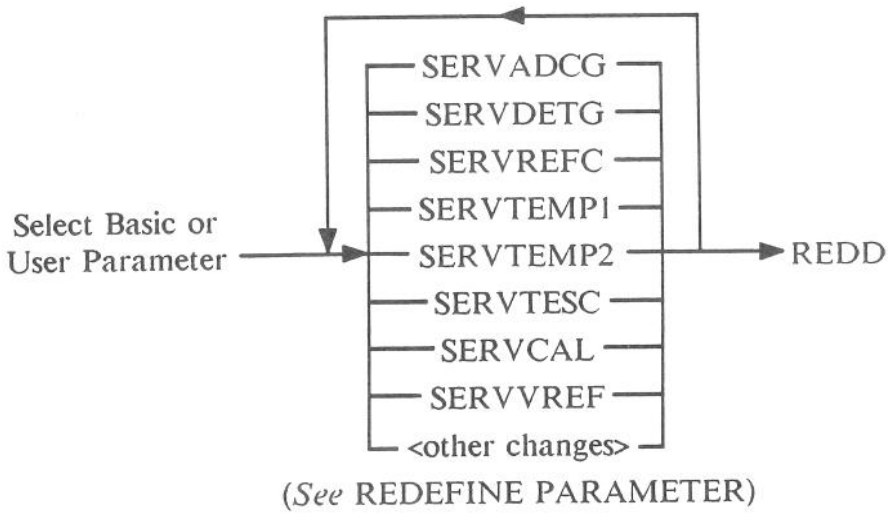


*Figure 14. Service Selections Program Sequence*

softkey SERVICE: ADC GROUND
mnemonic **SERVADCG**

softkey SERVICE: DETECTOR GROUND
mnemonic **SERVDETG**

softkey SERVICE: REF CAL
mnemonic **SERVREFC**

softkey SERVICE: TEMP. 1
mnemonic **SERVTEMP1**

softkey SERVICE: TEMP. 2
mnemonic **SERVTEMP2**

softkey SERVICE: TEST CAL
mnemonic **SERVTESC**

softkey SERVICE: VCAL
mnemonic **SERVVCAL**

softkey SERVICE: VREF
mnemonic **SERVVREF**

Service Use Only.

---

| | |
|---|---|
| **MAIN MENU** | PARAMETER |
| **PRIOR MENU** | SERVICE SELECTIONS |
| **NEXT MENU** | NONE |
| **PRESET** | STANDARD BASIC AND USER PARAMETER DEFINITIONS |
| **COUPLED** | ALWAYS COUPLED |
| **RECALLED** | BASIC PARAMETERS: NO<br>USER PARAMETERS: YES |
| **SEE ALSO** | SERVICE SELECTIONS |

---

**Manual Sequence**

*See* SERVICE SELECTIONS.

**Program Sequence**

*See* SERVICE SELECTIONS.

softkey SET FREQ. (LOW PASS)
mnemonic **SETF**

Set Frequency Range for Time Domain Low Pass Mode.

---

**MAIN MENU** CAL *or* DOMAIN

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence: CAL**

<select number of points>
CAL 1 <cal kit 1 label> *or*
CAL 2 <cal kit 2 label>
<set STOP frequency>
SET FREQ. (LOW PASS)
<select cal type>

**Program Sequence: CAL**

<select number of points>
CAL1; *or* CAL2;
<set STOP frequency>
SETF;
<select cal type>

*continued* →

**Manual Sequence: DOMAIN**

<select number of points>
<set STOP frequency>
DOMAIN
TIME LOW PASS
SET FREQ. (LOW PASS)
LOWPIMPU;
SPECIFY TIME
LOW PASS: STEP or
LOW PASS: IMPULSE

**Program Sequence: DOMAIN**

<select number of points>
<set STOP frequency>
TIML; (SETF is included in TIML)
LOWPSTEP;

*or*

---

Set the STOP frequency, then select SET FREQ (LOW PASS) which automatically sets the frequency sweep to

$$F_{start} = F_{stop} / \text{Number of Points}$$

where the START frequency to rounded to nearest Hz, or 45 MHz whichever is greater, then Fstop is set to

$$F_{stop} = \text{Number of Points} \cdot F_{start}$$

in order to obtain the harmonically related frequency steps necessary for TIME LOW PASS domain modes.

SET FREQ. (LOW PASS) may be used at any time, from the Cal Menu or the Domain Menu. If it has been selected once, selecting it again will have no effect unless the frequency range or number of points has been changed. Selecting SET FREQ. (LOW PASS) with CORRECTION ON, will cause correction to be turned off if the frequency range changes.

*Table 20. Minimum Frequency Ranges for Time Low Pass*

| Number of Points | Minimum Frequency Range (GHz) | | |
|---|---|---|---|
| | Start | Stop | |
| | | 2-point | DC |
| 51 | 0.045 | 1.170 | 2.295 |
| 101 | 0.045 | 2.295 | 4.545 |
| 201 | 0.045 | 4.545 | 9.045 |
| 401 | 0.045 | 9.045 | 18.045 |
| 801 | 0.045 | 18.045 | 36.045 |

softkey SET REF:: REFLECT
mnemonic **SETRREFL**

Set the Measurement Reference Plane in TRL
By the Thru Standard.

softkey SET REF:: THRU
mnemonic **SETRTHRU**

Set the Measurement Reference Plane in TRL
By the Reflection Standard.

---

**MAIN MENU** CAL
**PRIOR MENU** MODIFY CAL KIT
**NEXT MENU** *

**SEE ALSO** CALITRL2

---

**Manual Sequence**

See TRL OPTION
*
*

**Program Sequence**

*

---

During the TRL process, one of two approaches can be used to set the measurement reference plane:

1. SETRTHRU should be selected if the thru is zero-length, or relatively short compared to the difference between the thru and line (less than 2 - 3 times longer), or the phase characteristics of the reflection are not well known.

2. Select SETRREFL if the thru is physically long and the phase of the reflection is well known.

softkey SET UP DISC

Brings up the Menu That Allows Discs to be Initialized and Disc Unit, Volume Number, and Disc Format to be Set.

---

| | |
|---|---|
| **MAIN MENU** | TAPE/DISC |
| **PRIOR MENU** | TAPE/DISC |
| **NEXT MENU** | SET UP DISC |
| **SEE ALSO** | DISCUNIT |
| | DISCVOL |
| | INITIALIZE DISC |
| | SAVE USING ASCII |
| | SAVE USING BINARY |

---

**Manual Sequence**

TAPE/DISC
STOIDISC
SET UP DISC

softkey SET $Z_0$
mnemonic **SETZ**

Set System $Z_0$.

---

**MAIN MENU** CAL

**PRESET** $Z_0$ = 50 Ω

**COUPLED** ALWAYS COUPLED **RECALLED** YES

---

**Manual Sequence**

CAL
MORE
SET $Z_0$ [entry] (x1 = ohms)

**Program Sequence**

SETZ [value]; (value = ohms)

---

$Z_0$ is used as:

* The center point in the Smith and Inverted Smith formats.
* $Z_0$ in the load type calibration standard models.
* $Z_0$ in the REDEFINE PARAMETER, CONVERT to Z and CONVERT to Y definitions.

mnemonic **SIMS**

Simulate Standard Measurement.
Transfers Raw Data Into Selected Cal Coefficient Array.

---

**MAIN MENU** NONE (HP-IB ONLY)

**SEE ALSO** SRQM;
TRIG;

---

**Program Sequence**

```
<select instrument state>
  TRIG;
    CAL1; or CAL2;
      <select cal type>
        <select standard>
        <wait for Bit 2 of Primary Status Byte>
          SDC NWA (Selected Device Clear)
            INPURAW1;
              <send real, imaginary pairs>
                SIMS;
                  <repeat for each required standard>
                    DONE or SAVn; CALSn; (n = 1 - 8)
                      FRER;
```

---

This allows data to be used in any calibration to be supplied from an external computer.

To begin the calibration procedure, the HP 8510 is set to the TRIG mode. When data is normally measured during calibration, a request for trigger will occur (SEE SRQM - BIT #2). Instead of responding with an HP-IB trigger, do a device clear (CLEAR 716 in HP BASIC), input raw data of the simulated standard, and then do a SIMS. This will cause the input raw data to be used in place of measured data.

Repeat the standard selection, selected device clear, input data, and issue SIMS; for each required standard of the calibration type. Finally save the Cal Set. Use FRER; to return to the selected sweep mode.

softkey SINGLE
mnemonic **SING**

Execute a Single Group of Sweeps, then Hold.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | STIMULUS | | |
| **PRESET** | CONTINUAL | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |

---

**Manual Sequence**

STIMULUS MENU
MORE
SINGLE

**Program Sequence**

SING;

---

Operational equivalent to NUMBER of GROUPS 1. Bit 4 of the Primary Status byte is set upon completion of data acquisition.

After SING is issued to the HP 8510 HP-IB, HP-IB activity is held off until the group is complete.

softkey SINGLE CHANNEL
mnemonic **SINC**

Select Single Channel Display.

---

**MAIN MENU** DISPLAY

**PRESET** SINGLE CHANNEL
**RECALLED** YES

---

**Manual Sequence**

DISPLAY
SINGLE CHANNEL

**Program Sequence**

SINC;

---

In single channel display mode, only the measurements needed to display data for the selected channel are made.

For SINGLE CHANNEL display, only the selected channel Raw, Corrected, and Formatted data arrays are available.

If DUAL CHANNEL display has been selected, and at least 1 group of sweeps has been completed, selecting SINGLE CHANNEL does not delete the Raw Data arrays for the inactive channel.

softkey SINGLE POINT
mnemonic **SINP**

Select Single Point Mode.

---

**MAIN MENU** STIMULUS

**PRESET** RAMP
**COUPLED** ALWAYS COUPLED **RECALLED** YES

---

**Manual Sequence**

```
DOMAIN
  FREQUENCY
    STIMULUS MENU
      SINGLE POINT
        CENTER [entry]  (x1 = Hz)
```

**Program Sequence**

```
FREQ;
  SINP;
    CENT [value [freq or time suffix] ];
```

---

In the FREQUENCY domain, the center frequency of the current sweep is selected. Use the CENTER function to set the CW measurement frequency. Measurement data is taken once each time interval defined by the sweep time setting. Only the first point of the trace is new data; the remaining points are replicates of the first.

softkey SINGLE SEGMENT
mnemonic **SSEG**

Measure Single Frequency List Segment.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | STIMULUS | | |
| **PRIOR MENU** | STIMULUS | | |
| **PRESET** | ALL SEGMENTS | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |
| **SEE ALSO** | ALL SEGMENTS<br>FREQUENCY LIST | | |

---

**Manual Sequence**

STIMULUS MENU
FREQUENCY LIST
SINGLE SEGMENT
<enter segment number>, x1

**Program Sequence**

LISFREQ;
SSEG *n*; (n = segment number)

---

After pressing FREQUENCY LIST, the Frequency List Segment Select menu appears. SINGLE SEGMENT causes the Edit List Display to appear with Segment as the active function.

When SINGLE SEGMENT is selected directly after Preset, Segment 1 is active. Thereafter, the last selected segment is active. Enter the segment number to be measured using the knob, STEP keys, or numeric entry.

If CORRECTION ON is selected, correction is applied to thge current segment.

softkey SLIDE is SET
mnemonic **SLIS**

Measure One Position of Sliding Load.

---

**MAIN MENU** CAL

**SEE ALSO** SLIDING
SLIDING LOAD DONE
STANA - STANG

---

**Manual Sequence**

*See* STANA - STANG *and* SLIDING LOAD DONE.

**Program Sequence**

*See* STANA - STANG *and* SLID.

---

For best accuracy in measuring directivity, the slide is moved to result in 5 to 8 unique points distributed over the full 360 degrees at each frequency point. This is accomplished by moving the sliding element over its full range in 5 to 8 unequally spaced increments. If the sliding load has these increments marked on the housing, use the labeled increments, beginning with the slide closest to the test port.

If RAMP mode is selected, and averaging is on, averaging is restarted and n+1 sweeps are taken.

Any number (more than 5) of sliding load positions may be measured.

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softkey SLIDING
mnemonic **SLIL**

Define Load Type as Sliding.

---

MAIN MENU CAL

SEE ALSO FIXED
MODIFY 1 <cal set 1 label>
MODIFY 2 <cal set 2 label>
STANA - STANG
STD TYPE: LOAD

---

**Manual Sequence**

*See* STD TYPE: LOAD.

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

During a modify cal kit sequence, this keyword is used to specify that when the standard is selected during the measurement calibration sequence, the standard is treated as a sliding load requiring multiple measurements to obtain the value for directivity.

softkey SLIDING LOAD DONE
mnemonic **SLID**

Measurement of the Sliding Load is Complete.

---

MAIN MENU CAL

SEE ALSO SLIDING
SLIDE is SET
STANA - STANG

---

**Manual Sequence: Standard 7 mm Example**

CAL 1 *or* CAL 2
<select 1-PORT or 2-PORT cal>
LOADS
SLIDING
<position load element>
SLIDE is SET (repeat at 5 to 8 positions of sliding load)
SLIDING LOAD DONE
<measure other standards>
SAVE <cal type>
CAL SET *n* (*n* = 1 - 8)

**Program Sequence: Standard 7 mm Example**

CAL1; *or* CAL2;
<select 1-Port or 2-Port Refelction cal>
STANC;
<position load element>
SLIS; <repeat at 5 to 8 positions of sliding load>
SLID;
<measure other standards if required>
SAVE *n*; (*n* = 1 or 2)
CALS *n*; (*n* = 1 - 8)

*continued* →

A minimum of 5 slide positions (6 to 8 are recommended) are used to compute the center of the circle of points at each frequency and thus obtain the value for the directivity error coefficient.

After five slide positions are measured, the operator message changes from

"POSITION SLIDE THEN PRESS KEY TO MEASURE"

to "PRESS "DONE" IF FINISHED WITH STANDARDS". Any number (more than 5) of sliding load positions may be measured.

softkey SLOPE OFF
mnemonic **SLOPOFF**

Stimulus Power Slope Off.

softkey SLOPE ON
mnemonic **SLOPON**

Set Stimulus Power Slope (dB/GHz) for Source #1.

---

**MAIN MENU** STIMULUS
**PRIOR MENU** STIMULUS

**PRESET** SLOPE OFF
**COUPLED** MAY BE UNCOUPLED **RECALLED** YES

**SEE ALSO** POWER MENU

---

**Manual Sequence**

STIMULUS MENU
POWER MENU
SLOPE OFF *or*
SLOPE ON [entry] (x1 = dB/GHz)

**Program Sequence**

SLOPOFF; *or*
SLOPON [value]; (value = dB/GHz)

---

Controls the stimulus power slope function of source 1 only. Its operation is one in which power at the beginning of the sweep is equal to the current POWER setting, increasing by the selected dB/GHz at the end of the sweep. Use to increase the power in the upper frequency range to compensate for increased signal path losses.

Range and resolution are dependent upon the characteristics of the source; the source UNLEVELED indicator may light at high output levels.

hardkey SMITH CHART
mnemonic **SMIC**

Select Smith Chart Format
for Current Parameter on Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | NONE (HARDKEY) | | |
| **PRESET** | REF VALUE = 1<br>SCALE = 0.2/<br>REF POSN is not meaningful | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

<select channel>
<select parameter>
SMITH CHART

**Program Sequence**

<select channel>
<select parameter>
SMIC;

---

This format changes the display and measurement marker readout to :

$$S_{ij} = R_{ij} + jX_{ij}$$

where $S_{ij}$ is the selected parameter.

The REF VALUE represents the correspondingly scaled polar display outer circle value. Selection of REF VALUE of 0.05 or less changes the display format to a polar display.

Selecting SMITH CHART recalls the last selected RESPONSE selections on that channel.

At less than 4 mU, Smith charts are replaced with a polar chart. The marker always reads impedance.

softkey SMOOTHING OFF
mnemonic **SMOOOFF**

Select Smoothing Off
for Selected Channel.

softkey SMOOTHING ON
mnemonic **SMOOON**

Select Smoothing On
for Selected Channel.

---

**MAIN MENU** RESPONSE
**PRIOR MENU**
**NEXT MENU**

**PRESET** SMOOTHING OFF
SMOOTHING APERTURE 0.1 % of SPAN

**RANGE** 0.1 to 20.0 % of SPAN

**COUPLED** ALWAYS UNCOUPLED

---

**Manual Sequence**

<select channel>
RESPONSE MENU
SMOOTHING OFF *or*
SMOOTHING ON [entry] (x1 = percent of span)

**Program Sequence**

SMOOOF; *or*
SMOOON [value]; (value = percent of span)

*continued* →

Smoothing is a linear moving average of adjacent points on the trace. The presently selected Smoothing Aperture is displayed in percent of sweep width. The Stimulus Aperture (the width of the linear moving average) is displayed in parenthesis (Hz, seconds, or volts depending upon the domain selected). When Smoothing is turned on and has a non-zero value for the displayed channel, the Enhancement Annotation S is displayed on the CRT.

When Smith or Polar formats are selected, the Smoothing Aperture is displayed but the trace is not smoothed.

Percent of Span: 1, 2, 5, . . . sequence from 0.01 to 20 using STEP keys.

*Table 21. Smoothing Aperture*

| %Span | Number of Points | | | | |
|---|---|---|---|---|---|
| | 801 | 401 | 201 | 101 | 51 |
| 0.1 | 1 | 1 | 1 | 1 | 1 |
| 0.2 | 3 | 1 | 1 | 1 | 1 |
| 0.5 | 5 | 3 | 1 | 1 | 1 |
| 1.0 | 9 | 5 | 3 | 1 | 1 |
| 2.0 | 21 | 9 | 5 | 3 | 1 |
| 5.0 | 41 | 21 | 11 | 5 | 3 |
| 10.0 | 81 | 41 | 21 | 11 | 5 |
| 20.0 | 161 | 81 | 41 | 21 | 11 |

| | |
|---|---|
| mnemonic | **SOFT1** |
| mnemonic | **SOFT2** |
| mnemonic | **SOFT3** |
| mnemonic | **SOFT4** |
| mnemonic | **SOFT5** |
| mnemonic | **SOFT6** |
| mnemonic | **SOFT7** |
| mnemonic | **SOFT8** |

Press Softkey;
Execute Current Labeled Function.

---

MAIN MENU NONE (HP-IB ONLY)

---

**Program Sequence**

SOFT *n*; (*n* = 1 - 8)

---

These mnemonics are included to provide completeness, but it is not recommended that these be used in normal operation.

softkey SOFTWARE REVISION
mnemonic **SOFR**

Display HP 8510 Operating System Software Revision.

---

**MAIN MENU** SYSTEM
**PRIOR MENU** SYSTEM

**SEE ALSO** OUTPIDEN

---

**Manual Sequence**

SYSTEM
  SOFTWARE REVISION

**Program Sequence**

SOFR;

---

The software revision also appears in the Active Entry area at the end of the line power up sequence.

softkey SOURCE 1: EXT. LEVEL
mnemonic **SOU1EXTE**

Select Source 1 External Leveling

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM | | |
| **PRIOR MENU** | SYSTEM MORE | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | NOT CHANGED | **RECALLED** | NO |
| **INITIALIZED** | INTERNAL | | |
| **COUPLED** | ALWAYS COUPLED | | |

---

**Manual Sequence**

SYSTEM
MORE
POWER LEVELING
SOURCE 1: EXT. LEVEL

**Program Sequence**

SOU1EXTE;

---

The primary source (source 1) will level its power using external leveling. This leveling is used with 8349 series apllifiers. There are two kinds of external leveling on the 834XA and B, XTAL and [SHIFT] XTAL. This selection on the 8510 is the same as XTAL. For more information on these two modes refer to the Operating Section, under the sub-heading Leveling Functions, of the 834XA and B manuals. This selection is not affected by PRESET or Power-up or INSTRUMENT STATE RECALL. It is part of the hardware state.

softkey SOURCE 1: INTERNAL
mnemonic **SOU1INTE**

Select Source 1 Internal Leveling

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM | | |
| **PRIOR MENU** | SYSTEM MORE MENU | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | NOT CHANGED | **RECALLED** | NO |
| **INITIALIZED** | INTERNAL | | |
| **COUPLED** | ALWAYS | | |

---

**Manual Sequence**

SYSTEM
  MORE
    POWER LEVELING
      SOURCE 1: INTERNAL

**Program Sequence**

SOU1INTE;

---

The primary source (source 1) will level its power using its internal leveling. This selection is part of the Hardware State and is not changed by Power-up or PRESET or INSTRUMENT STATE RECALL.

softkey SOURCE 2: EXT. LEVEL
mnemonic **SOU2EXTE**

Select Source 2 External Leveling

---

| | | | |
|---|---|---|---|
| MAIN MENU | SYSTEM | | |
| PRIOR MENU | SYSTEM MORE | | |
| NEXT MENU | NONE | | |
| PRESET | UNCHANGED | RECALLED | NO |
| INITIALIZED | INTERNAL | | |
| COUPLED | ALWAYS | | |

---

**Manual Sequence**

SYSTEM
MORE
POWER LEVELING
SOURCE 2: EXT. LEVELING

**Program Sequence**

SOU2EXTE;

---

The secondary source (source 2) will level its power using its external leveling method. This leveling is used with 8349 series amplifiers. It is NOT the same as the shift external leveling on the HP 8340B or 8341B Synthesized Sweepers. This selection is part of the Hardware State definition. It is not affected by PRESET, Power-up, or INSTRUMENT STATE RECALL.

