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HP References in this Manual

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Reference Guide

HP 71500 Series

HP Part No. 70820-90051
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CAUTION	The *CAUTION* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the product or the user's work. Do not proceed beyond a *CAUTION* sign until the indicated conditions are fully understood and met.
WARNING	**The *WARNING* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury to the user. Do not proceed beyond a *WARNING* sign until the indicated conditions are fully understood and met.**
DANGER	**The *DANGER* sign denotes an imminent hazard to people. It warns the reader of a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a *DANGER* sign until the indicated conditions are fully understood and met.**

General Safety Considerations

WARNING

- **The instructions in this document are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.**
- **The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.**
- **The power cord is connected to internal capacitors that may remain live for five seconds after disconnecting the plug from its power supply.**
- **This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited.**
- **For continued protection against fire hazard, replace fuse only with same type and ratings, (type nA/nV). The use of other fuses or materials is prohibited.**

WARNING

- **Before this instrument is switched on, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact.**

  Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.
- **Before this instrument is switched on, make sure its primary power circuitry has been adapted to the voltage of the ac power source.**

  Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

Contents

Tables

1

Specifications and Characteristics

This chapter contains specifications and characteristics for the HP 70820A microwave transition module and the HP 71500A microwave transition analyzer system.

Definitions of terms and information about F_S and F_{IF} are also given at the beginning of the chapter.

Definitions of Terms

The distinction between specifications, *characteristics*, typical performance, and nominal values is described as follows:

- Specifications describe warranted performance over the temperature range 0 °C to +55 °C (unless otherwise noted). All specifications apply after the instrument's temperature has been stabilized after 1 hour continuous operation and self-calibration routines have been run. Unless otherwise noted, corrected limits are given when specifications are subject to minimization with error-correction routines.
- *Characteristics* provide useful, but nonwarranted information about the functions and performance of the instrument. *Characteristics are printed in italics*.
- Typical Performance, where listed, is not *warranted*, but indicates performance which most units will exhibit.
- Nominal Value indicates the expected, but not *warranted*, value of the parameter.

Information about F_S and F_{IF}

The information in this section is required for determining values for several of the specifications listed in this chapter.

F_S, the Hardware Sampling Frequency

The sampling frequency depends on the application. Press `Config`, `more 1 of 3`, `more 2 of 3`, then `INTERNL STATE` to view the sampling frequency value. Some example frequencies are shown below.

Repetition Frequency	F_S
>1 GHz	19 MHz $\leq F_S \leq$ 20 MHz
>10 MHz	10MHz $\leq F_S \leq$ 20 MHz
$\leq$10 MHz	19 MHz $\leq F_S \leq$ 20 MHz

F_{IF}, the Frequency of the Signal in the IF

F_{IF} depends on the specific application but will be between dc and 10 MHz. Press `Config`, `more 1 of 3`, `more 2 of 3`, then `INTERNL STATE` to view the value of the actual IF frequency being used.

You can also determine F_{IF} by viewing the signal with the FFT. Without zoom, the left side of the screen of the FFT corresponds to dc in the IF, and the right side of the screen corresponds to 0.5 × F_S.

There are different values of F_{IF} for different applications:

- For time sweeps: $F_{IF} = (N_C/N_P) \times F_S$

  Where:
  N_C = Number of cycles of the signal shown across screen
  N_P = Number of trace points across screen
  F_