The second source must be connected to the HP 8510 system and specified in the multiple source menu in order to change its power leveling type.

softkey SOURCE 2: INTERNAL
mnemonic **SOU2INTE**

Select Source 2 Internal Leveling

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM | | |
| **PRIOR MENU** | SYSTEM MORE MENU | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | UNCHANGED | **RECALLED** | NO |
| **INITIALIZED** | INTERNAL | | |
| **COUPLED** | ALWAYS | | |

---

**Manual Sequence**

SYSTEM
  MORE
    POWER LEVELING
      SOURCE 2: INTERNAL

**Program Sequence**

SOU2INTE;

---

The secondary source (source 2) will level its power using the internal leveling method. This selection is part of the Hardware State and is not changed by PRESET, Power-up, or INSTRUMENT STATE RECALL. The second source must be connected to the HP 8510 system and specified in the multiple source menu in order to change its leveling type.

softkey SPACE

Next Character in Title is a Space.

---

**MAIN MENU** TITLE

hardkey SPAN
mnemonic SPAN

Select Center/Span Stimulus Mode;
Active Function is Current SPAN Value.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | NONE (HARDKEY) | | |
| **PRESET** | SEE BELOW | | |
| **RANGE** | DEPENDS UPON SOURCE | | |
| **COUPLED** | MAY BE COUPLED | **RECALLED** | YES |

---

**Manual Sequence**

SPAN, [entry] (x1=Hz, seconds, *or* volts)

**Program Sequence**

SPAN [value [suffix] ];

---

In the FREQUENCY domain, CENTER/SPAN sets the frequency sweep; in the TIME domain, sets the display upper and lower x-axis limits; in the AUX. VOLT OUTPUT domain, sets the upper and lower limits of the AUX VOLT OUTPUT ANALOG ± 10V ouput.

PRESET selects FREQUENCY DOMAIN, START/STOP stimulus mode, and appropriate frequency range according to test set.

Refer to SEGMENT when using the HP-IB mnemonic SPAN with FREQUENCY LIST.

softkey SPECIFY CLASS

Present Specify Class Menu.

---

**MAIN MENU** CAL

**SEE ALSO** SPECIFY: <class>

---

**Manual Sequence**

CAL
  MORE
    MODIFY 1 <cal kit 1 label> *or*
    MODIFY 2 <cal kit 2 label>
    SPECIFY CLASS
      SPECIFY: $S_{11}A$ *or*
      SPECIFY: $S_{11}B$ *or*
      SPECIFY: $S_{11}C$ *or*
      SPECIFY: $S_{22}A$ *or*
      SPECIFY: $S_{22}B$ *or*
      SPECIFY: $S_{22}C$ *or*
      MORE
        SPECIFY: FWD. TRANS. *or*
        SPECIFY: REV. TRANS. *or*
        SPECIFY: FWD. MATCH *or*
        SPECIFY: REV. MATCH *or*
        SPECIFY: RESPONSE
        CLASS DONE (SPEC'D)
          <other changes>
            KIT DONE (MODIFIED)

**Program Sequence**

*See* MODI1 *and* MODI2.

---

At least one and up to seven standards are assigned to each standard class.

softkey SPECIFY GATE

Present Specify Gate Menu.

---

**MAIN MENU** DOMAIN

**SEE ALSO** GATE ON

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN
SPECIFY GATE
GATE ON *or*
GATE OFF *or*
GATE START *or*
GATE STOP *or*
GATE CENTER *or*
GATE SPAN *or*
GATE SHAPE

**Program Sequence**

*See* GATE ON.

softkey SPECIFY OFFSET

Present Specify Offset Menu.

---

**MAIN MENU** CAL

**SEE ALSO** MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

```
CAL
  MORE
    MODIFY 1 <cal kit 1 label> or
    MODIFY 2 <cal kit 2 label>
      DEFINE STANDARD entry x1
        STD TYPE : <std type>
          SPECIFY OFFSET
          (menu depends upon STD TYPE selection)
            <specify standard characteristics>
              STD OFFSET DONE
                <other changes>
                  KIT DONE (MODIFIED)
```

**Program Sequence**

*See* MODI1 *and* MODI2.

---

Used when the current cal standard termination is offset from the reference plane.

softkey SPECIFY TIME

Present Specify Time Menu.

---

**MAIN MENU** DOMAIN

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN
SPECIFY TIME
LOW PASS: STEP *or*
LOW PASS: IMPULSE
WINDOW: MAXIMUM *or*
WINDOW: NORMAL *or*
WINDOW: MINIMUM

**Program Sequence**

*See* LOW PASS : STEP *or* LOW PASS : IMPULSE *and* WINDOW : <type> .

| | | | |
|---|---|---|---|
| softkey | SPECIFY: ADAPTER | softkey | SPECIFY: RESPONSE |
| mnemonic | **SPECADAP** | mnemonic | **SPECRESP** |
| softkey | SPECIFY: FWD. ISOL'N | softkey | SPECIFY: REV. ISOL'N |
| mnemonic | **SPECFWDI** | mnemonic | **SPECREVI** |
| softkey | SPECIFY: FWD. MATCH | softkey | SPECIFY: REV. MATCH |
| mnemonic | **SPECFWDM** | mnemonic | **SPECREVM** |
| softkey | SPECIFY: FWD. TRANS. | softkey | SPECIFY: REV. TRANS |
| mnemonic | **SPECFWDT** | mnemonic | **SPECREVT** |

| | | | |
|---|---|---|---|
| softkey | SPECIFY: $S_{11}A$ | softkey | SPECIFY: $S_{22}A$ |
| mnemonic | **SPECS11A** | mnemonic | **SPECS22A** |
| softkey | SPECIFY: $S_{11}B$ | softkey | SPECIFY: $S_{22}B$ |
| mnemonic | **SPECS11B** | mnemonic | **SPECS22B** |
| softkey | SPECIFY: $S_{11}C$ | softkey | SPECIFY: $S_{22}C$ |
| mnemonic | **SPECS11C** | mnemonic | **SPECS22C** |

| | |
|---|---|
| softkey | SPECIFY: TRL LINE |
| mnemonic | **SPECTRLL** |
| softkey | SPECIFY: TRL REFLECT |
| mnemonic | **SPECTRLR** |
| softkey | SPECIFY: TRL THRU |
| mnemonic | **SPECTRLT** |

Specify from One to Seven
Calibration Standards in each Class.

---

**MAIN MENU** CAL

*continued* →

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
SPECIFY CLASS
SPECIFY: <class> stanAno x1 [stanBno x1] ... [stanGno x1]
(stanA - Gno = stdno = 1 - 21)
(terminate each standard number with x1)
CLASS DONE (SPECIFIED),
<other changes>,
KIT DONE (MODIFIED).

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

Assign the appropriate standards to each class by entering the number of each of the from one to seven standards to be used in the class.

If only one standard is assigned to a class, then the standard label is displayed on the cal menu.

If more than two standards are assigned to a class, then pressing the class label key presents the Standard Selection menu which lists the labels of the standards assigned to the class.

After selecting the class to be specified, the title area will display the present definition as a series of standard numbers.

softkey SPLIT
mnemonic **SPLI**

Select Dual Channel Split Display Format.

---

| | |
|---|---|
| MAIN MENU | DISPLAY |
| **preset** | SINGLE CHANNEL |
| **RECALLED** | YES |

---

**Manual Sequence**

DISPLAY
DUAL CHANNEL
SPLIT

**Program Sequence**

SPLI;

---

The current Channel 1 and Channel 2 measurement displays are presented, with Channel 1 on the left and Channel 2 on the right. Uncoupled functions apply to the currently selected channel.

mnemonic **SRQM**

Set SRQ Mask.

| | |
|---|---|
| **MAIN MENU** | NONE (HP-IB ONLY) |
| **PRESET** | STATUS BYTES = 0 , 0<br>NOT CHANGED UNLESS A PROBLEM IS DETECTED |
| **RANGE** | 0- 255, each byte |
| **COUPLED** | ALWAYS COUPLED **RECALLED** NO |

**Program Sequence**

SRQM <bytea> , <byteb>; (bytea, byteb = ASCII Integers)

Send two ASCII integers from 0 to 255 to mask selected bits of the Status bytes and thus enable HP 8510 SRQ generation if the masked bits are set during operation. Mask does not affect OUTPSTAT.

Cleared on Power Up, addressed device clear.

bytea = primary status byte, 0 - 255
byteb = secondary status byte, 0 - 255.

*continued* →

*Table 22. HP 8510 Status Bytes*

| **Primary Status Byte (#1)** | | | | |
|---|---|---|---|---|
| **Bit #** | **7** | **6** | **5** | **4** |
| **Decimal Value** | **128** | **64** | **32** | **16** |
| **Function** | Reason in Extended Byte | RQS (SRQ issued) | Syntax Error | SING, NUMG, cal std measurement complete |
| **Bit #** | **3** | **2** | **1** | **0** |
| **Decimal Value** | **8** | **4** | **2** | **1** |
| **Function** | One-Path 2-Port Measurement. Wait for GET after REVERSE DEVICE. | TRIG Mode, Waiting for GET (next point or sweep) or SIMS; also FASC; ready for GET menu Hardware Trigger | Data Entry Complete | CAUTION Message Displayed |
| **Extended Status Byte (#2)** | | | | |
| **Bit #** | **7** | **6** | **5** | **4** |
| **Decimal Value** | **128** | **64** | **32** | **16** |
| **Function** | not used | not used | not used | not used |
| **Bit #** | **3** | **2** | **1** | **0** |
| **Decimal Value** | **8** | **4** | **2** | **1** |
| **Function** | not used | Power ON Sequence Complete | Key Pressed | not used |

| | | |
|---|---|---|
| mnemonic | **STANA** | (1st Std) |
| mnemonic | **STANB** | (2nd Std) |
| mnemonic | **STANC** | (3rd Std) |
| mnemonic | **STAND** | (4th Std) |
| mnemonic | **STANE** | (5th Std) |
| mnemonic | **STANF** | (6th Std) |
| mnemonic | **STANG** | (7th Std) |

Select Calibration Standard in Class;
Measure Standard.

---

**MAIN MENU** NONE (HP-IB ONLY)

**SEE ALSO** CALIBRATE: <cal type>

---

**Program Sequence: Open, Fixed Load, Arbitrary Impedance, Short, and Delay/thru Type Standards**

CAL1; *or* CAL2;
  <select cal type>
    <select class>
      STAN *n*; (*n* = A, B, C, D, E, F, G)
        SAVE *n*; (*n* = 1 *or* 2) *or* DONE;
          CALS *n*; (*n* = 1 - 8)

**Sliding Load Type Standards (STANC of 7 mm LOADS)**

STANC;
  SLIS; (5 slides minimum, 8 recommended)
    SLID;

*continued* →

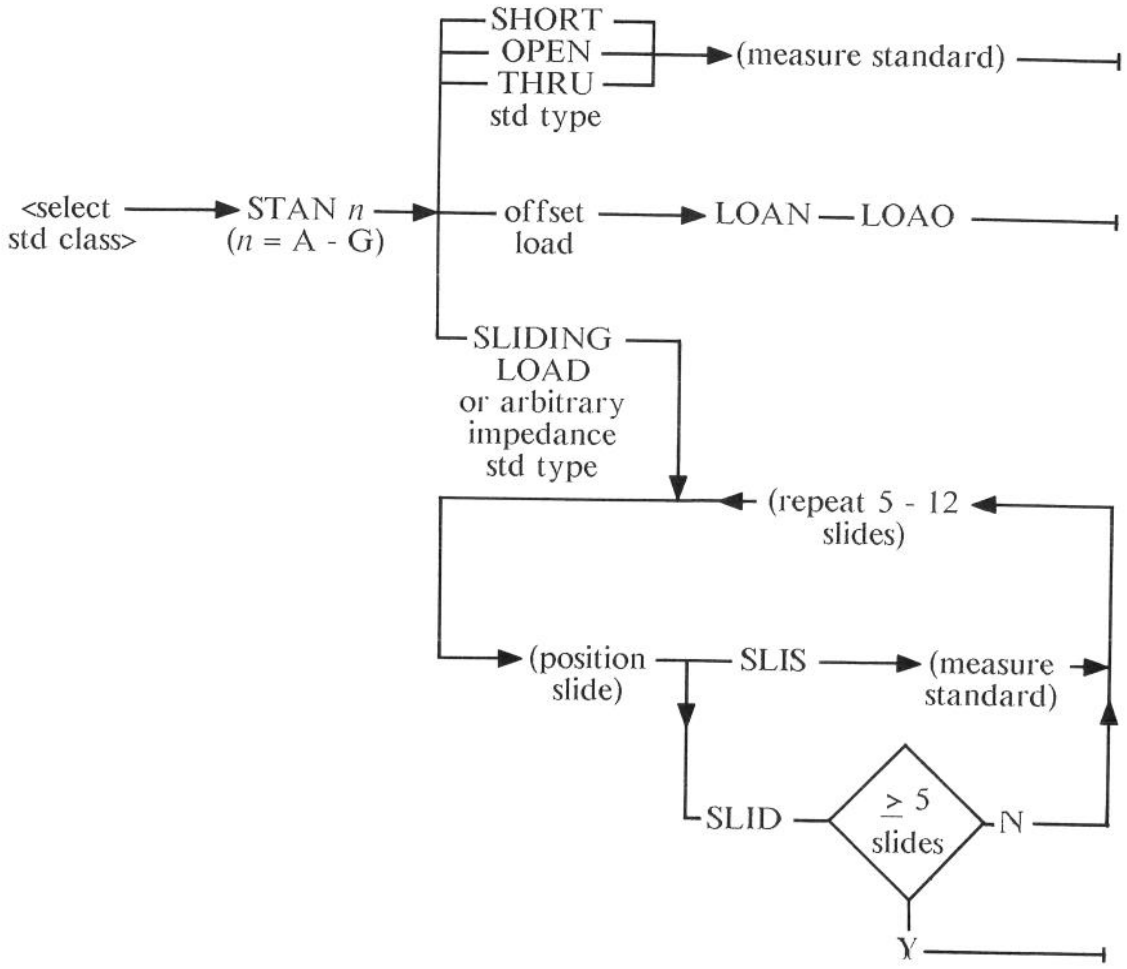



*Figure 15. STANA - STANG Program Sequence*

When two or more standards are assigned to a Class, selecting the Class presents the Standard Selection Menu. Since the labels for the calibration standards are user-definable, these mnemonics are used to specify the current standard for measurement.

Causes MEASUREMENT RESTART, then the standard is measured.

If RAMP mode and averaging on, n+1 groups are taken where n is the averaging factor.

The sliding load sequence is also initiated by standard class selection if the sliding load is the only standard in the class.

*continued* →

*Table 23. Select Calibration Standards in Class*

| Mnemonic | 7 mm and 3.5 mm Standard Labels | |
|---|---|---|
| | $S_{11}$ and $S_{22}$ Loads | Response |
| **STANA** | BROADBAND | OPEN |
| **STANB** | SLIDING | SHORT |
| **STANC** | LOWBAND | THRU |
| **STAND** | OffsetLoad | (not used) |
| **STANE** | (not used) | (not used) |
| **STANF** | (not used) | (not used) |
| **STANG** | (not used) | (not used) |

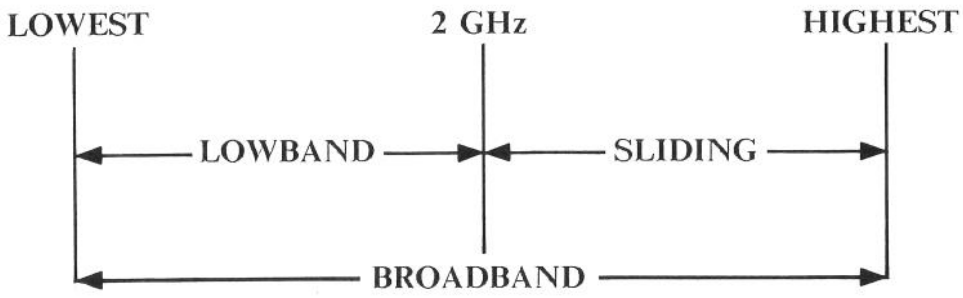



*Figure 16. LOADS Frequency Ranges*

hardkey START
mnemonic **STAR**

Select Start/Stop Stimulus Mode;
Active Function is Current START Value.

| | | | |
|---|---|---|---|
| **MAIN MENU** | NONE (HARDKEY) | | |
| **PRESET** | SEE BELOW | | |
| **RANGE** | DEPENDS UPON SOURCE | | |
| **COUPLED** | MAY BE COUPLED | **RECALLED** | YES |

**Manual Sequence**

START [entry] (x1 = Hz, seconds, *or* volts)

**Program Sequence**

STAR [ value [suffix] ];

*continued* →

In the FREQUENCY domain, START/STOP sets the frequency sweep.

In the TIME domain, START/STOP sets the display upper and lower x-axis limits. In the TIME domain mode, START/STOP also sets the upper and lower limits of the AUX VOLT OUTPUT ANALOG +/-10V ouput.

PRESET selects FREQUENCY DOMAIN, START/STOP Stimulus mode, and sets the start and stop frequencies at the limits of the frequency range of the test set being used. Unless changed by the user, Instrument State 8 (Power Up) sets the start and stop frequencies, regardless of test set, at 2 GHz and 18 GHz.

Minimum selectable start frequency is 45 MHz.

Refer to SEGMENT when using the HP-IB mnemonic STAR with FREQUENCY LIST.

softkey STD DONE (DEFINED)
mnemonic **STDD**

All Characteristics of the Current Calibration Standard are Defined.

---

**MAIN MENU** CAL

**SEE ALSO** DEFINE STANDARD
MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

*See* DEFINE STANDARD.

**Program Sequence**

*See* MODIFY 1 *or* MODIFY 2.

---

STD DONE (DEFINED) automatically changes the last character of the cal kit label to an asterisk ( * ) to indicate that the standard cal kit has been modified.

softkey STD OFFSET DONE

Offset Characteristics of the Current Standard are Specified.
Return to Next Higher Menu.

---

**MAIN MENU** CAL

**SEE ALSO** SPECIFY OFFSET
MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

*See* SPECIFY OFFSET.

**Program Sequence**

*See* MODI1 *and* MODI2.

softkey STD TYPE : ARBITRARY IMPEDANCE
mnemonic **STDTARBI**

Specify Current Standard as an Arbitrary (other than $Z_0$) Terminating Impedance.

---

**MAIN MENU** CAL
**PRIOR MENU** DEFINE STANDARD
**NEXT MENU**

**PRESET**
**INITIALIZED** **RANGE**
**COUPLED** **RECALLED**

**SEE ALSO** MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
DEFINE STANDARD entry x1 (entry = stdno = 1 - 22)
STD TYPE: ARBITRARY IMPEDANCE
TERMINAL IMPEDANCE [entry] (x1 = ohms)
FIXED *or* SLIDING
SPECIFY OFFSET
OFFSET DELAY [entry] (x1 = ps)
OFFSET LOSS [entry] (x1 = Gohms/second)
OFFSET $Z_0$ [entry] (x1 = ohms)
MAXIMUM FREQUENCY [entry] (x1 = Hz)
MINIMUM FREQUENCY [entry] (x1 = Hz)
COAX *or* WAVEGUIDE
STD OFFSET DONE
LABEL STD
<enter std label> (see TITLE)
STD DONE (DEFINED)
<other changes>
KIT DONE (DEFINED)

*continued* →

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

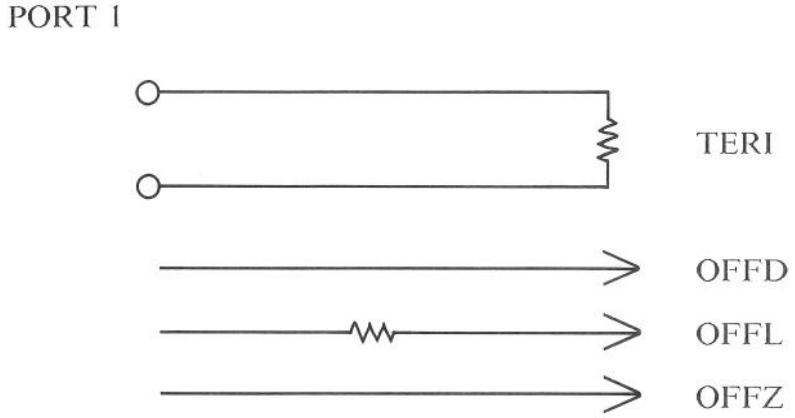



*Figure 17. Arbitrary Impedance Standard*

softkey STD TYPE: DELAY/THRU
mnemonic **STDTDELA**

Specify Current Standard as a Thru or Arbitrary Delay.

---

**MAIN MENU** CAL

**SEE ALSO** MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
DEFINE STANDARD entry x1 (entry = stdno = 1 - 22)
STD TYPE: DELAY/THRU
SPECIFY OFFSET
OFFSET DELAY [entry] (x1 = picoseconds)
OFFSET LOSS [entry] (x1 = Gohms/second)
OFFSET $Z_0$ [entry] (x1 = ohms)
MINIMUM FREQUENCY [entry] (x1 = Hz)
MAXIMUM FREQUENCY [entry] (x1 = Hz)
COAX or WAVEGUIDE
STD OFFSET DONE
LABEL STD
<enter std label> (see TITLE)
STD DONE (DEFINED)
<other changes>
KIT DONE (DEFINED)

*continued* →

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

Used to define a two-port standard.

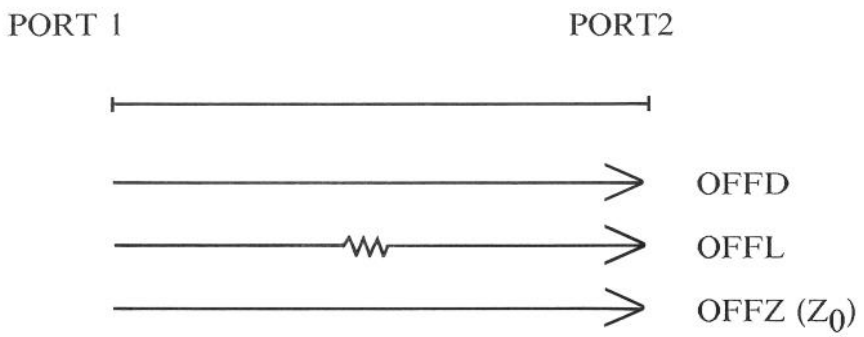



*Figure 18. Delay/Thru Standard*

Only OFFD needs to be specified for devices used in ADAPTER std. class.

softkey STD TYPE: LOAD
mnemonic **STDTLOAD**

Specify Current Standard as a $Z_0$ Termination.

---

**MAIN MENU** CAL

**SEE ALSO** SET $Z_0$
MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
DEFINE STANDARD entry x1 (entry = stdno = 1 - 21)
STD TYPE : LOAD
FIXED *or* SLIDING
SPECIFY OFFSET
OFFSET DELAY [entry] (x1 = picoseconds)
OFFSET LOSS [entry] (x1 = Gohms/second)
OFFSET $Z_0$ [entry] (x1 = ohms)
MINIMUM FREQUENCY [entry] (x1 = Hz)
MAXIMUM FREQUENCY [units] (x1 = Hz)
COAX *or* WAVEGUIDE
STD OFFSET DONE
LABEL STD
<enter std label> (see TITLE)
STD DONE (DEFINED)
<other changes>
KIT DONE (DEFINED)

*continued* →

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

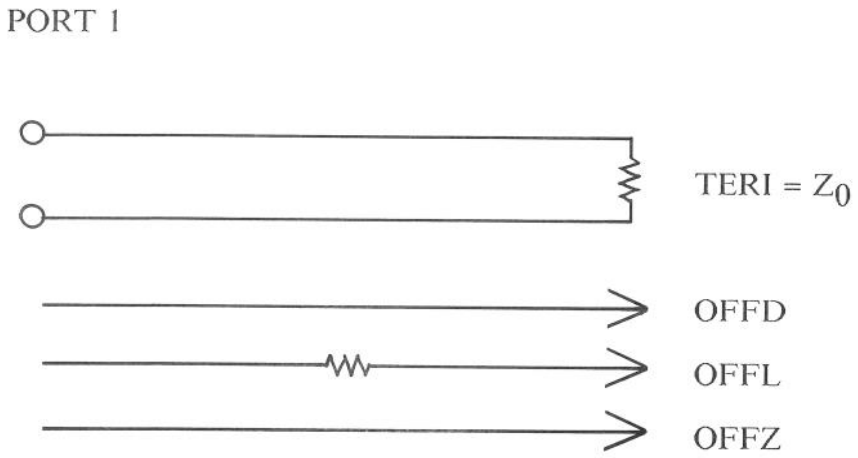



*Figure 19. Load Standard*

softkey STD TYPE: OPEN
mnemonic **STDTOPEN**

Specify Current Standard
as an Open Circuit Termination.

---

**MAIN MENU** CAL

**SEE ALSO** MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
DEFINE STANDARD [entry] (x1 = stdno = 1 - 22)
STD TYPE: OPEN
$C_0$ [entry] (x1=x$10^{-15}$F)
$C_1$ [entry] (x1=x$10^{-27}$F/Hz)
$C_2$ [entry] (x1=x$10^{-36}$F/Hz$^2$)
$C_3$ [entry] (x1=x$10^{-45}$F/Hz$^3$)
SPECIFY OFFSET
OFFSET DELAY [entry] (x1=picoseconds)
OFFSET LOSS [entry] (x1=Gohms/second)
OFFSET $Z_0$ [entry] (x1=ohms)
MINIMUM FREQUENCY [entry] (x1=Hz)
MAXIMUM FREQUENCY [entry] (x1 = Hz)
COAX *or* WAVEGUIDE
STD OFFSET DONE
LABEL STD
<enter std label>
(see TITLE)
STD DONE (DEFINED)
<other changes>
KIT DONE (MODIFIED)

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

Specify the magnitude and phase response of the Open Circuit calibration standard using a combination of fringing capacitive reactance (see C0, C1, C2, and C3) to model the non-linear phase shift, an offset delay to model the characteristic phase shift (linear coaxial or standard rectangular waveguide), and offset loss to model its loss.

Open circuit standards are usually only applicable in COAX.

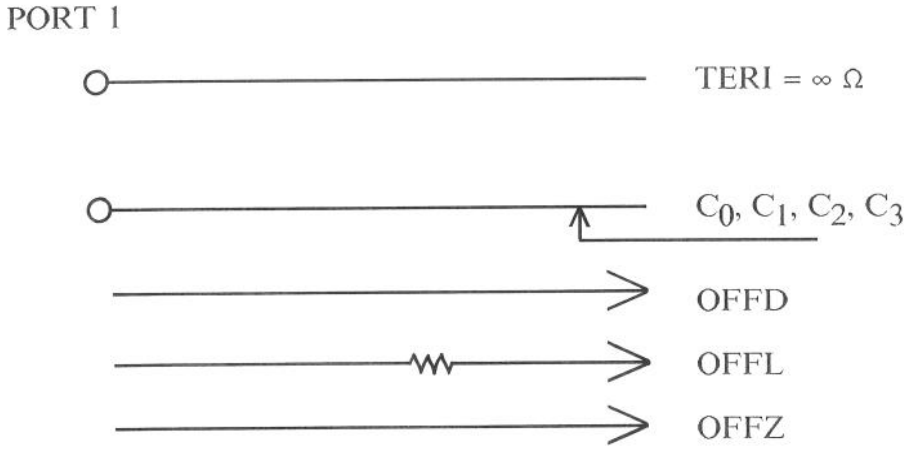



*Figure 20. Open Standard*

softkey STD TYPE: SHORT
mnemonic **STDTSHOR**

Specify Current Standard as a Short Circuit Termination.

---

**MAIN MENU** CAL

**SEE ALSO** MODIFY 1 <cal kit 1 label>
MODIFY 2 <cal kit 2 label>

---

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
DEFINE STANDARD entry x1 (entry = stdno = 1 - 22)
STD TYPE: SHORT
SPECIFY OFFSET
OFFSET DELAY [entry] (x1 = picoseconds)
OFFSET LOSS [entry] (x1 = Gohms/second)
OFFSET $Z_0$ [entry] (x1 = ohms)
MINIMUM FREQUENCY [entry] (x1 = Hz)
MAXIMUM FREQUENCY [entry] (x1 = Hz)
COAX *or* WAVEGUIDE
STD OFFSET DONE
LABEL STD
<enter std label> (see TITLE)
STD DONE (DEFINED)
<other changes>
KIT DONE (MODIFIED)

*continued* →

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

PORT 1

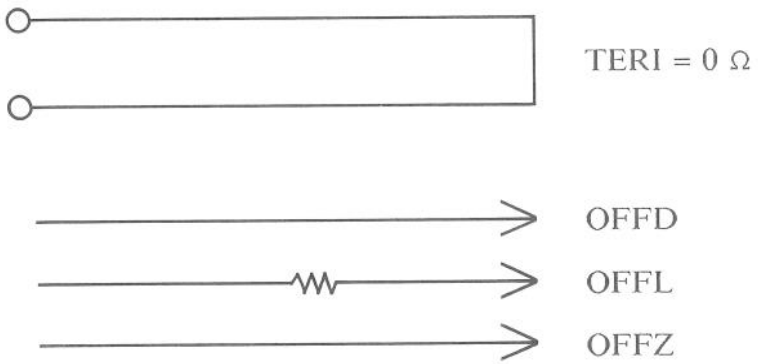



*Figure 21. Short Standard*

softkey STEP
mnemonic **STEP**

Select Step Sweep Mode in which the Source is Phase-Locked at Each Frequency Point.

---

| | | | |
|---|---|---|---|
| MAIN MENU | STIMULUS | | |
| **PRESET** | RAMP | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |

---

**Manual Sequence**

STIMULUS MENU
STEP

**Program Sequence**

STEP;

---

STEP sweep mode is used only with HP 8340x-series synthesized sweepers. It is a digital sweep beginning at the START frequency and ending at the STOP frequency with the source phase-locked and the data measured at frequency intervals determined by the NUMBER of POINTS selection. An up arrow on the trace identifies the data point just measured. This mode provides best frequency accuracy and repeatability.

Dwell time prior to measurement at each frequency point is controlled by the SWEEP TIME setting. Measurement time at each point is determined by the averaging factor.

TRIM SWEEP is not used for STEP sweep.

In TRIG mode, GET causes data acquisition for next point. Data acquisition process depends upon ADDRESS of SOURCE, ADDRESS of TEST SET, and LOCK to selection.

hardkey STEP ↓
mnemonic **DOWN**

hardkey STEP ↑
mnemonic **UP**

Decrease or Increase Current Active Function.

---

**MAIN MENU** NONE (HARDKEY)

---

**Manual Sequence**

<select active function>
STEP ↓ *or*
STEP ↑ *or*

**Program Sequence**

<select active function>
DOWN; *or*
UP;

---

The step size for each function is determined algorithmically by internal logic and is not settable by the user.

hardkey STIMULUS MENU
mnemonic **MENUSTIM**

Present Stimulus Menu.

---

MAIN MENU NONE (HARDKEY)

---

**Manual Sequence**

STIMULUS MENU
- POWER MENU *or*
- SWEEP TIME *or*
- NUMBER OF POINTS *or*
- SINGLE POINT *or*
- RAMP *or*
- STEP *or*
- MORE
  - HOLD *or*
  - SINGLE *or*
  - NUMBER of GROUPS *or*
  - CONTINUAL *or*
  - COUPLED CHANNELS *or*
  - UNCOUPLED CHANNELS

**Program Sequence**

MENUSTIM;

hardkey STOP
mnemonic **STOP**

Select Start/Stop Stimulus Mode;
Active Function is Current STOP Value.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | NONE (HARDKEY) | | |
| **PRESET** | SEE BELOW | | |
| **RANGE** | DEPENDS ON DOMAIN | | |
| **COUPLED** | MAY BE UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

STOP [entry] (x1 = Hz, seconds, *or* volts)

**Program Sequence**

STOP [value [ suffix ] ];

---

In the FREQUENCY domain, START/STOP sets the frequency sweep; in the TIME domain, sets the display upper and lower x-axis limits; in the AUX. VOLT OUTPUT domain, sets the upper and lower limits of the AUX VOLT OUTPUT ANALOG ±10V output.

PRESET selects FREQUENCY domain, START/STOP Stimulus mode, appropriate frequency range according to test set.

Maximum selectable stop frequency is set by limitations of the source.

Refer to SEGMENT when using the HP-IB mnemonic STOP with FREQUENCY LIST.

softkey STORAGE IS DISC
mnemonic **STOIDISC**

Select Disc for Store/Load/Delete Operations.

softkey STORAGE IS TAPE
mnemonic **STOITAPE**

Select Internal Tape for Store/Load/Delete Operations.

---

**MAIN MENU** TAPE/DISC
**PRIOR MENU** TAPE/DISC
**NEXT MENU** NONE

**PRESET** STORAGE IS TAPE

**RANGE** TAPE OR DISC
**RECALLED** YES

**SEE ALSO**

INIT DISC? YES
ADDRESS of DISC
DISC UNIT NUMBER
DISC VOLUME
SAVE USING BINARY
SAVE USING ASCII
STORE

---

**Manual Sequence**

TAPE/DISC
  STORAGE IS DISC *or*
  STORAGE IS TAPE
    <select operation>

**Program Sequence**

STOIDISC; *or*
STOITAPE;
  <select operation>

---

Selects the active storage device (tape or disc).

softkey STORE
mnemonic **STOR**

Store Specified Data Type from
HP 8510 Memory to Specified Tape/Disc File.

---

**MAIN MENU** TAPE/DISC

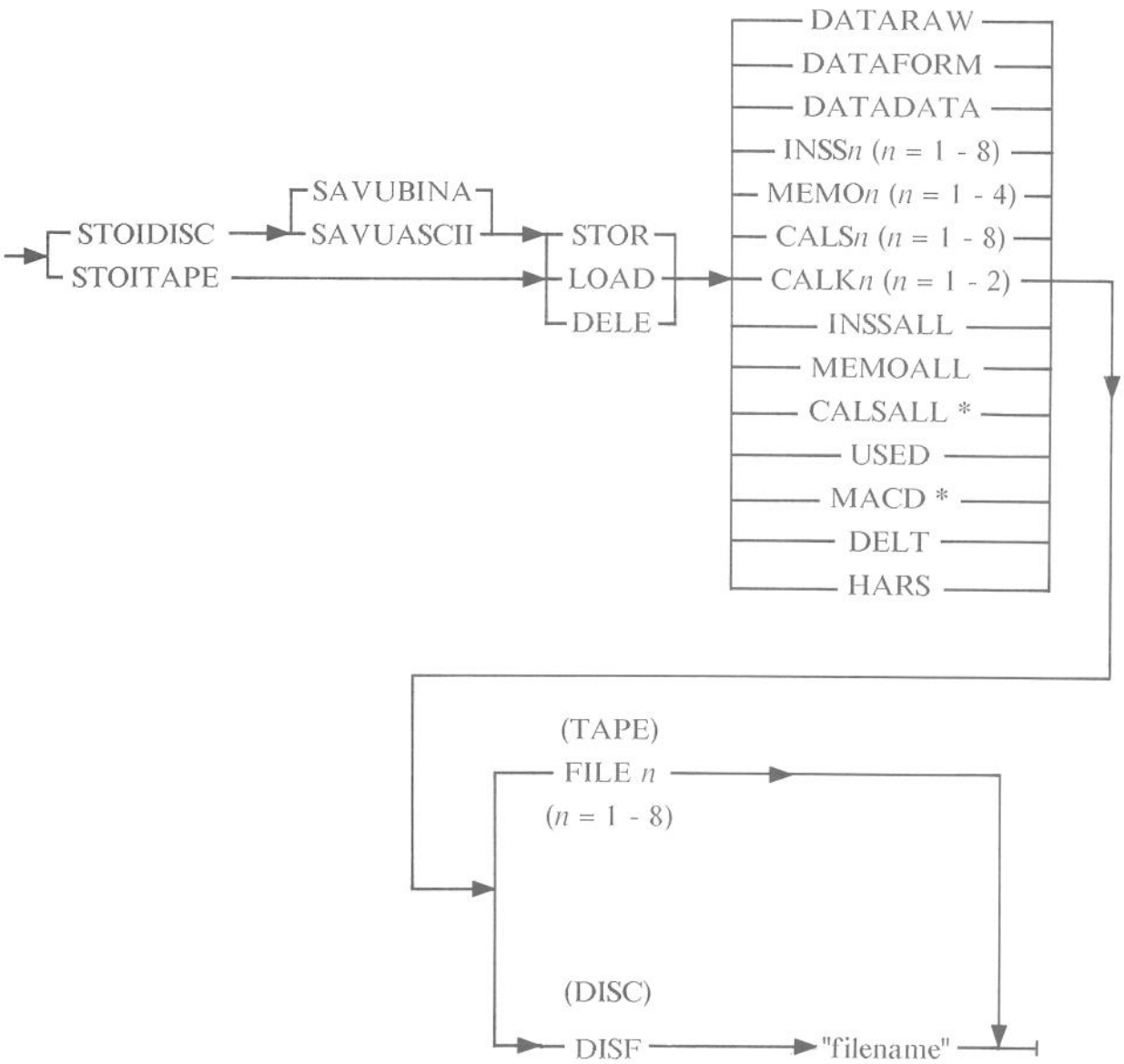
---

=

**Manual Sequence**

TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
STORE
INST STATE 1-8 *or*
INST STATE ALL *or*
MEMORY 1-8 *or*
MEMORY ALL *or*
CAL SET 1-8 *or*
CAL SET ALL *or*
CAL KIT 1-2 *or*
MORE
DATA: RAW *or*
DATA: DATA *or*
DATA: FORMATTED *or*
DELAY TABLE *or*
USER DISPLAY *or*
HARDWARE STATE *or*
MACHINE DUMP
FILE *n* (*n* = 1 - 8) (for Tape) *or*
<enter *or* select disc file>
STORE FILE *or*
REPLACE MENU
<select disc filename>
REPLACE FILE (for Disc)

*continued* →




* Cannot be used with TAPE.

*Figure 22. TAPE/DISC Key Sequence*

| MNEMONIC | NOTES |
|---|---|
| CALS *n*, CALSALL | CORROFF before loading cal sets |
| MEMO *n*, MEMOALL | DISPDATA or DISPMATH before loading memories |
| | 8 files/data type and 85 data blocks/tape. |
| | See data types for tape blocks/files. |

softkey STORE FILE
mnemonic **DISF**

Store/Replace Disc Filename.

---

**MAIN MENU** TAPE/DISC

**SEE ALSO**

DISC UNIT NUMBER
DISC VOLUME
DELETE FILE
LOAD FILE
SAVE USING ASCII
SAVE USING BINARY
STORE
STORE FILE
STORAGE IS DISC

---

**Manual Sequence**

```
TAPE/DISC
  STORAGE IS DISC
    STORE
      <select data type>
        <enter disc file name>
          STORE FILE
```

**Program Sequence**

```
SEE STORE;

STOIDISC;
  STOR;
    <select data type>
      DISF "<disc file neame>";
```

---

If no file exists on disc with the same name, a new file is created. If a file exists with the same name, the existing file is replaced.

The HP 8510 uses discs formatted in the logical interchange format (LIF). See INIT DISC for more information.

Files will be stored in either ASCII or Binary file formats, depending on the type of file and which file format has been selected. See SAVE USING ASCII for more information.

A three-letter prefix is added to the beginning of the file name in order to show the type of file that is being stored.

| | | | |
|---|---|---|---|
| softkey | SUBSET: CENTER | softkey | SUBSET: SPAN |
| mnemonic | **SUBSCENT** | mnemonic | **SUBSSPAN** |
| softkey | SUBSET: START | softkey | SUBSET: STOP |
| mnemonic | **SUBSSTAR** | mnemonic | **SUBSSTOP** |

Set Frequency Subset Range.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | CAL | | |
| **PRIOR MENU** | MODIFY CAL SET TYPE | | |
| **PRESET** | CURRENT SWEEP FULL SPAN | | |
| | | **RANGE** | CURRENT FREQUENCY SWEEP |
| **COUPLED** | SUBSETS ALWAYS COUPLED | | |
| | | **RECALLED** | YES |
| **SEE ALSO** | CREATE & SAVE<br>FREQUENCY SUBSET | | |

---

**Manual Sequence**

CAL, MORE
  MODIFY CALSET,
    FREQUENCY SUBSET
      SUBSET: START [entry] *or* SUBSET: STOP [entry] *or*
      SUBSET: CENTER [entry] *or* SUBSET: SPAN [entry]
      (x1 = Hz)
        CREATE & SAVE
          CAL SET *n* (*n* = 1 - 8)

*continued* →

**Program Sequence**

FRES;
SUBSCENT [value [suffix]]; *or*
SUBSSPAN [value [suffix]]; *or*
SUBSSTAR [value [suffix]]; *or*
SUBSSTOP [value [suffix]];
CRES;
CALS *n*; (*n* = 1 - 8)

---

With correction on, define the start/stop or center/span range of the frequency subset using these controls. The resultant cal set is in frequency list mode.

softkey SWEEP TIME
mnemonic **SWET**

Set Source Sweep Time.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | STIMULUS | | |
| **PRESET** | 100 ms | | |
| **RANGE** | 50 ms to 100 seconds | | |
| **COUPLED** | MAY BE UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

STIMULUS MENU
SWEEP TIME [entry] (x1 = seconds)

**Program Sequence**

SWET [value [time suffix] ];

---

In RAMP sweep mode, sets the elapsed time between the start of the sweep and the end of the sweep.

For STEP sweep mode, dwell time (in milliseconds) between time that the network analyzer is phase-locked at the new frequency point and initiation of data measurement is:

Sweep Time (ms) / Number of Points

to allow the device under test to respond to the new tuned frequency.

Minimum sweep time is approximately: Number of Points · 0.2 ms .

In RAMP sweep mode, if SWEEP TIME is greater than 0.05 seconds, a sweep marker will appear above the Stimulus values along the bottom of the measurement display area.

softkey SWR
memonic **SWR**

Select SWR format for Display
of Current Parameter on Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | FORMAT | | |
| **PRESET** | REF VALUE = 1<br>SCALE = 1/<br>REF POSN = 1 | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

---

**Manual Sequence**

<select channel>
<select parameter>
FORMAT MENU
SWR

**Program Sequence**

```
<select channel>
<select parameter>
SWR;
```

---

Selects Cartesian display in which the trace value is

$$SWR = ( 1 + |S_{ij}| ) / ( 1 - |S_{ij}| )$$

where $|S_{ij}|$ is the linear magnitude of the selected parameter.

hardkey SYSTEM
mnemonic **MENUSYST**

Present System Menu.

---

**MAIN MENU** NONE (HARDKEY)

---

**Manual Sequence**

SYSTEM
TITLE *or*
HP-IB ADDRESSES *or*
CRT OFF *or*
FREQUENCY OFF *or*
RESET IF CORRECTION *or*
SERVICE FUNCTIONS

**Program Sequence**

MENUSYST;

softkey SYSTEM BUS 'LOCAL'
mnemonic **SYSBLOCA**

HP 8510 System Bus LOCAL.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | SYSTEM | | |
| **PRIOR MENU** | SYSTEM | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | SYSTEM BUS "REMOTE" | | |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | YES |

---

**Manual Sequence**

SYSTEM
  SYSTEM BUS "LOCAL"

**Program Sequence**

```
SYSBLOCA;
```

---

When SYSTEM BUS 'LOCAL' is selected, the HP 8510 suspends all activity on the HP 8510 System Bus and enters the HOLD mode. Front panel control of instruments connected to the HP 8510 System Bus is enabled to allow the user to change instrument functions not controllable from the HP 8510.

Selecting SYSTEM BUS 'LOCAL' also allows an external controller to communicate directly with any "appliance" or instrument on the HP 8510 System Bus via the HP 8510 System Bus Address.

Any PASS-THRU command to any "appliance" or instrument on the HP 8510 System Bus causes an automatic SYSTEM BUS "LOCAL".

softkey SYSTEM BUS 'REMOTE'
mnemonic **SYSBREMO**

HP 8510 System Bus REMOTE.

---

| | |
|---|---|
| **MAIN MENU** | SYSTEM |
| **PRIOR MENU** | SYSTEM |
| **NEXT MENU** | NONE |
| **PRESET** | SYSTEM BUS "REMOTE" |
| **COUPLED** | ALWAYS COUPLED |
| **RECALLED** | YES |
| **SEE ALSO** | REDEFINE PARAMETER |

---

**Manual Sequence**

SYSTEM
SERVICE FUNCTIONS
SYSTEM BUS "REMOTE"

**Program Sequence**

SYSBREM;

---

Selecting SYSTEM BUS 'REMOTE' returns control of instruments on the HP 8510 system bus to the HP 8510.

Source functions controlled by the HP 8510 are returned to the state represented by the current HP 8510 instrument state (for example: RAMP/STEP/SINGLE POINT, Frequency Range, Sweep Time, Source Power, and Power Slope). Other source functions set locally are not changed.

The test set is interrogated and parameter definitions are established (see RE-DEFINE PARAMETER).

Raw data arrays are zeroed; the displayed trace are updated by the next group of sweeps.

Addressing the HP 8510 HP-IB after pass-thru to any system bus address causes automatic SYSTEM BUS 'REMOTE'.

softkey SYSTEM PARAMETERS
mnemonic **SYSP**

Display System Parameters.

---

**MAIN MENU** COPY

**RECALLED** NO

---

**Manual Sequence**

```
COPY
  MORE
    SYSTEM PARAMETERS
      RESTORE DISPLAY or
      PRINT PARAMETERS or
      PLOT PARAMETERS
```

**Program Sequence**

```
OPEP;
  RESD; or
  PRIP; or
  PLOP;
```

---

Refer to Figure 23 for a typical system parameters listing. This listing shows the following:

- the current HP-IB address of the HP 8510
- the expected interface bus addresses of each standard instrument type which may be used on the HP 8510 system bus
- the current value of the HP 8510 SRQ mask.

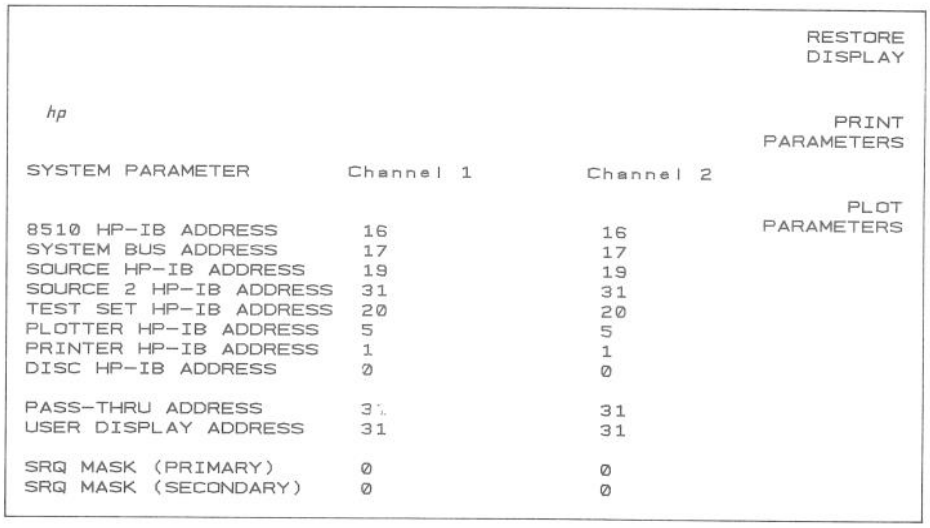



*Figure 23. Typical Initialized System Parameters Listing*

softkey SYSTEM PHASELOCK

Present System Phaselock Menu.

---

| | |
|---|---|
| **MAIN MENU** | SYSTEM |
| **PRIOR MENU** | SYSTEM |
| **NEXT MENU** | SYSTEM PHASELOCK |
| **PRESET** | UNCHANGED |
| **INITIALIZED** | INTERNAL, NORMAL |
| **COUPLED** | ALWAYS COUPLED |
| **SEE ALSO** | LOCK SPEED: FAST<br>LOCK SPEED: NORMAL<br>LOCK TYPE: EXTERNAL<br>LOCK TYPE: INTERNAL<br>LOCK TYPE: NONE |

softkey TABLE DELAY
mnemonic **TABD**

Use User Defined Delay Table for Electrical Delay.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | RESPONSE | | |
| **PRIOR MENU** | RESPONSE | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | COAXIAL DELAY | | |
| **INITIALIZED** | COAXIAL DELAY | | |
| **COUPLED** | UNCOUPLED | **RECALLED** | YES |
| **SEE ALSO** | COAXIAL DELAY<br>WAVEGUIDE DELAY<br>DELAY TABLE | | |

---

**Manual Sequence**

RESPONSE MENU
MORE
TABLE DELAY

**Program Sequence**

TABD;

---

TABLE DELAY uses a user-defined delay table for all line stretcher functions. This disables electrical delay, phase offset, magnitude slope, and magnitude offset.

There is one delay table for each channel. Initially, this table must be supplied over HP-IB from a controller. Subsequently, the table can be read out over HP-IB, and stored or loaded from tape/disc (DELT).

The delay table consists of a complex (real and imaginary) data entry for each point in the data trace. This entry can be thought of as a complex scaling factor, which is multiplied with the measured data just after error correction and before time domain.

Because the operation takes place before time domain, the delay table can be used to simulate arbitrary time domain stimulus.

hardkey TAPE/DISC
mnemonic **MENUTAPE**

Present Tape Menu.

---

**MAIN MENU** NONE (HARDKEY)

**SEE ALSO** DELETE
LOAD
STORE

---

**Manual Sequence**

TAPE/DISC
DIRECTORY *or*
STORE *or*
LOAD *or*
DELETE *or*
UN-DELETE *or*
STORAGE IS TAPE *or* STORAGE IS DISC
INITIALIZE TAPE *or*
SET UP DISC

**Program Sequence**

MENUTAPE;

---

Results will be unpredictable if STORE, LOAD, and DELETE operations are aborted by pressing any HP 8510 key, or by ejecting the tape or disc.

Magnetic media has a finite life: back up important files using another tape or disc.

Store the tape or disc in a location safe for magnetic materials.

The tape or disc must be initialized before use. See INITIALIZE TAPE or INITIALIZE DISC.

The tape cartridge or disc write protect must be disabled before data can be stored.

softkey TARGET VALUE
mnemonic **TARV**

Specify Target Value for Marker to Target.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | MARKER | | |
| **PRIOR MENU** | MARKER MORE | | |
| **NEXT MENU** | NONE | | |
| **PRESET INITIALIZED** | FORMAT on ea. channel specific values for each FORMAT | **RANGE** | 0 ±500 dB |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |
| **SEE ALSO** | MARKER to TARGET | | |

---

**Manual Sequence**

MARKER
MORE
TARGET VALUE [entry] (x1 = basic units
SEARCH: LEFT *or* for selected format)
SEARC*H:* RIGHT *or*
MARKER TO TARGET

**Program Sequence**

TARV [value];

---

A separate target value is stored for each format of each channel. TARGET VALUE sets the search value for MARKER to TARGET and left or right target searches.

softkey TERMINAL IMPEDANCE
mnemonic **TERI**

Specify Terminating Impedance of
Arbitrary Impedance Calibration Standard.

---

**MAIN MENU** CAL

**SEE ALSO** STD TYPE: ARBITRARY IMPEDANCE
MODIFY 1 <cal set 1 label>
MODIFY 2 <cal set 2 label>

---

**Manual Sequence**

*See* STD TYPE : ARBITRARY IMPEDANCE.

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

TERMINAL IMPEDANCE allows a definition of the real part of the terminating impedance. For all standards except the Arbitrary Impedance Standard type, the Terminal Impedance has a default value. See STD TYPE: <std type>.

hardkey TEST

Execute Network Analyzer Line Power-up Test.
Leaves HP 8510 System in PRESET State.

---

**MAIN MENU** NONE (HARDKEY)

---

**Manual Sequence**

TEST

---

Use a small plastic instrument to press the recessed TEST button.

If a certain class of error is detected, the Test Menu (see TEST MENU) is displayed and error codes in the Display/Processor indicator area show the error number. Refer to the HP 8510 Service Manual for diagnostic information.

If the Test Menu is displayed when the HP 8510 is addressed via the HP 8510 HP-IB, it will be necessary to press TEST to restore normal operation.

softkey TEST AMP. GAIN
mnemonic **TESA**

For Service Only, Manually Select Test IF Amplifier Gain.

---

| | |
|---|---|
| **MAIN MENU** | SYSTEM |
| **PRIOR MENU** | SERVICE FUNCTIONS |
| **NEXT MENU** | GAIN SELECTION |
| **PRESET** | GAIN: AUTO for<br>TEST AMP. GAIN and<br>REFERENCE AMP. GAIN |
| **SEE ALSO** | REFERENCE AMP. GAIN |

---

**Manual Sequence**

SYSTEM
IF GAIN
TEST AMP. GAIN
GAIN *n* (*n* = 1 - 4 *or* AUTO)

**Program Sequence**

TESA;
GAIN *n*; (*n* = 1 - 4 *or* AUTO)

softkey TEST MENU
mnemonic **MENUTEST**

Present Test Menu.

---

**MAIN MENU** SYSTEM
**PRIOR MENU** SYSTEM
**NEXT MENU** TEST

---

**Manual Sequence**

SYSTEM,
SERVICE FUNCTIONS,
TEST MENU.

**Program Sequence**

MENUTEST;

---

Selecting the Test Menu disables the HP-IB interface. This menu gives access to self-test menu items. To return to normal operation, enter 15 then = MARKER, or cycle line power, or press TEST. Operation of selections from the Test Menu are described as part service procedures in the HP 8510 Service Manual.

*continued* →

*Table 24. HP 8510B Test Menu*

**POWER-UP SELF TESTS**

1 A11 PROCESSOR EPROM
2 A11 PROCESSOR RAM
3 A15 DATA BUS
4 A14 DISPLAY RAM
5 A14 DATA
6 A15 TIMER
7 A15 PUBLIC HPIB
8 A15 SYSTEM BUS
9 INTERRUPT SYSTEM
10 A11 MULTIPLIER
11 A15 TAPE CONTROLLER
12 A13 IF DETECTOR DATA
13 IF DETECTOR DATA
14 KEYBOARD

**SYSTEM COMMANDS**

15 RUN MAIN PROGRAM
16 MEMORY OPERATIONS
17 RERUN SELF TEST
18 REPEAT TEST LOOP

**TAPE COMMANDS**

19 LOAD PROGRAM TAPE
20 RECORD PROGRAM TAPE
21 INITIALIZE TAPE

**SERVICE COMMANDS**

22 RUN SERVICE PROGRAM
23 DIAGNOSE A FAILURE

ENTER SELECTION, THEN PRESS =MARKER

softkey THRU <class or standard label>
mnemonic **TRLT**

Measure TRL Thru Standard Class.

---

**MAIN MENU** CAL

**SEE ALSO** CALIBRATE: TRL 2-PORT

---

**Manual Sequence**

CAL
  CAL 1 <cal kit 1 label> *or*
  CAL 2 <cal kit 2 label>
    TRL 2-PORT
      THRU THRU *or*
      $S_{11}$ REFLECT SHORT *or*
      $S_{22}$ REFLECT SHORT *or*
      LINE 2-18 LINE
        DONE

**Program Sequence**

```
CAL1; or CAL2;
  CALITRL2;
    TRLT;
    TRLR1;
    TRLR2;
    ISOL;
      <measure isolation standards>
      TRLL;
        SAVT;
          CALSn; (n = 1 - 8)
```

---

The second line of the softkey name for these is user definable (standard label), if one standard is assigned to the TRL LINE class, or TRL LINE class label if only one standard is assigned. These keys will cause the set of measurements needed to compute the error coefficients. They may be made in any order. TRLT and TRLL will cycle through a series of S-Parameter measurements, and then leave the system in $S_{11}$. TRLR1 and TRLR2 will measure and automatically select just one S-Parameter.

softkey TIME BAND PASS
mnemonic **TIMB**

Select Time Domain Band Pass Mode, Impulse Stimulus for Selected Channel.

---

MAIN MENU DOMAIN

**PRESET** FREQUENCY DOMAIN
**COUPLED** ALWAYS UNCOUPLED **RECALLED** YES

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

<select channel>
DOMAIN
TIME BAND PASS

**Program Sequence**

TIMB;

---

The frequency domain data is transformed to display magnitude of the response versus time (distance) using a simulated band limited Impulse stimulus. No frequency range limitations apply in this mode. The frequency sweep continues, but START/STOP/CENTER/SPAN controls apply to the x-axis limits of the display. Switching between the time and frequency domains automatically selects DISPLAY: DATA.

*continued* →

After PRESET, selecting TIME BAND PASS selects

| | |
|---|---|
| FORMAT | LINEAR MAGNITUDE |
| WINDOW | NORMAL |
| GATE | OFF |
| GATE START | -500 ps |
| GATE STOP | 500 ps |
| GATE CENTER | 0 s |
| GATE SPAN | 1 ms |
| GATE SHAPE | NORMAL |
| START | -1 ns |
| STOP | 4 ns |
| CENTER | 1.5 ns |
| SPAN | 5 ns |

Selecting TIME BAND PASS, SPECIFY TIME, LOW PASS: STEP or LOW PASS: IMPULSE has no effect on the displayed trace.

softkey TIME LOW PASS
mnemonic **TIML**

Select Time Domain Low Pass Mode
for Selected Channel.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | DOMAIN | | |
| **PRESET** | FREQUENCY DOMAIN | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

**TIME DOMAIN OPTION 010 ONLY**

**SEE ALSO** SET FREQ. (LOW PASS)

---

**Manual Sequence**

DOMAIN
TIME LOW PASS
SET FREQ. (LOW PASS)
SPECIFY TIME
LOW PASS: STEP *or*
LOW PASS: IMPULSE

**Program Sequence**

```
TIML;   (TIML includes execution of SETF)
  LOWPSTEP; or LOWPIMPU;
```

---

The frequency domain data is transformed to display impedance versus time (distance) using simulated last selected Step or Impulse stimulus. Frequency range limitations apply in this mode: see SET FREQ (LOW PASS). The frequency sweep continues, but START/STOP/CENTER/SPAN controls apply to the x-axis limits of the display. Switching between the time and frequency domains automatically selects DISPLAY: DATA.

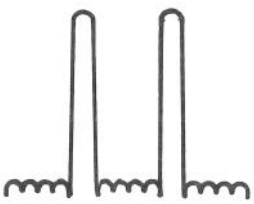
*continued* →

If the frequency range or Number of Points is changed, or if correction is turned on, the Frequency Domain is automatically selected. In order to make error-corrected measurements in the Time Domain Low Pass mode, a correction made with low pass frequencies set must be on before this mode is selected. See SET FREQ. (LOW PASS).

After PRESET, selecting TIME LOW PASS selects

| | |
|---|---|
| FORMAT | REAL |
| LOW PASS | IMPULSE |
| WINDOW | NORMAL |
| GATE | OFF |
| GATE START | -500 ps |
| GATE STOP | 500 ps |
| GATE CENTER | 0 s |
| GATE SPAN | 1 ms |
| GATE SHAPE | NORMAL |
| START | -1 ns |
| STOP | 4 ns |
| CENTER | 1.5 ns |
| SPAN | 5 ns. |

**RESPONSE REPETITION**



**RANGE CALCULATION**

$$\text{RANGE (sec)} = \frac{1}{\Delta f} = \frac{\text{NUMBER of POINTS - 1}}{f_{span}\ \text{(GHz)}}$$

$$\rightarrow\left|\ \frac{1}{\Delta f}\ \right|\leftarrow \qquad \text{RANGE (m)} = \left(\frac{1}{\Delta f}\right) \times \left(2.997925 \times 10^{8}\ \text{m/s}\right) \times \left(vf\right)$$

$\Delta f$ = Hz
$\Delta f$ = Velocity Factor

Figure 24. Response Repetition and Range Calculations

softkey TITLE
mnemonic **TITL**

Display String in Title Area of HP 8510 CRT.
Title Sequence is also used to make Labels.

---

**MAIN MENU** SYSTEM
**PRESET** RESTORES STANDARD TITLE
**RECALLED** YES

---

**Manual Sequence**

SYSTEM
TITLE
<use knob to select character>
SELECT LETTER *or*
SPACE *or*
BACKSPACE *or*
ERASE TITLE *or*
TITLE DONE
(Last Menu Displayed)

**Program Sequence**

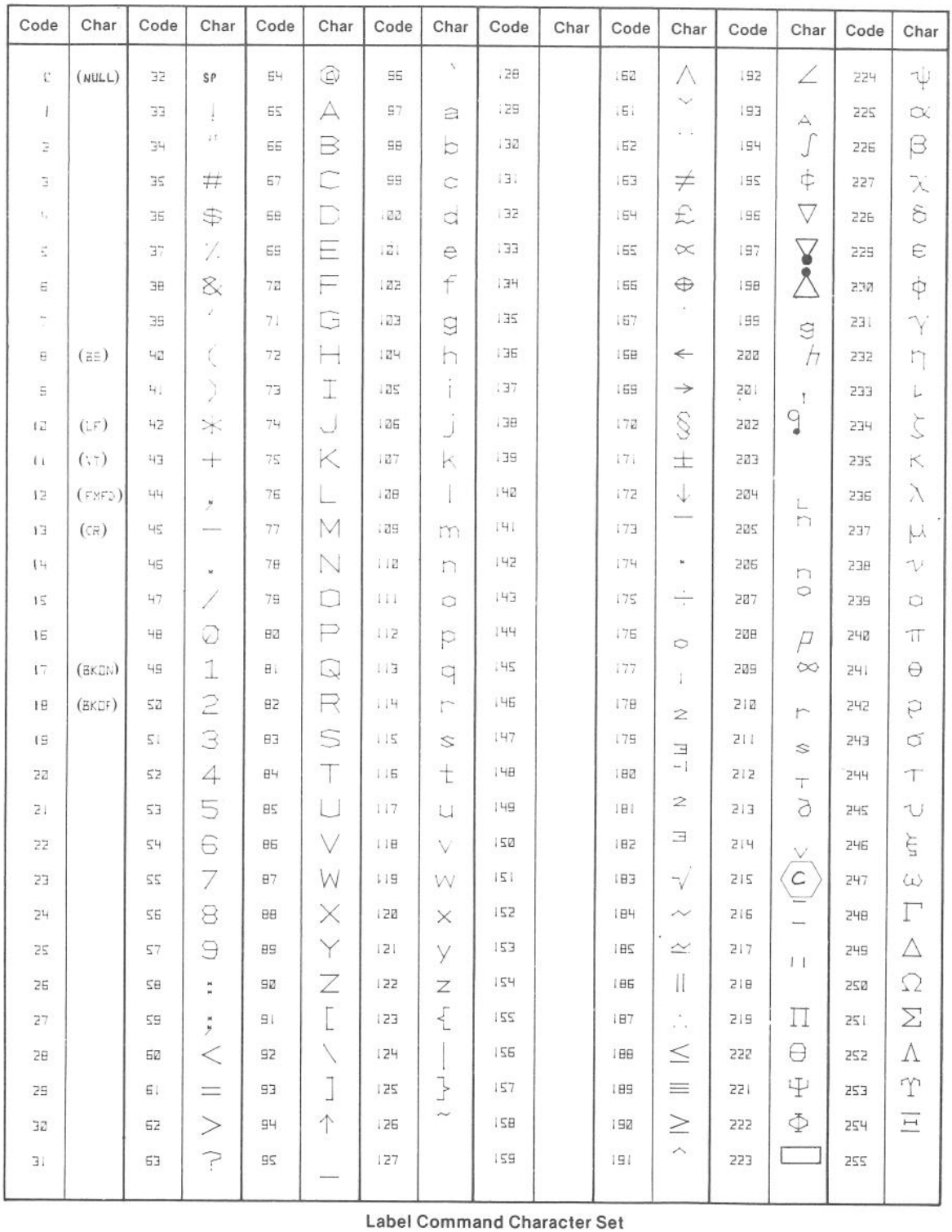
TITL ""string"";

---

Use the knob to point at the desired character, then press SELECT LETTER. Use SPACE, BACKSPACE, and ERASE TITLE as required. When complete, select TITLE DONE. The string will replace the current title. Via HP-IB, the old title or label is not erased until input with a new or an empty string. TITL ""string""; clears the title. TITL; makes TITLE the Active Function for output. See OUTPTITL.

The active function entry is turned off, but it is still active if it is recalled after the last active function. It is saved/recalled as part of the instrument state. Used with PARAMETER LABEL, LABEL: <std class>, LABEL KIT, LABEL STD. 50 characters available for TITLE, 10 characters for softkey labels.

*continued* →



| Code | Char | Code | Char | Code | Char | Code | Char | Code | Char | Code | Char | Code | Char | Code | Char |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | (NULL) | 32 | SP | 64 | @ | 96 | ` | 128 | | 160 | | 192 | | 224 | |
| 1 | | 33 | ! | 65 | A | 97 | a | 129 | | 161 | | 193 | | 225 | |
| 2 | | 34 | " | 66 | B | 98 | b | 130 | | 162 | | 194 | | 226 | |
| 3 | | 35 | # | 67 | C | 99 | c | 131 | | 163 | | 195 | | 227 | |
| 4 | | 36 | $ | 68 | D | 100 | d | 132 | | 164 | | 196 | | 228 | |
| 5 | | 37 | % | 69 | E | 101 | e | 133 | | 165 | | 197 | | 229 | |
| 6 | | 38 | & | 70 | F | 102 | f | 134 | | 166 | | 198 | | 230 | |
| 7 | | 39 | ' | 71 | G | 103 | g | 135 | | 167 | | 199 | | 231 | |
| 8 | (BS) | 40 | ( | 72 | H | 104 | h | 136 | | 168 | | 200 | | 232 | |
| 9 | | 41 | ) | 73 | I | 105 | i | 137 | | 169 | | 201 | | 233 | |
| 10 | (LF) | 42 | * | 74 | J | 106 | j | 138 | | 170 | | 202 | | 234 | |
| 11 | (VT) | 43 | + | 75 | K | 107 | k | 139 | | 171 | | 203 | | 235 | |
| 12 | (FMFD) | 44 | , | 76 | L | 108 | l | 140 | | 172 | | 204 | | 236 | |
| 13 | (CR) | 45 | - | 77 | M | 109 | m | 141 | | 173 | | 205 | | 237 | |
| 14 | | 46 | . | 78 | N | 110 | n | 142 | | 174 | | 206 | | 238 | |
| 15 | | 47 | / | 79 | O | 111 | o | 143 | | 175 | | 207 | | 239 | |
| 16 | | 48 | 0 | 80 | P | 112 | p | 144 | | 176 | | 208 | | 240 | |
| 17 | (BKON) | 49 | 1 | 81 | Q | 113 | q | 145 | | 177 | | 209 | | 241 | |
| 18 | (BKOF) | 50 | 2 | 82 | R | 114 | r | 146 | | 178 | | 210 | | 242 | |
| 19 | | 51 | 3 | 83 | S | 115 | s | 147 | | 179 | | 211 | | 243 | |
| 20 | | 52 | 4 | 84 | T | 116 | t | 148 | | 180 | | 212 | | 244 | |
| 21 | | 53 | 5 | 85 | U | 117 | u | 149 | | 181 | | 213 | | 245 | |
| 22 | | 54 | 6 | 86 | V | 118 | v | 150 | | 182 | | 214 | | 246 | |
| 23 | | 55 | 7 | 87 | W | 119 | w | 151 | | 183 | | 215 | | 247 | |
| 24 | | 56 | 8 | 88 | X | 120 | x | 152 | | 184 | | 216 | | 248 | |
| 25 | | 57 | 9 | 89 | Y | 121 | y | 153 | | 185 | | 217 | | 249 | |
| 26 | | 58 | : | 90 | Z | 122 | z | 154 | | 186 | | 218 | | 250 | |
| 27 | | 59 | ; | 91 | [ | 123 | { | 155 | | 187 | | 219 | | 251 | |
| 28 | | 60 | < | 92 | \ | 124 | \| | 156 | | 188 | | 220 | | 252 | |
| 29 | | 61 | = | 93 | ] | 125 | } | 157 | | 189 | | 221 | | 253 | |
| 30 | | 62 | > | 94 | ↑ | 126 | ~ | 158 | | 190 | | 222 | | 254 | |
| 31 | | 63 | ? | 95 | ← | 127 | | 159 | | 191 | | 223 | | 255 | |

**Label Command Character Set**

Blank codes are either unassigned or character pieces. ( ) indicates display machine language word see Appendix B.

*Figure 25. HP 8510 Character Set.*

softkey TITLE DONE

Current Displayed Character String is Used as Title.

---

**MAIN MENU** SYSTEM

---

**Manual Sequence**

*See* TITLE.

softkey TRANS. DONE
mnemonic **TRAD**

2-Port Transmission Calibration Sequence is Complete.

softkey TRANSMISSION
mnemonic **TRAN**

After Selection of 2-Port Measurement Calibration,
Begin Transmission Calibration Sequence.

---

**MAIN MENU** CAL

**SEE ALSO** CALIBRATE: FULL 2-PORT
CALIBRATE: ONE-PATH 2-PORT

---

**Manual Sequence**

CAL
CAL 1 <cal kit 1 label> *or*
CAL 2 <cal kit 2 label>
FULL 2-PORT *or*
ONE-PATH 2-PORT
TRANSMISSION
FWD. TRANS. <class label>
FWD. MATCH <class label>
REV. MATCH <class label>
REV. MATCH <class label>
TRANS. DONE
<reflection and isolation calibration steps>
SAVE 2-PORT CAL
CAL SET *n* ( *n* = 1 - 8)

*continued* →

**Program Sequence**

```
CAL1; or CAL2;
  CALIFUL2; or CALIONE2;
    TRAN;
      FWDT;
        FWDM;
          REVT;
            REVM;
              TRAD;
                <reflection and isolation calibration steps>
                  SAV2;
                    CALS n    (n = 1 - 8)
```

---

Error coefficient sets for forward and reverse transmission signal path frequency response and load match are measured.

mnemonic **TRIG**

Select Externally Triggered Data Acquisition Mode

| | |
|---|---|
| **MAIN MENU** | NONE (HP-IB ONLY) |
| **PRESET** | NORMAL OPERATION |
| **RECALLED** | NO |
| **SEE ALSO** | ADDRESS of SOURCE #1<br>ADDRESS of TEST SET<br>FRER<br>GROUP EXECUTE TRIGGER (GET command)<br>HP-IB ADDRESSED COMMAND<br>LOCK to NONE |

**Program Sequence**

```
<set frequency range>
  <select sweep mode>
    TRIG;                    (FRER; to exit)
```

Mode 1. Waiting for HP-IB GROUP EXECUTE TRIGGER:

Selecting TRIG allows data acquisition to be controlled by an external controller using the HP-IB GET (GROUP EXECUTE TRIGGER) command. The exact data acquisition process depends upon the current source address, the current test set address, and whether LOCK to NONE is selected.

If the source and test set addresses are standard (0 - 30) and LOCK to $a_1$ or $a_2$ is selected, TRIG sets the system to the beginning of the next group of sweeps, then sets bit 2 (Waiting for GET) of the HP 8510 Primary Status byte. GET initiates a group of sweeps (RAMP), or the next data point (STEP), or a single data point (SINGLE POINT).

*continued* →

When a Group Execute Trigger is received, the Waiting for GET bit in the Primary Status Byte is cleared. The test set local oscillator is phase-locked to the source if appropriate and the HP 8510 makes the selected measurement: a group of sweeps if RAMP is selected, the next point if STEP is selected, or a single point if SINGLE POINT is selected. When data acquisition and trace updating is complete, the Waiting for GET bit is set and the system waits for the next GET.

If the source address is 31, or a test set is not connected to the System Bus, the source tuning part of the data acquisition cycle is skipped and the current selected frequency range is used as the basis for the 1st IF phase lock.

If the test set address is 31, then no test set signal path switching operations are attempted. If LOCK to NONE is selected, the 1st IF phase lock part of the data acquisition sequence is skipped.

MODE 2. Waiting for HP 8510 SIMS, Simulated Measurement of a Calibration Standard:

Select the desired instrument state (sweep mode, frequency range, etc.), then issue TRIG. Selecting TRIG allows the measurement calibration process to proceed normally, except that after the standard is selected, the actual measurement does not take place. Instead, the data to be used to develop the error coeffiecient is input via the HP-IB to the Raw Data Array, and the SIMS; instruction causes the raw data to be transferred to the appropriate error coeffiecient array for the current selected standard, then underlines the standard label. When all standards are measured, issue CALS*n*; to compute and store the error coefficients.

softkey TRIM SWEEP
mnemonic **TRIS**

Start Stimulus Trim Sweep Procedure.

---

**MAIN MENU** CAL
**PRESET** 0
**RANGE** -1024 to +1024

**COUPLED** MAY BE UNCOUPLED **RECALLED** YES

---

**Manual Sequence**

CAL
MORE
TRIM SWEEP [entry x1] (entry = -1024 to +1024)

**Program Sequence**

TRIS [value]; (value = -1024 to +1024)

---

Performs a different function for HP 834x-series and HP 8350B/835xx-series sources. For HP 834x-series, used in the RAMP sweep mode, Trim Sweep adjusts the end frequency at each band switch point to minimize the difference between the end frequency of one band and the start frequency of the next band. For HP 8350B sources, Trim Sweep is adjusted to provide best overall frequency accuracy.

Trim Sweep is not used for HP 834x-series source operated in the STEP sweep mode.

Refer to the TRIM SWEEP adjustment procedure under Measurement Calibration in the HP 8510 Operating and Programming manual. For best accuracy, perform the Trim Sweep separately for each different frequency range prior to measurement calibration. The Trim Sweep value (-1024 to +1024) has no significance except as a scaling factor. Sweep time may affect the trim sweep adjustment.

The Trim Sweep setting is part of the Cal Set limited instrument state, and is recalled with the Cal Set. It is also saved/recalled with the Instrument State. Changing the Trim Sweep setting with correction on will not cause correction to be turned off, but may result in measurement errors because the actual frequencies measured will change.

softkey TRL OPTION

Specify Options for TRL 2-Port Calibration.

softkey TRL OPTION DEFINED
mnemonic **TRLO**

TRL Options Specified

---

**MAIN MENU** CAL
**PRIOR MENU** MODIFY CAL KIT
**NEXT MENU** MODIFY CAL KIT

**SEE ALSO**
CAL Z0: LINE
CAL Z0: TRLL
LOWBAND FREQUENCY
MODIFY 1
MODIFY 2
SET REF.: REFLECT
SET REF.: THRU

---

**Manual Sequence**

CAL
MORE
MODIFY 1 <cal kit 1 label> *or*
MODIFY 2 <cal kit 2 label>
TRL OPTION
CAL Z0: LINE Z0 *or*
CAL Z0: SYSTEM Z0
SET REF.: THRU *or*
SET REF.: REFLECT
LOWBAND FREQUENCY [value]
TRL OPTION DONE
<other changes>
KIT DONE (MODIFIED).

**Program Sequence**

MODI1; *or* MODI2;
CALZLINE; *or* CALZSYST;
SETRTHRU; or SETRREFL;
LOWF [value]; (x1 = Hz)
TRLO;
<other changes>
KITD;

---

TRL OPTION DEFINED is done after the appropriate TRL options have been selected. This will automatically change the last character of the cal kit label to indicate that the standard cal kit has been modified.

softkey UNCOUPLED CHANNELS
mnemonic **UNCC**

Uncouples Channel 1 and Channel 2 Stimulus and Cal Set.

---

**MAIN MENU** STIMULUS

**PRESET** COUPLED CHANNELS

**RECALLED** YES

---

**Manual Sequence**

STIMULUS MENU
MORE
UNCOUPLED CHANNELS

**Program Sequence**

UNCC;

---

Selecting UNCOUPLED CHANNELS allows the functions listed in the Cal Set limited instrument state and time domain Gate markers to be different for Channel 1 and Channel 2, thus allowing a different cal set to be applied to the same parameter on different channels.

If the instrument state is changed from COUPLED CHANNELS to UNCOUPLED CHANNELS, then correction is turned off for all parameters of the non-active channel.

*continued* →

These functions can be uncoupled:

- Frequency Range
- Sweep Time
- CORRECTION ON, Cal Sets
- Time Domain Gate Markers
- Source Power
- Power Slope

These functions are always coupled, and cannot be uncoupled:

- Number of Points
- Ramp/Step/Single Point
- Frequency Domain Markers
  if Domain is the same for
  both channels
- Attenuator Port 1, 2
- Hold/Continual
- HP-IB Addresses

softkey UN-DELETE
mnemonic **UNDE**

Recover Last Deleted Tape or Disc File.

---

**MAIN MENU** TAPE/DISC

---

**Manual Sequence**

TAPE/DISC
UN-DELETE

**Program Sequence**

UNDE;

---

If the file area has not been used by storing or loading another file, the tape or disc has not been removed, or PRESET selected, then the last deleted tape or disc file will be recovered.

softkey USER DISPLAY
mnemonic **USED**

Tape/Disc Data Type Select User Display Data Memory.

---

**MAIN MENU** TAPE/DISC
**PRIOR MENU** DATA TYPE SELECT
**NEXT MENU** FILE SELECT

---

**Manual Sequence**

TAPE/DISC
STORAGE IS TAPE *or* STORAGE IS DISC
STORE *or*
LOAD *or*
DELETE
MORE
USER DISPLAY
FILE *n* (*n* = 1 - 8) (for Tape) *or*
STORE FILE *or* LOAD FILE *or* DELETE FILE

**Program Sequence**

STOITAPE *or* STOIDISC;
STOR *or* LOAD or DELE;
USED;
FILE *n*; (*n* = 1 - 8) (for Tape) *or*
DISF "filename"; (for Disc)

---

Tape information: 2 tape blocks/file.

| | |
|---|---|
| softkey | USER 1 $a_1$ |
| mnemonic | **USER1** |
| softkey | USER 2 $b_2$ |
| mnemonic | **USER2** |
| softkey | USER 3 $a_2$ |
| mnemonic | **USER3** |
| softkey | USER 4 $b_1$ |
| mnemonic | **USER4** |

Select User Parameter.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | PARAMETER | | |
| **PRESET** | STANDARD BASIC AND USER PARAMETER DEFINITIONS | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |
| **SEE ALSO** | REDEFINE PARAMETER | | |

---

**Manual Sequence**

PARAMETER MENU
USER 1 $a_1$ *or*
USER 2 $b_2$ *or*
USER 3 $a_2$ *or*
USER 4 $b_1$

**Program Sequence**

USER1; *or* USER2; *or* USER3; *or* USER4;

*continued* →

The standard user parameter definitions measure the unratioed power level allowing approximation of the test or reference signal level applied to the first frequency conversion stage.

These parameters may be redefined for other measurements, and for use in frequency response measurement calibrations. However, due to automatic parameter selection, these parameters cannot be used in 1-Port or 2-Port measurement calibration sequences.

Selecting a User parameter recalls the last selected FORMAT and RESPONSE characteristics for that parameter on the selected channel.

Redefined User parameters can be saved and recalled.

softkey VELOCITY FACTOR
mnemonic **VELOFACT**

Relative Velocity Factor of Propagation.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | CAL | | |
| **PRIOR MENU** | PORT EXTENSIONS | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | 1.0 | | |
| **INITIALIZED** | 1.0 | **RANGE** | .001 to 500 |
| **COUPLED** | ALWAYS COUPLED | **RECALLED** | AS PART OF INSTRUMENT STATE |
| **SEE ALSO** | ELECTRICAL DELAY | | |

---

**Manual Sequence**

CAL
MORE
PORT EXTENSIONS
VELOCITY FACTOR [entry] (x1 = factor)

**Program Sequence**

VELOFACT [value];

---

Velocity factor modifies the distance readout that occurs with certain active functions (ELECTRICAL DELAY, PORT EXTENTIONS), and marker readouts in time domain.

This allows a calibrated distance readout when the propagation velocity is different than the speed of light in a vacuum (C = 2.997925 x $10^8$ meters/sec.). This value is normally related to the relative dielectric constant of the propagation media, as shown in the equation below:

$V_{rel} = 1/(\epsilon_r)^{0.5}$

$\epsilon_r = 1.00064$ for standard air.

mnemonic **WAIT**

Hold Off Processing of Next HP-IB Instruction
Until Currently Executing Program Instruction is Complete.

---

**MAIN MENU** NONE (HP-IB ONLY)

---

**Program Sequence**

```
WAIT;
```

---

WAIT will not allow the next instruction to be processed until any previous instruction is complete and the current instrument state is updated. This is useful when instructions are input via the HP 8510 HP-IB which do not include an automatic holdoff.

One use of WAIT is after a domain change to allow conversion of data before the marker is positioned and the trace value is output:

```
"MARK1  10 GHz;  OUTPMARK;"
   .
   .
   .
"TIMB;  WAIT;  MARK 1  10 ns; OUTPMARK;"
   .
   .
   .
```

softkey WAVEGUIDE
mnemonic WAVE

Specify Current Calibration Standard as Waveguide Type.

---

**MAIN MENU** CAL

**SEE ALSO** MINIMUM FREQUENCY

---

**Manual Sequence**

*See* MODIFY 1 *and* MODIFY 2.

**Program Sequence**

*See* MODIFY 1 *and* MODIFY 2.

---

OFFSET LOSS is not used for WAVEGUIDE type standards.

OFFSET $Z_0$ should be specified as 50 ohms for WAVEGUIDE type standards.

softkey WAVEGUIDE DELAY
mnemonic **WAVD**

Select Waveguide Phase for Electrical Delay;
Make Cutoff Frequency Active Function
(Standard Rectangular Waveguide Phase).

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | RESPONSE | | |
| **PRIOR MENU** | RESPONSE | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | COAXIAL DELAY | | |
| **INITIALIZED** | COAXIAL DELAY | **RANGE** | 0 Hz to 999 GHz |
| **COUPLED** | UNCOUPLED | | |
| **SEE ALSO** | COAXIAL DELAY<br>TABLE DELAY | | |

---

**Manual Sequence**

RESPOMSE MENU
  MORE
    WAVEGUIDE DELAY
      <enter waveguide cutoff frequency value>

**Program Sequence**

WAVD [value];

---

WAVEGUIDE DELAY Sets the mode for electrical delay in dispersive standard rectangular waveguide.

| | |
|---|---|
| softkey | WINDOW: MAXIMUM |
| mnemonic | **WINDMAXI** |
| softkey | WINDOW: MINIMUM |
| mnemonic | **WINDMINI** |
| softkey | WINDOW: NORMAL |
| mnemonic | **WINDNORM** |

Select Time Domain Window Type.

---

| | | | |
|---|---|---|---|
| **MAIN MENU** | DOMAIN | | |
| **PRIOR MENU** | DOMAIN | | |
| **NEXT MENU** | NONE | | |
| **PRESET** | WINDOW: NORMAL | | |
| **COUPLED** | ALWAYS UNCOUPLED | **RECALLED** | YES |

**TIME DOMAIN OPTION 010 ONLY**

---

**Manual Sequence**

DOMAIN
SPECIFY TIME
  WINDOW: MAXIMUM *or*
  WIDOW: NORMAL *or*
  WINDOW: MINIMUM

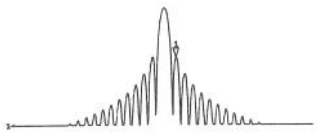
**Program Sequence**

WINDMAXI; *or* WINDNORM; *or* WINDMINI;

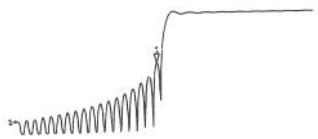
---

If Time Domain is selected, the specified window is applied to the displayed data.

*continued* →



*Impulse Sidelobe Level*



***Step Sidelobe Level***

| WINDOW TYPE | IMPULSE SIDELOBE LEVEL | STEP SIDELOBE LEVEL |
|---|---|---|
| MINIMUM | -13 dB | -21 dB |
| NORMAL | -44 dB | -60 dB |
| MAXIMUM | < -90 dB | < -90 dB |

*Figure 26. Window Characteristics*

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# HP 8510B Network Analyzer
# Alphabetical List of Programming Codes

## INTRODUCTION

Use this alphabetical list of the HP 8510 programming mnemonics as a reference to the syntax requirements and general function of the individual commands. Also refer to the Menu Structure portion of Reference Data in the HP 8510 Operating and Programming Manual.

## NOTATION

Symbols used in this list are:

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

[ ] Square brackets indicate that whatever is enclosed in the bracket is optional.

[suffix] Optional programmer entry Units Terminator for frequency and time units:

| **Frequency Suffix** | **Time Suffix** | **Voltage** |
|---|---|---|
| GHz | fs | |
| MHz | ps | |
| kHz | ns | |
| Hz | us (μs) | |
| | ms | mV |
| | s | V |

; semicolon is the required Terminator character for each program instruction.

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

(range of values) lower case text enclosed in parenthesis describes the range of values which may be input for the selected function.

value a constant or a pre-assigned simple or complex numeric or string variable transferred to the HP 8510.

variable a simple or complex numeric or string variable which receives the value returned by the HP 8510.

(PRESET) Value or state after HP 8510 PRESET

## EXAMPLE

**GATECENT** [value [time suffix]];
Mnemonic may be written as:

**GATECENT**;
Makes Gate Center the Active Function.

**GATECENT 1**;
Makes Gate Center the Active Function, Sets Gate Center to 1 second.
(If no units, default to basic units.)

**GATECENT** 1 ns;
Makes Gate Center the Active Function, Sets Gate Center to 1 nanosecond.

# Alphabetical List

**ADAP1**;
**ADAP2**;
Specify Cal Kit containing adapter in Adapter Removal Modify Cal Set.

**ADAR**;
Select Adapter Removal Modify Cal Set.

**ADDR8510** [value];
HP-IB Address of HP 8510. (0-30)

**ADDRDISC** [value];
Disc Unit System Bus Address. (0-30)

**ADDRPASS** [value];
System Bus Address of Device to Send/Receive data via HP 8510 System Bus HP-IB address. (0-31)

**ADDRPLOT** [value];
Digital Plotter System Bus address. (0-30)

**ADDRPRIN** [value];
Printer System Bus address. (0-30)

**ADDRRFS** [value];
System Bus Address of RF Switch

**ADDRSOUR** [value];
Source #1 System Bus address. (0-31)

**ADDRSOU2** [value];
Source #2 System Bus address. (0-31)

**ADDRSYSB** [value];
HP-IB address of HP 8510 System Bus. (0-30)

**ADDRTESS** [value];
Test Set System Bus address. (0-31). When changed, issues command to RF Switch.

**ANAOOFF**;
Analog Output Off.

**ANAOON**;
Analog Output On.

**ASEG**;
Measure all Frequency List Segments.

**ATTP1** [value];
Port 1 attenuator. (0-90 dB, 10 dB steps)

**ATTP2** [value];
Port 2 attenuator. (0-90 dB, 10 dB steps)
(HP 8514, HP 8515 only, if attenuators installed)

**AUTD**;
Automatic Setting of ELECTRICAL DELAY to balance phase.

**AUTO**;
Automatic selection of REF VALUE and SCALE for current channel to position trace for viewing.

**AUXV**;
Source set to START frequency; measurement synchronized to AUX OUT.

STIMULUS controls set characteristics of digital ramp at AUX OUT connector.

**AVEROFF**;
Turn off averaging for selected channel. (PRESET)

**AVERON** [value];
Turn on averaging for selected channel; (1-4096; 1, 2, 4, 8, ... 4096 sequence)

**BEEPOFF**;
Turn Caution/Warning Beep Off.

**BEEPON**;
Turn Caution/Warning Beep On (PRESET).

| | | |
|---|---|---|
| **C0** [value]; | $x10^{-15}F$. | Open Circuit Capacitance Model Values. |
| **C1** [value]; | $x10^{-27}F/Hz$. | |
| **C2** [value]; | $x10^{-36}F/Hz^2$. | |
| **C3** [value]; | $x10^{-45}F/Hz^3$. | |

**CAL1**;
Begin measurement calibration using Cal Kit 1.

**CAL2**;
Begin measurement calibration using Cal Kit 2.

**CALIFUL2**;
Select FULL 2-PORT cal.

**CALIONE2**;
Select ONE-PATH 2-PORT cal.

**CALIRAI**;
Select Response and Isolation cal.

**CALIRESP**;
Select RESPONSE cal.

**CALIS111**;
Select $S_{11}$ 1-PORT cal.

**CALIS221**;
Select $S_{22}$ 1-PORT cal.

**CALITRL2**;
Select TRL 2-Port cal.

**CALK1**;
Cal Kit 1 data type under TAPE/DISC.

**CALK2**;
Cal Kit 2 data type under TAPE/DISC.

**CALS1**;
**CALS2**;
**CALS3**;
**CALS4**;
**CALS5**;
**CALS6**;
**CALS7**;
**CALS8**;
Under TAPE/DISC, Cal Set data type.
Under CAL, select, replace, or delete a cal set.
Under ADAPTER REMOVAL, specify Port 1 and Port 2 Cal Set and storage for Modified Cal Set.

**CALSALL**;
Cal Sets 1-8 data type under TAPE/DISC.
(Usable only to Disc.)

**CALSPORT1**;
Select Port 1 Cal Set in Adapter Removal Modify Cal Set. Followed by CALS*n*;.

**CALSPORT2**;
Specify Port 2 Cal Set in Adapter Removal Modify Cal Set. Followed by CALS*n*;.

**CALZLINE**;
TRL $Z_0$ referenced to Line $Z_0$.

**CALZSYST**;
TRL $Z_0$ referenced to System $Z_0$ (SETZ;)

**CENT** [value [suffix]];
Set CENTER Stimulus value.

**CHAN1**;
Select CHANNEL 1.

**CHAN2**;
Select CHANNEL 2.

**CLAD**;
Current standard class is specified.

**CLASS11A**;
**CLASS11B**;
**CLASS11C**;
**CLASS22A**;
**CLASS22B**;
**CLASS22C;**
Select Calibration Standard Class.
Measure if single std in class.

**CLEL**;
Clear Frequency List;

**CLES**;
Clear HP 8510 status bytes to 0,0.

**COAD**;
Select Coaxial (linear phase) ELECTRICAL DELAY and PORT EXTENSIONS. (PRESET)

**COAX**;
Coaxial (linear phase) cal standard.

**CONF**;
Constant Frequency value, Multiple Source.

**CONT**;
CONTINUAL sweep. (PRESET)

**CONV1S**;
Convert to 1/S.

**CONVS**;
Convert to S-Parameter (PRESET).

**CONVY**;
Convert to Y.

**CONVZ**;
Convert to Z.

**CORROFF**;
CORRECTION OFF for current parameter set.

**CORRON**;
CORRECTION ON for current parameter set.
(Follow with CALS*n*.)

**COUC**;
Couple Channel 1 and Channel 2 stimulus and cal sets. (PRESET)

**CRES**;
Create and Save Frequency Subset.

**CRTO**;
Turn HP 8510 CRT Off. (PRESET Turns On.)

**CWFREQ** [value[freq suffix]];
Frequency List CW frequency.

**DATACHAN1**;
Trace math uses DATA from CHANNEL 1.
(DUAL CHANNEL)

**DATACHAN2**;
Trace math uses DATA from CHANNEL 2.
(DUAL CHANNEL)

**DATADATA**;
Corrected Data type under TAPE/DISC.

**DATAFORM**;
Formatted Data type under TAPE/DISC.

**DATARAW**;
Raw Data type under TAPE. (All appropriate selected channel Raw Data arrays)

**DATI**;
Transfer selected channel corrected data array to default trace memory.

**DEBUOFF**;
Turn off Debug mode.

**DEBUON**;
Turn on Debug mode.

**DEFA**;
Multiple Source Default Equation (PRESET).

**DEFIRECV**;
Multiple Source Define receiver equation.

**DEFISOUR1**;
Multiple Source Define Source #1 (test signal) equation.

**DEFISOUR2**;
Multiple Source Define Source #2 (local Osc.) equation.

**DEFM1**;
**DEFM2**;
**DEFM3;**
**DEFM4**;
**DEFM5**;
**DEFM6**;
**DEFM7**;
**DEFM8**;
Define memory used for memory operations on selected channels.
Memories 1, 2, 3, 4 are non-volatile.
Memories 5, 6, 7, 8 are volatile.

**DEFS** stdno;
Define the number of the cal std to be modified. (stdno=1-21)

**DELA**;
DELAY format.

**DELC**;
DELETE CAL SET, followed by **CALS***n*.

**DELE**;
DELETE tape/disc file, followed by data type and FILE*n*.

**DELO**;
Δ OFF.

**DELR1**;
**DELR2**;
**DELR3**;
**DELR4**;
**DELR5**;
Select Δ REF = Delta Mode Reference Marker.

**DELT**;
Delay Table data type under Tape.

**DENOA1**; $a_1$
**DENOA2**; $a_2$
**DENOB1**; $b_1$
**DENONOR**; $b_2$
Select DENOMINATOR for current parameter.

**DIRE**;
Display directory for current tape cartridge.

**DISCUNIT** [value];
Disc Unit Number under disc setup (0-15).
Usually 0 (left drive); 1 (right drive).

**DISCVOL** [value];
Disc Volume Number under disc setup (0-7).

**DISF** "filename";
Delete Disc filename.
Load Disc filename.
Store/Replace Disc filename.
Select data type filename under DISC STORE/LOAD/DELETE Operations. 7 Characters; Do not include filename data type prefix.

**DISPDATA**;
Display current data only.

**DISPDATM**;
Display current data and memory.
Selected Channel

**DISPMATH**;
Display current data with math.

**DISPMEMO**;
Display memory only.

**DIVI**;
Select complex divide trace math for selected channel.

**DONE**;
Current Standard Class Done during measurement calibration.

**DOWN**;
Decrease current active function one step.

**DRIVNONE**;
**DRIVPORT1**;
**DRIVPORT2**;
Select DRIVE port for current parameter.

**DUPD**;
Frequency List Delete Duplicate Points.

**DUPM**;
Frequency List Measure Duplicate Points (PRESET).

**EDITDONE**;
Edit Frequency List Done.

**EDITLIST**;
Edit Frequency List.

**EDITMULS**;
Edit Multiple Source Equations.

**ELED** [value [time suffix]];
Set ELECTRICAL DELAY for current parameter on selected channel. (see COAD; and WAVD;)

**ENTO**;
ENTRY OFF.

**EQUA**;
Set current Active Function equal to current active marker value.

**FASC**;
Select Fast CW data Acquisition (externally triggered). Exit using SINP;.

**FILE1**;
**FILE2**;
**FILE3**;
**FILE4**;
**FILE5**;
**FILE6**;
**FILE7**;
**FILE8**;
Select data type file number under TAPE/DISC STORE/LOAD/DELETE operations.

**FIRP**;
FIRST PAGE of Tape Directory and Operating Parameters.

**FIXE**;
Define Load std type as FIXED.

**FORM1**;
HP 8510 internal binary (6 bytes/point).

**FORM2**;
IEEE 32 bit fp (8 bytes/point).

**FORM3**;
IEEE 64 bit fp (16 bytes/point).

**FORM4**;
ASCII (strings separated by comma).

**FREO;**
Turn off display of frequency values.
Turn on by PRESET or Recall Inst. State.

**FRES**;
Begin definition of Frequency Subset.

**FREQ**;
Select FREQUENCY domain.

**FRER**;
Free-run selected sweep mode. (PRESET)

**FREU**;
Update Frequency Annotation with no Sweep.

**FULP**;
Select FULL PAGE plot.

**FWDI**;
Measure FWD. ISOL'N ISOL'N STD.

**FWDM**;
Measure FWD. MATCH std.

**FWDT**;
Measure FWD. TRANS. std.

**GAIN0**;
**GAIN1**;
**GAIN2**;
**GAIN3**;
**GAIN4**;
**GAINAUTO**; (PRESET)
Service Only. Select REF or TEST IF GAIN.

**GATECENT** [value [time suffix]];
Set Gate Center.

**GATEOFF**;
Turn off time domain gating.

**GATEON**;
Turn on time domain gating. Display Time domain gate markers.

**GATESPAN** [value [time suffix]];
Set Gate Span.

**GATESTAR** [value [time suffix]];
Set Gate Start.

**GATESTOP** [value [time suffix]];
Set Gate Stop.

**GATSMAXI**;
**GATSMINI**;
**GATSNORM**;
**GATSWIDE**;
Select Gate Shape.

**HARS**;
Hardware State data type under Tape/Disc. Complete Multiple Source hardware state and HP-IB Addresses.

**HOLD**;
HOLD mode; Sweep stopped.

**IMAG**;
IMAGINARY Cartesian format.

**INID**;
Begin Disc Initialization.

**INIT**;
Begin Tape initialization.

**INPUCALC01**;
**INPUCALC02**;
**INPUCALC03**;
**INPUCALC04**;
**INPUCALC05**;
**INPUCALC06**;
**INPUCALC07**;
**INPUCALC08**;
**INPUCALC09**;
**INPUCALC10**;
**INPUCALC11**;
**INPUCALC12**;
Store measurement calibration error coefficient set real/imaginary pairs input via HP 8510 HP-IB into HP 8510 memory. Select appropriate cal type then input necessary coefficient sets (see OUTPCALC*n*), then issue SAVC; CALS*n*; to save in a cal set. Issue CORRON; CALS*n*; to turn correction on.

**INPUDATA**;
Store selected channel Corrected Data trace memory real/imaginary pairs input via HP 8510 HP-IB. To input to memory, INPUDATA; DATI;

**INPUDELA**;
Input Delay Table real, imaginary pairs for selected channel via HP-IB.

**INPUFORM**;
Store selected channel Formatted trace memory input via HP 8510 HP-IB.
Cartesian: x = basic units.
y = 0.
Polar and Smith: real/imaginary pairs.

**INPUFREL**;
Input Frequency List via HP-IB.

**INPULEAS**;
Store FORM1 HP 8510 Learn String, previously output by OUTPLEAS, input via HP 8510 HP-IB. Set HP 8510 to Learn String state.

**INPURAW1**;
**INPURAW2**;
**INPURAW3**;
**INPURAW4**;
Store selected channel Raw Data trace memory real/imaginary pairs input via HP 8510 HP-IB. (See OUTPRAW*n*.)

**INSS1**;
**INSS2**;
**INSS3**;
**INSS4**;
**INSS5**;
**INSS6**;
**INSS7**;
**INSS8**;
Single Instrument State data type under TAPE/DISC.

**INSSALL**;
All Instruments States 1-8 data type under TAPE/DISC.

**INVS**;
INVERTED SMITH chart format.

**ISOD**;
ISOLATION DONE.

**ISOL**;
Begin ISOLATION calibration step.

**KEYC** value;
Press HP 8510 front panel key. See OUTPKEY.

**KITD**;
KIT DONE (MODIFIED). Store current cal kit definition.

| | | |
|---|---|---|
| **L0** [value]; | $x10^{-12}H$ | Short Circuit Inductance Model Values. |
| **L1** [value]; | $x10^{-24}H/Hz$ | |
| **L2** [value]; | $x10^{-33}H/Hz^2$ | |
| **L3** [value]; | $x10^{-42}H/Hz^3$ | |

**LABEADAP** ["string"];
**LABEFWDI** ["string"];
**LABEFWDM** ["string"];
**LABEFWDT** ["string"];
**LABERESP** ["string"];
**LABEREVI** ["string"];
**LABEREVM** ["string"];
**LABEREVT** ["string"];
**LABES11A** ["string"];
**LABES11B** ["string"];
**LABES11C** ["string"];
**LABES22A** ["string"];
**LABES22B** ["string"];
**LABES22C** ["string"];
**LABETRLL** ["string"];
**LABETRLR** ["string"];
**LABETRLT** ["string"];
Up to ten character standard class label. Standard class label is displayed only when more than one standard in class.

**LABK** ["string"];
LABEL KIT. Up to ten character label for current cal kit.

**LABS** ["string"];
LABEL STD. Up to ten character label for current cal standard.

**LASP**;
LAST PAGE of Tape Directory.

**LEFL**;
LEFT LOWER plot.

**LEFU**;
LEFT UPPER plot.

**LINM**;
LINEAR MAGNITUDE cartesian format.

**LINP**;
LIN mkr on POLAR format.

**LISFREQ**;
Select FREQUENCY LIST sweep mode.

**LIST**;
LIST TRACE VALUES to HP 8510 System Bus printer.

**LOAD**;
Load tape/disc data file into HP 8510 memory.

**LOAN**;
Measure LOAD NO OFFSET.

**LOAO**;
Measure LOAD OFFSET.

**LOCKA1**;
**LOCKA2**;
**LOCKNONE**;
Select Phase Lock input for current parameter.

**LOCSFAST**;
**LOCSNORM**;
Select fast or normal phaselock speed.

**LOCTEXTE**;
Select System 1st IF Phase Lock to External LO.

**LOCTINTE**;
Select System 1st IF Phase Lock to Internal LO. (PRESET)

**LOCTNONE**;
Do not Phase Lock 1st IF.

**LOGM**;
LOG MAG cartesian format.

**LOGP**;
LOG mkr on POLAR format.

**LOWF** [value [freq suffix]];
Specify TRL Lowband Frequency.

**LOWPIMPU**;
Time Domain LOW PASS: IMPULSE.

**LOWPSTEP**;
Time Domain LOW PASS: STEP.

**LOWR**;
Begin TRL 2-Port Lowband Reflection Cal. (Full 2-Port Reflection)

**MACD**;
MACHINE DUMP data type under TAPE/DISC. Complete instrument state and all memories. (Usable Only to Disc).

**MAGO** [value];
Set MAGNITUDE OFFSET, dB, for current parameter on selected channel.

**MAGS** [value];
Set MAGNITUDE SLOPE, dB/GHz, for current parameter on selected channel.

**MARK1** [value [suffix]];
**MARK2** [value [suffix]];
**MARK3** [value [suffix]];
**MARK4** [value [suffix]];
**MARK5** [value [suffix]];
Select Active marker and move it to specified stimulus value.

**MARKCONT**;
MARKERS: CONTINUOUS
(linear interpolation between measured points).

**MARKDISC**;
MARKERS: DISCRETE (only measured points).
(PRESET)

**MARKMAXI**;
Active marker to maximum trace value.

**MARKMINI;**
Active marker to minimum trace value.

**MARKOFF**;
Turn all markers off.

**MARKTARG**;
Active marker to target trace value. (Search starts from lowest stimulus value.)

**MAXF** [value [freq suffix]];
MAXIMUM FREQUENCY of current cal standard.

**MEMO1**;
**MEMO2**;
**MEMO3**;
**MEMO4**;
**MEMO5**;
**MEMO6**;
**MEMO7**;
**MEMO8**;
**MEMOALL**;
Trace memory data type under TAPE/DISC.

**MENUCAL**;
Present CAL Menu.

**MENUCOPY**;
Present COPY Menu.

**MENUDISP**;
Present DISPLAY Menu.

**MENUDOMA**;
Present DOMAIN Menu.

**MENUFORM**;
Present FORMAT Menu.

**MENUMARK**;
Present MARKER Menu.

**MENUOFF**;
Turn off display of menus.

**MENUON**;
Turn on normal display of menus.

**MENUPARA**;
Present PARAMETER Menu.

**MENUPRIO**;
Present PRIOR Menu.

**MENURECA**;
Present RECALL Menu

**MENURESP**;
Present RESPONSE Menu.

**MENUSAVE**;
Present SAVE Menu.

**MENUSTIM**;
Present STIMULUS Menu.

**MENUSYST**;
Present SYSTEM Menu.

**MENUTAPE**;
Present TAPE Menu.

**MENUTEST**;
Present TEST Menu. (HP-IB activity suspended.)

**MINF** [value [freq suffix]];
MINIMUM FREQUENCY of current cal standard.
($F_{co}$ for WAVEGUIDE type.)

**MINU**;
MINUS. Complex subtraction trace math for selected channel.

**MODI1**;
MODIFY 1 <cal kit 1 label>.

**MODI2**;
MODIFY 2 <cal kit 2 label>.

**MODS**;
Modify selected Cal Sets and Save, follow with CALSn;.

**MONI**;
For Service Use Only.
(TEST or cycle LINE power to exit)

**MULD** [value];
Multiple Source Multiplier Denominator.

**MULN** [value];
Multiple Source Multiplier Numerator.

**MULSOFF**;
Turn Off Multiple source and Save into Hardware State.

**MULSON**;
Turn On Multiple Source and Save into Hardware State.

**MULT**;
MULTIPLY. Complex multiplication trace math for selected channel.

**NEXP**;
NEXT PAGE; TAPE directory.

**NUMEA1**;
**NUMEA2**;
**NUMEB1**;
**NUMEB2**;
Select NUMERATOR for current parameter.

**NUMG** value;
NUMBER of GROUPS. Execute the specified number of groups of sweeps.

**OFFD** [value [time suffix]];
OFFSET DELAY of current cal standard.
= physical length/C
(C = 299.79 Mm/s *Velocity Factor)

**OFFF** [value];
Multiple Source Offset Frequency.

**OFFL** [value];
OFFSET LOSS of current cal standard (Gohms/s at 1 GHz) Series resistance per unit length.
$R_F = R@1GHz \sqrt{F / 1\ GHz}$
(Not used for WAVEGUIDE type.)

**OFFS**;
Define Load or Arbitrary Impedance std type as OFFSET type.

**OFFZ** [value];
Real Z of offset cal standard (ohms).
(Use $Z_0$ for WAVEGUIDE type.)

**OFLD**;
OFFSET LOAD DONE.

**OMII**;
OMIT ISOLATION calibration step.

**OPEP**;
Display Operating Parameters.

**OUTPACTI**;
Output current Active Function value.
(One FORM4 ASCII number.)

**OUTPCALC01**;
**OUTPCALC02**;
**OUTPCALC03**;
**OUTPCALC04**;
**OUTPCALC05**;
**OUTPCALC06**;
**OUTPCALC07**;
**OUTPCALC08**;
**OUTPCALC09**;
**OUTPCALC10**;
**OUTPCALC11**;
**OUTPCALC12**;
Output measurement calibration error coefficient set real/imaginary pairs for current cal set to external controller via HP 8510 HP-IB.

**OUTPDATA**;
Output selected channel Corrected Data array real/imaginary pairs.

**OUTPDELA**;
Output Delay Table real, imaginary pairs.

**OUTPERRO**;
Output number and message of current caution/tell message to external controller, clear status bytes, clear caution/tell message, no change to Status Request Mask. (See SRQM.)

**OUTPFORM**;
Output selected channel Formatted Data array pairs.
Cartesian: x=basic units of selected format,y=0.
Polar and Smith: real/imaginary pairs.

**OUTPFREL**;
Output Frequency List.

**OUTPIDEN**;
Output HP 8510 identification ASCII string.
(Same string as displayed for **SOFR;**)

**OUTPKEY**;
Output Integer number for last key pressed.
(See Keyword Dictionary for list.)

**OUTPLEAS**;
Output 4390-byte FORM1 HP 8510 Learn String.
(Same contents as Instrument State.)

**OUTPMARK**;
Output Active marker trace value.
(Two FORM4 ASCII numbers.)

**OUTPMEMO**;
Output currently selected trace memory real/imaginary pairs.

**OUTPPLOT**;
Output complete screen including menu as variable-length HPGL strings to HP 8510 HP-IB.

**OUTPRAW1**;
**OUTPRAW2**;
**OUTPRAW3**;
**OUTPRAW4**;
Output trace data from currently selected channel Raw Data array real/imaginary pairs.

**OUTPSTAT**;
Output HP 8510 Status Bytes (2 ASCII integers), clear status bytes. (See SQRM.)

**OUTPTITL**;
Output current Active Title, Cal Kit, Std. Label, Class Label ASCII string, or stds in Class.

**OVER**;
DUAL CHANNEL OVERLAY display.

**PAGP**;
PAGE PARAMETERS. Display Next page of Operating Parameters list.

**PARL** [''string''];
PARAMETER LABEL. Label current User parameter using up to eight characters. (User parameters only.)

**PEEK**;
Examine contents of memory specified by PEEK/POKE LOCATION. Active function is contents of specified memory location. Service use only.

**PEEL** memory address;
PEEK/POKE LOCATION. Specify PEEK and POKE memory address. Service use only.

**PEN1**;
**PEN2**;
**PEN3**;
**PEN4**;
**PEN5**;
**PEN6**;
**PEN7**;
**PEN8**;
Select pen for current plot type for selected channel.

**PHAO** [value];
Phase offset for current parameter on selected channel.

**PHAS**;
PHASE cartesian format.

**PLOP**;
Plot current page of Operating Parameters listing using digital plotter on HP 8510 System Bus.

**PLOTALL**;
Plot complete measurement display including User display using digital plotter on HP 8510 System Bus.

**PLOTGRAT**;
Plot graticule only using digital plotter on HP 8510 System Bus.

**PLOTMARK**;
Plot marker(s) only using digital plotter on HP 8510 System Bus.

**PLOTTEXT**;
Plot text only using digital plotter on HP 8510 System Bus.

**PLOTTRAC**;
Plot trace only using digital plotter on HP 8510 System Bus.

**PLUS**;
PLUS. Complex addition trace math for selected channel.

**POIN**;
Make total number of measured points active function.

**POIN** [value];
Specify Current Frequency List Segment. Number of Points.

**POIN51**;
**POIN101**;
**POIN201**;
**POIN401**;
**POIN801**;
Select number of points for both channels. (PRESET)

**POKE** value;
Change contents of memory location specified by PEEK/POKE LOCATION. Service use only.

**PORT1** [value [time suffix]];
**PORT2** [value [time suffix]];
Reference Plane Extensions. Additive with ELED;. (See COAD; and WAVD;)
PORT1 extends $S_{11}$, $S_{21}$, $S_{12}$;
PORT2 extends $S_{22}$, $S_{12}$, $S_{21}$.

**POW2** [value];
Set source #2 power dBm.

**POWE** [value];
Set source #1 power dBm.

**PREC**;
Press to Continue softkey During One-Path 2-Port Measurement.

**PREP**;
PREVIOUS PAGE. Display previous page of Tape Directory.

**PRES**;
PRESET.

**PRIP**;
PRINT PARAMETERS. Print current page of Operating or System Parameters using printer on HP 8510 System Bus.

**RAID**;
Response and Isolation Cal Done; followed by CALS*n*;.

**RAIRESP**;
Measure Response std in RESPONSE & ISOL'N Cal.

**RAIISOL**;
Measure Isolation std in RESPONSE & ISOL'N Cal.

**RAMP**;
RAMP sweep mode.

**REAL**;
REAL cartesian format.

**RECA1**;
**RECA2**;
**RECA3**;
**RECA4**;
**RECA5**;
**RECA6**;
**RECA7**;
**RECA8**;
RECALL previously stored Instrument State from specified internal memory. (Restores standard Basic parameter definitions; selects DISPDATA;.)

**REDD**;
REDEFINE DONE. Store current parameter definition.

**REFA**;
REFERENCE AMPLIFIER GAIN. See GAIN*n*.

**REFD**;
REFLECT'N DONE. All 2-port reflection standard classes are measured.

**REFL**;
Begin Reflection calibration step of 2-Port cal.

**REFP** [value];
REF POSN; (0 – 10)

**REFV** [value];
REF VALUE.

**REIP**;
Re/Im on POLAR format.

**RESC**;
RESUME CAL at point cal menu structure was exited.

**RESD;**
RESTORE DISPLAY after DIRE, OPEP, or SYSP.

**RESI;**
RESET IF CORRECTION. Initiate automatic IF gain cal; reset timer.

**REST**;
MEASUREMENT RESTART at beginning of group.

**REVI**;
Measure REV. ISOL'N ISOL'N STD.

**REVM**;
Begin REV. MATCH measurement calibration step. Measure if single std in class.

**REVT**;
Begin REV. TRANS. measurement calibration step. Measure if single std in class.

**RIGL**;
RIGHT LOWER plot quadrant.

**RIGU**;
RIGHT UPPER plot quadrant.

**S11**;
**S12**;
**S21;**
**S22**;
Select S-Parameter on current channel.

**SADD**;
Add a Frequency List segment.

**SAV1**;
SAVE 1-PORT measurement calibration; followed by CALS*n*;.

**SAV2**;
SAVE FULL 2-PORT measurement calibration; followed by CALS*n*;.

**SAVC**;
Store calibration coefficients loaded using INPUCALC*n*. Followed by CALS*n;*.

**SAVE1**;
**SAVE2**;
**SAVE3**;
**SAVE4**;
**SAVE5**;
**SAVE6**;
**SAVE7**;
**SAVE8**;
SAVE current instrument state in specified internal memory.

**SAVT;**
SAVE TRL 2-PORT measurement calibration; followed by CALS*n*;.

**SAVUASCI**;
Select ASCII format for disc operation.

**SAVUBINA**;
Select Binary format for disc operation. (PRESET)

**SCAL** [value];
SCALE Y-axis and Polar Scale/division.

**SDEL** [value];
Delete current or specified Frequency List segment. (value=1-31)

**SDON**;
Current Frequency List Segment Edit Done. If in Frequency List sweep mode, update trace.

**SEAL**;
Active Marker Search Left from current position for selected MIN, MAX, or TARGET.

**SEAR**;
Active Marker Search Right from current position for selected MIN, MAX, or TARGET.

**SEDI** [value];
Edit current or specified Frequency List segment.

**SEGM** [value];
Choose Frequency List segment to Edit.

**SERVADCG**;
**SERVDETG**;
**SERVREFC;**
**SERVTEMP1**;
**SERVTEMP2**;
**SERVTESC;**
**SERVVCAL**;
**SERVVREF**;
Service Use Only.

**SETF**;
SET FREQ. (LOW PASS). Start/Stop Frequencies may change. Issue once after CAL1; or CAL2;. Included in TIML;.

**SETRREFL**;
TRL Reflection std sets Reference Plane

**SETRTHRU**;
TRL Thru std sets Reference Plane.

**SETZ** [value];
SET $Z_0$ of Smith Chart, Inverted Smith, LOAD cal stds, CONVZ; and CONVY;. (PRESET selects $Z_0$=50 ohms.)

**SIMS**;
In TRIG mode, with cal std selected, move Raw Data to cal coefficient storage. (Simulate measurement of cal std).

**SINC**;
SINGLE CHANNEL display.

**SING**;
SINGLE SWEEP. Execute one group of sweeps, then HOLD.

**SINP**;
SINGLE POINT mode. Use CENT to set frequency.

**SLID**;
SLIDING LOAD DONE.

**SLIL**;
Specify the current STDTLOAD; cal std as SLIDING.

**SLIS**;
SLIDE IS SET; measure one slide position. 5 slides minimum; 6-12 slides recommended.

**SLOPOFF**;
Source #1 power slope off.

**SLOPON** [value];
Set source #1 power slope (dB/GHz).

**SMIC**;
SMITH CHART format.

**SMOOOFF**;
SMOOTHING OFF for selected channel.

**SMOOON** [value];
SMOOTHING ON for selected channel;
value = Percent of Span:
0.1, 0.2, 0.5,...20 sequence.
Cartesian displays only.

**SOFR**;
Display operating system SOFTWARE REVISION.

**SOFT1**;
**SOFT2**;
**SOFT3**;
**SOFT4**;
**SOFT5**;
**SOFT6**;
**SOFT7**;
**SOFT8**;
Press soft key. Execute current labeled function.

**SOU1EXTE**;
**SOU1INTE**;
**SOU2EXTE**;
**SOU2INTE**;
Select internal or external source leveling.

**SPAN** [value [suffix]];
Set Stimulus SPAN.

**SPECADAP** stanAno [, stanBno ... [, stanGno]];
**SPECFWDI** stanAno [, stanBno ... [, stanGno]];
**SPECFWDM** stanAno [, stanBno ... [, stanGno]];
**SPECFWDT** stanAno [, stanBno ... [, stanGno]];
**SPECRESP** stanAno [, stanBno ... [, stanGno]];
**SPECREVI** stanAno [, stanBno ... [, stanGno]];
**SPECREVM** stanAno [, stanBno ... [, stanGno]];
**SPECREVT** stanAno [, stanBno ... [, stanGno]];
**SPECS11A** stanAno [, stanBno ... [, stanGno]];
**SPECS11B** stanAno [, stanBno ... [, stanGno]];
**SPECS11C** stanAno [, stanBno ... [, stanGno]];
**SPECS22A** stanAno [, stanBno ... [, stanGno]];
**SPECS22B** stanAno [, stanBno ... [, stanGno]];
**SPECS22C** stanAno [, stanBno ... [, stanGno]];
**SPECTRLL** stanAno [, stanBno ... [, stanGno]];
**SPECTRLR** stanAno [, stanBno ... [, stanGno]];
**SPECTRLT** stanAno [, stanBno ... [, stanGno]];
Specify one to seven standards in each class.
stanAno = stdno of first std in class;
stanGno = stdno of seventh std in class.

**SPLI**;
Dual Channel SPLIT display format.

**SRQM** bytea,byteb;
Set SRQ mask. Mask selected bits of the Status bytes to enable HP 8510 SRQ. Mask doesn't affect OUTPSTAT.
bytea = primary status byte, 0-255;
byteb = secondary status byte, 0-255.

**SSEG** [value];
Measure single segment of Frequency List.

**STANA**;
**STANB**;
**STANC**;
**STAND**;
**STANE**;
**STANF**;
**STANG**;
Measure calibration standard in class.
(See CAL KIT Standard Class Assignments)

**STAR** [value [suffix]];
Set START Stimulus value.

**STDD**;
STD DONE (DEFINED). All necessary characteristics of current std are defined.

**STDTARBI**; ARBITRARY IMPEDANCE.
**STDTDELA**; DELAY/THRU.
**STDTLOAD**; LOAD.
**STDTOPEN**; OPEN.
**STDTSHOR**; SHORT.
Specify current Standard Type.

**STEP**;
STEP sweep mode.

**STOIDISC**;
Select External Disc on System Bus for Store/Load/Delete Operations.

**STOITAPE**;
Select Internal Tape for Store/Load/Delete Operations. (PRESET)

**STOP** [value [suffix]];
Set STOP Stimulus value.

**STOR**;
STORE tape/disc data file.

**STPSIZE** [value [freq suffix]];
Specify Current Frequency List Segment Frequency Step Size.

**SUBSCENT** [value [frequency suffix] ];
**SUBSSPAN** [value [frequency suffix] ];
**SUBSSTAR** [value [frequency suffix] ];
**SUBSSTOP** [value [frequency suffix] ];
Specify Frequency Subset.

**SWET** [value [time suffix]];
Set SWEEP TIME.

**SWR**;
SWR cartesian format.

**SYSBLOCA**;
HP 8510 SYSTEM BUS 'LOCAL'.
(Automatic when Pass-Thru executed.)

**SYSBREMO**;
HP 8510 SYSTEM BUS 'REMOTE'. (Automatic after HP 8510 addressed following Pass-Thru; includes Source Limited Instrument State Recall.)

**SYSP**;
Display SYSTEM PARAMETERS.

**TABD**;
Use Delay Table for ELECTRICAL DELAY.

**TARV** [value];
Specify Current Format Target Value for MARKER to TARGET.

**TERI** [value];
TERMINAL IMPEDANCE of Arbitrary Impedance type cal std (Ohms).

**TESA**;
TEST AMPLIFIER GAIN. See GAIN*n*.

**TIMB**;
TIME BAND PASS. Time Domain display with no frequency limitations.

**TIML**;
TIME LOW PASS. Time domain display with harmonically related frequencies. (Includes execution of SETF.)

**TITL** [''string''];
TITLE.

**TRAD**;
TRANS. DONE. All necessary 2-port TRANS. and MATCH standard classes are measured.

**TRAN**;
Begin 2-port TRANSMISSION measurement calibration steps.

**TRIG**;
Select Triggered Data Acquisition. Waits for HP-IB GROUP EXECUTE TRIGGER command to make next measurement; or SIMS;. Exit using FRER; or PRES;. See SRQM.

**TRIS** [value];
TRIM SWEEP.

**TRLL**;
Measure TRL Line cal std.

**TRLO**;
Modify Cal Kit, TRL Options defined.

**TRLR1**;
Measure TRL Port 1 Reflection std.

**TRLR2**;
Measure TRL Port 2 Reflection std.

**TRLT**;
Measure TRL Thru std.

**UNCC**;
UNCOUPLED CHANNELS.

**UNDE**;
UNDELETE last deleted tape/disc file.

**UP**;
Increase current active function one step.

**USED**;
USER DISPLAY tape/disc data type.

**USER1**;
**USER2**;
**USER3**;
**USER4**;
Select User Parameter.

**VELOFACT** [value];
Velocity factor used in supplementary distance displays for Frequency Domain ELECTRICAL DELAY, PORT EXTENSIONS, DELAY Marker Value, Time Domain Marker Value, and Gate Marker value. (Range 0.01 to 500;
1= Speed of Light = $299.7925 \times 10^6$ m/s)

**WAIT;**
Hold off execution of next instruction until current instruction is complete.

**WAVD** [cutoff freq [suffix]];
Select Waveguide Phase for Electrical Delay and Port Extensions. Make Cutoff Frequency Active Function. (Standard rectangular waveguide phase.)

**WAVE**;
Waveguide cal std.
(Standard rectangular waveguide.)

**WINDMAXI**; WINDOW: MAXIMUM.
**WINDMINI**; WINDOW: MINIMUM.
**WINDNORM**; WINDOW: NORMAL.
Time Domain Window Type.

# HP 8510B Query Commands

| COMMAND | FUNCTION | RESPONSE |
|---|---|---|
| **ANAO?**; | Analog On/Off | 1=on, 0=off |
| **AVER?**; | Averaging | 1=on, 0=off |
| **BEEP?**; | Beeper | 1=on, 0=off |
| **CALI?**; | Active Cal Type | "RESPONSE", "RESPONSE & ISOL'N", "S11 1-PORT", "S22 1-PORT", "2-PORT" "UNDEFINED" |
| **CALS?**; | Active Cal Set | 0=no active cal set, or 1, 2, 3, 4, 5, 6, 7, 8 |
| **CALSDIRE?**; | Stored Cal Sets | "<list of cal sets saved>" example: "1,2,3" |
| **CALZ?**; | TRL Cal $Z_0$ | "THRU" or "SYSTEM" |
| **CHAN?**; | Selected Channel | 1 or 2 |
| **CONV?**; | Parameter Conversion | "S", "1/S", "Z", "Y" |
| **CORR?**; | Correction | 0=off, 1=on |
| **COUP?**; | Coupled Channels | 0=uncoupled, 1=coupled |
| **CRT?**; | CRT On/Off | 0=off, 1=on |
| **DEBU?**; | Debug On/Off | 0=off, 1=on |
| **DEFM?**; | Default Memory | 1, 2, 3, 4, 5, 6, 7 or 8, or "DATA from CHANNEL 1", or "DATA from CHANNEL 2" |
| **DELM?**; | Electrical Delay | "COAXIAL", "WAVEGUIDE", "TABLE" |
| **DELR?**; | Delta Ref Marker | 0=Δ Mode Off or 1, 2, 3, 4, 5 |
| **DENO?**; | Parameter Denominator | a1, a2, b1, or "NO RATIO" |
| **DISP?**; | Display Trace | "DATA", "MEMORY", "DATA and MEMORY", "MATH" |
| **DOMA?**; | Domain | "FREQUENCY", "TIME LOW PASS", "TIME BAND PASS", "AUX. VOLT OUTPUT" |
| **DRIV?**; | Parameter Drive | "PORT 1", "PORT 2", "NONE" |
| **DUPP?**; | Duplicate Points | "DELETED", "MEASURED" |
| **FORM?**; | Format | "LOG MAG", PHASE", "DELAY", SMITH", "SWR", "LINEAR MAGNITUDE", "LIN mkr on POLAR", "LOG mkr on POLAR", "Re/Im mkr on POLAR", "INVERTED SMITH", "IMAGINARY", "REAL", . |
| **FREA?**; | Frequency Annotation | 0=frequency annotation off, 1=frequency annotation on |
| **GATE?**; | Gate On/Off | 0=Gate Off, 1=Gate On |
| **GATS?**; | Gate Shape | "MAXIMUM", "WIDE", "NORMAL", "MINIMUM" |
| **GROU?**; | Sweep | "CONTINUAL", "HOLD" |
| **IFGREFA?**; | Ref IF gain | 0, 1, 2, 3, 4, or "AUTO" |
| **IFGTESA?**; | Test IF gain | 0, 1, 2, 3, 4, or "AUTO" |

| COMMAND | FUNCTION | RESPONSE |
|---|---|---|
| **LOAT?**; | Load Type | "FIXED", "SLIDING", "OFFSET" |
| **LOCK?**; | Parameter Lock To | a1, a2, "NONE" |
| **LOCS?**; | Lock Speed | "NORMAL", "FAST" |
| **LOCT?**; | System Phase Lock | "INTERNAL", "EXTERNAL", "NONE" |
| **LOWP?**; | Time Stimulus | "STEP", "IMPULSE" |
| **LOWPSET?**; | Set Freq (Low Pass) | 0=no, 1=yes |
| **MARK?**; | Active Marker | 0=All Off, 1, 2, 3, 4, 5 |
| **MARKMODE?**; | Marker Mode | "CONTINIOUS", "DESCRETE" |
| **MARKSEAR?**; | Search Mode | "TARGET", "MINIMUM:, "MAXIMUM" |
| **MATH?**; | Trace Math | "PLUS", "MINUS", "MULTIPLY", "DIVIDE" |
| **MEDT?**; | Cal Std Media Type | "COAX" or "WAVEGUIDE" |
| **MENU?**; | Menu On/Off | 0=off, 1=on |
| **MULS?**; | Multiple Source | 0=off,1=on |
| **NUME?**; | Parameter Numerator | b1, b2, a1, a2,<br>"TEST CAL", "REF CAL", "DETECTOR GROUND",<br>"ADC GROUND", "VCAL", "VREF",<br>"TEMP. 1", "TEMP. 2" |
| **NUMS?**; | Freq List Segments | <number of segments in frequency list> |
| **PARA?**; | Parameter | "S11", "S21", "S12", "S22",<br>"USER1", "USER2", USER3", "USER4" |
| **PEN?**; | Select Pen | 1, 2, 3, 4, 5, 6, 7, 8 |
| **QUAD?**; | Select Quadrant | "UPPER LEFT", LOWER LEFT",<br>"UPPER RIGHT", "LOWER RIGHT", "FULL PAGE" |
| **SAVU?**; | Save Using | "ASCII", "BINARY" |
| **SEG?**; | Segment Measured | "ALL", "SINGLE" |
| **SETR?**; | TRL Cal Ref. Plane | "THRU" or "REFLECT" |
| **SLOP?**; | Power Slope | 0=off, 1=on |
| **SMOO?**; | Smoothing | 0=off, 1=on |
| **STDT?**; | Standard Type | "OPEN", "SHORT", "LOAD", "DELAY/THRU",<br>ARBITRARY IMPEDANCE" |
| **STOI?**; | Storage is | "TAPE", "DISC" |
| **SWEM?**; | Sweep Mode | "RAMP", "STEP", "SINGLE",<br>"FREQUENCY LIST", "FAST CW" |
| **SYNM**; | System Sync Mode | "TRIGGERED STEP", "FREE RUN" |
| **SYSB?**; | System Bus | "'LOCAL"', "'REMOTE"' |
| **TRAM?**; | Single/Dual Channel | "SINGLE CHANNEL", "SPLIT", "OVERLAY" |
| **WIND?**; | Window | "MAXIMUM", "MINIMUM", "NORMAL" |

# User Display

(ADDRPASS 31; send data to HP 8510 System Bus Address)

| | |
|---|---|
| **CS**; | Turn off Measurement display. |
| **DF**; | Set to default state (PU, PA). |
| **KP**; | Turn off User Display. |
| **LB**string CNTL C; | Label text. ASCII string terminated with CONTROL C. |
| **PA** $x_1,y_1[,x_2,y_2 ...[,x_n,y_n]]$; | Plot absolute.<br>$0 \leq x \leq 4095$,<br>$0 \leq y \leq 4095$. |
| **PD**; | Pen Down. |
| **PG**; | Clear (erase) User Display. |
| **PR** $x_1,y_1[,x_2,y_2 ...[,x_n,y_n]]$; | Plot relative. |
| **PU**; | Pen Up. |
| **RP**; | Turn on user display. |
| **RS**; | Turn on measurement display. |

# Circuit Modeling Program

## Statements

nnn **PORT** node (50 ohm termination)

nnn **R** node1 node2 resistance

nnn **L** node1 node2 inductance

nnn **C** node1 node2 capacitance

nnn **TL** node1 node2 Z len Er series corfreq shunt

nnn **FREQ** fstart fstop numsteps

nnn **FREQ LOWPASS** fstop numsteps

nnn **OUTPUT** Snn Send S-parameter data to HP 8510.

nnn **PLOT** S*nn* [,S*nn*] ... Plot data on Controller CRT.

**NOTE:**

nnn represents a line number.

*nn* represents S-parameter notation.

OUTPUT and PLOT can also be used as commands after the program has been RUN once.

The controller key CLR I/O interupts an executing command and returns the program to user control.

# Commands

**CAT** [volume specifier]

**DEL**

**GET** filename

**HELP** [statement or command]

**LIST**

**RUN**

**SAVE**

**PURGE** filename

**OUTPUT** Snn

**PLOT** Snn [, Snn] ...

**END**

**BYE**

**EXIT**

**QUIT**

# HP-IB Universal Commands

**DCL** Device Clear.

**LLO** Local Lockout, disables HP 8510 LOCAL key.
Must be cancelled by GTL.

**SPD** Disable Serial Poll.

**SPE** Enable Serial Poll.

**PPU** Not Used.

# HP-IB Addressed Commands

**GET** Group Execute Trigger.
(1.) After TRIG, Make next measurement.
Bit 2 of Primary Status Byte set upon completion.
(2.) During measurement using R/T test set with
ONE-PATH 2-PORT error model,
Continue measurement after reversing device.
Bit 3 of Primary Status Byte set upon completion.
(3) After FASC; data acquisition triggered by external input.

**GTL** Go to Local.
No response to HP 8510 instructions.

**PPC** Not Used.

**REN** Remote Enable.
Enable all HP-IB functions.

**SDC** Selected Device Clear.

**TCT** Not Used.

## PRESET STATE/VALUES

| FUNCTION | PRESET STATE/VALUE |
|---|---|
| Current Selected Channel | Channel 1 |
| Domain | Frequency |
| Display Format | LOG MAG |
| Trace Mode | SINGLE CHANNEL |
| Stimulus Display Mode | START/STOP |
| Frequency Domain (values based on using the HP 8515B and HP 8340B) | START = 45 MHz<br>STOP = 26.5 GHz<br>CENTER = 13.27 GHz<br>SPAN = 26.46 GHz |
| Time Domain | START = -1 ns<br>STOP = 4 ns<br>CENTER = 1.5 ns<br>SPAN = 5 ns |
| Auxiliary Voltage Domain | START = -1 V<br>STOP = 1 V<br>CENTER = 0 V<br>SPAN = 2 V |
| Sweep Mode | RAMP |
| Number of Groups | CONTINUAL |
| Number of Points | 201 |
| Averaging<br>Averaging Factor | Off<br>0 |
| Smoothing<br>Smoothing Aperture | Off<br>0 per cent |
| Correction<br>Active Cal Set | Off<br>None |
| Sweep Time | 100 ms |
| Sweep Trim | 0 |
| Source Power<br>Power Slope Value | 10 dBm Power Slope Mode Off<br>0 dB/GHz |

| | |
|---|---|
| Electrical Delay | 0 seconds<br>Coaxial Delay |
| Phase Offset | 0 degrees |
| Magnitude Offset<br>Magnitude Slope | 0 dB<br>0 dB/GHz |
| Parameter | $S_{11}$ - Channel 1<br>$S_{22}$ - Channel 2<br><br>DRIVE - Port 1<br>PHASE LOCK - a1<br>CONVERSION - S<br>DENOMINATOR - a1<br>NUMERATOR - b1 |
| Parameter Labels | USER 1 - a1<br>USER 2 - b2<br>USER 3 - a2<br>USER 4 - b1 |
| Reference Value | 0 dB *or* 0 units |
| Test Port IF Gain | AUTO |
| Reference Port IF Gain | AUTO |
| Attenuation | Port 1 - 0 dB<br>Port 2 - 0 dB |
| Port Extensions | Port 1 - 0 seconds<br>Port 2 - 0 seconds |
| System $Z_0$ | 50 Ω |
| Velocity Factor | 1.0 |
| Channel Coupling | Coupled |
| CRT | Enabled |
| Frequency Display | Enabled |
| Beeper | Not Changed |
| Title Line | HP logo |
| Plotter | Pen 1 - Channel 1<br>Pen 2 - Channel 2<br><br>Full Page |

| | |
|---|---|
| Reference Position | 5 div<br>0 div (time band pass) |
| Scale | 10 dB/ (frequency domain)<br>20 dB/ (aux voltage)<br>10 unit/ (time low pass)<br>1 unit/ (time band pass) |
| Marker State | Off, Descrete |
| Last Active Marker | Marker 1 |
| Reference Marker | Off |
| Marker 1 Value | 4.0 GHz |
| Marker 2 Value | 4.0 GHz |
| Marker 3 Value | 4.0 GHz |
| Marker 4 Value | 4.0 GHz |
| Marker 5 Value | 4.0 GHz |
| Δ Reference Marker Mode | Off |
| Δ Reference Marker 1 Value | 0 Hz |
| Δ Reference Marker 2 Value | 0 Hz |
| Δ Reference Marker 3 Value | 0 Hz |
| Δ Reference Marker 4 Value | 0 Hz |
| Δ Reference Marker 5 Value | 0 Hz |
| Marker Search Mode | Target |
| Target Search Vale | -3 dB for Log Mag.<br>Depends on Format. |

| | |
|---|---|
| Low Pass Time Domain Mode | STEP |
| Gating | OFF |
| Gate Window | NORMAL |
| Gate Shape | NORMAL |
| Gate | START = -500 ps<br>STOP = 500 ps<br>CENTER = 0 ns<br>SPAN = 1 ns |
| Trace Math Operator | Operator ( / ) |
| Trace Math Memory Mode | DISPLAY: DATA |
| Trace Math Memory Number | 1 - Channel 1<br>2 - Channel 2 |
| Storage is | Tape |
| Save Using (Disc) | Not Changed |
| Disc Unit/Disc Volume | Not Changed |
| System Phase Lock | Not Changed |
| Analog Out | Off |
| Multiple Source | Not Changed |
| HP-IB Addresses | Not Changed |

## CAUTION/TELL MESSAGES

When a message appears, press ENTRY OFF or program OUTPERRO and read error number to clear message from CRT. All "Tell" messages are error number 0 (zero).

| NUMBER | ERROR MESSAGE STRING |
|---|---|
| 1 | OPTIONAL FUNCTION, NOT INSTALLED<br>Attempt to use option not available with current system. Time Domain Option not installed. |
| 2 | SYNTAX ERROR |
| 3 | INVALID KEY<br>Pressed unlabeled softkey. |
| 4 | SOURCE SYNTAX ERROR |
| 5 | TEST SET SYNTAX ERROR |
| 6 | SYSTEM BUS ADDRESS ERROR<br>Source or test set not connected to HP 8510 System Bus. Check address selection at instrument and check HP 8510 address assignments. |
| 7 | SYSTEM BUS SRQ ERROR |
| 8 | VTO FAILURE<br>Pretune cycle not sucessfully completed.<br>Possible causes are:<br>Failure in VTO or summing amplifier.<br>Bad IF Detector/Test Set interconnect cable. |
| 9 | NO IF FOUND<br>Possible causes of no IF are:<br>IF counter failure.<br>Defective sampler.<br>Weak VTO.<br>Bad cable in IF path. |

10 PHASE LOCK FAILURE
Pretune has been accomplished but phase lock not achieved.
Refer to Service procedures.

11 PHASE LOCK LOST
Phase lock established then lost.
Refer to Service procedures.

12 VTO OVERRANGE
VTO swept beyond its normal range.
Refer to Service procedures.

13 SOURCE SWEEP SYNC ERROR

14 IF OVERLOAD
IF level is too high. Possible causes are:
Source Power too high.
Test Device Output level too high.

In the normal ramp mode, the algorithm for autoranging the IF gain allows the gain to change 1 step at each point. If the response changes more than one IF gain step (about 15 dB) then the IF gain cannot follow the reponse and the message is issued to indicate a possible, but not definite, error. The error indication is displayed as an O symbol in the Enhancement Labels area of the CRT display.

15 ADC CAL FAILED
The automatic calibration sequence for the Analog-to-Digital Converter has failed.
Refer to Service procedures.

16 IF CAL FAILED
The IF calibration is out of limits.
Refer to Service procedures.

17 ADC NOT RESPONDING
Power up message.
Analog-to-Digital Converter not responding.
Refer to Service procedures.

18 AUTORANGE CAL FAILED
One or more of the IF gain steps out of limits.
Refer to Service procedures.

19 SWEEP TIME TOO FAST
Slow down the source Sweep Time.

20 UNABLE TO LOCK TO EXT 10 MHZ REFERENCE

21 NOT IMPLEMENTED IN SOURCE
Requested function cannot be executed by source.

22 ERROR IN SAVING/STORING <INST. STATE/CAL SET/MEMORY>

A write error has been detected while saving data into HP 8510 internal memory. If repeated attempts fail, service is required.

23 CORRECTION OFF (MEMORY REALLOCATION)

24 CURRENT PARAMETER NOT IN CAL SET
The recalled cal set does not include the currently selected parameter.
Correction is not turned on.

25 ADDITIONAL STANDARDS NEEDED

26 CORRECTION MAY BE INVALID.
Cal Set Inst. State changed.
Correction not turned off.

27 NO CALIBRATION CURRENTLY IN PROGRESS
Attempted RESUME CAL with no cal in progress.

28 NO SPACE FOR NEW CAL
Must delete at least one Cal Set before resuming or restarting measurement calibration.

29 MORE SLIDES NEEDED

| | |
|---|---|
| 30 | EXCEEDED 7 STANDARDS PER CLASS |
| 31 | NO <MEMORY/CAL SET/INST STATE> FOUND |
| 32 | ERROR IN RECALLING <MEMORY/CAL SET><br>Possible HP 8510 memory malfunction.<br>If repeated attempts fail, service is required. |
| 33 | DATA OVERFLOW |
| 34 | ERROR IN DELETING CAL<br>Same as 32. |
| 35 | NO PRINTER CONNECTED |
| 36 | PRINT ABORTED |
| 37 | NO PLOTTER CONNECTED |
| 38 | PLOT ABORTED |
| 39 | NO TAPE IN DRIVE |
| 40 | TEST SET IS TOO HOT |
| 41 | ATTEMPTED ILLEGAL TEST SET OPERATION |
| 42 | READ ATTEMPTED WITHOUT SELECTING OUTPUT TYPE |
| 43 | WRITE ATTEMPTED WITHOUT SELECTING INPUT TYPE |
| 44 | WRITE PROTECTED DISC OR TAPE |
| 45 | BLOCK ERROR INPUT |
| 46 | BLOCK INPUT LENGTH ERROR |
| 47 | FILE NOT FOUND |
| 48 | TAPE INIT ABORTED |
| 49 | COMMAND OUT OF SEQUENCE |

50 FILE <STORE/LOAD/DELETE/ UN-DELETE> ERROR

51 FILE <STORE/LOAD/DELETE/ UN-DELETE> ABORTED

52 LOAD ABORTED <data type> DATA MAY BE BAD

53 NO ROOM ON TAPE
Current data type to be stored exceeds available remaining tape blocks.

54 UNABLE TO LOAD <stored data number of points> POINTS
Attempting to load DATA: <data type> stored with different number of points than current selection.

55 <tape format/tape drive/parity/write protect/ checksum/unknown> ERROR

56 USING BACKUP DIRECTORY
Transfer important data files to new tape.
Primary tape directory error.

57 DIRECTORY NOT DISPLAYED

58 PARAMETERS NOT DISPLAYED
Display System or Operating parameters before attempting page, plot, or print operations.

59 TURN <MEMORY/CORRECTION> OFF BEFORE LOADING FILE

60 LOAD ERROR. <data type> DATA MAY BE BAD

61 CAN ONLY LABEL USER PARAMETERS

62 CORRECTION AND DOMAIN RESET

63 ILLEGAL '101 KEY
Keyboard error.

64 ILLEGAL '102 KEY
Keyboard error.

65 REQUESTED DATA NOT AVAILABLE
Attempt to input/output raw data arrays which are not available due to calibration type. Input cal coefficients without selecting proper Cal Type. See INPURAW, OUTPRAW. Output memory trace without turning on memory.

66 INSUFFICIENT MEMORY

67 NOT USED

68 COMMAND NOT IMPLEMENTED

69 CAL ABORTED (MEMORY REALLOCATION)

70 TURN OFF CORRECTION AND/OR TIME DOMAIN

71 CORRECTION RESET.
Correction turned off due to change in instrument state.
See Cal Set Instrument State.

72 DOMAIN RESET
Domain changed from time to frequency due to instrument state change. (Cal Set instrument state, or turning correction on.)

73 NOT USED

74 SLIDES ABORTED (MEMORY REALLOCATION)

75 SPECIFY CALSETS, AND ADAPTER TO REMOVE

76 INVALID CALSET SELECTION

77 SELECT CALSET FOR PORT 1 FIRST

78 ILLEGAL UNIT OR VOLUME NUMBER

79 DISC HARDWARE PROBLEM

80 DISC IS UNFORMATTED - INITIALIZE IT?

| | |
|---|---|
| 81 | ? INITIALIZATION FAILED |
| 82 | DISC MEDIA WEARING OUT - REPLACE SOON |
| 83 | DISC IS WRONG FORMAT. INITIALIZE TO USE |
| 84 | NO <data type> FILES FOUND |
| 85 | Generic Error |
| 86 | DATA MISSING IN FILE <file name> |
| 87 | FILE <file name> IS NOT CURRENT REVISION |
| 88 | FILE IS NOT <data type> DATA |
| 89 | REGISTER NUMBER ERROR IN FILE <file name> |
| 90 | REGISTER NUMBER ERROR IN FILE <file name> |
| 91 | DISC FILE IS NOT A RECOGNIZEED FORMAT |
| 92 | DISC FILE IS NOT A RECOGNIZEED FORMAT |
| 93 | NO FILES FOUND ON DISC |
| 94 | OPERATION AVAILABLE WITH DISC ONLY<br>Certain Data Types can only be stored to disc. |
| 95 | CANNOT USE GATING IN LIST MODE<br>Time Domain Gating cannot be used in Frequency List Mode. |
| 97 | TOO MANY SEGMENTS OR POINTS<br>401 points maximum, 28 segments maximum in Frequency List mode. |
| 98 | FREQUENCY LIST EMPTY |
| 99 | BEYOND NON VOLATILE MEMORY LIMITS |
| 100 | LEARN STRING LENGTH ERROR |
| 101 | INVALID CALSET SELECTION |

| | |
|---|---|
| 100 | LEARN STRING LENGTH ERROR |
| 101 | INVALID CALSET SELECTION |
| 102 | TARGET VALUE NOT FOUND |
| 103 | ? IS NOT CURRENT STORAGE DEVICE |
| 104 | SYNTAX ERROR: ? |
| 105 | NO FAST PHASE LOCK WITH THIS SOURCE |
| 106 | TURN ON CORRECTION BEFORE CREATING |
| 107 | SUBSET CANNOT CONTAIN MORE THAN 401 POINTS |

## ALPHABETICAL INDEX OF KEYS

Alphabetic by key name or HP-IB Only mnemonic. User Display and Circuit Modeling Program keywords appear separately at the end of the index.

HP-IB UNIVERSAL COMMANDS



HP-IB ADDRESSED COMMANDS

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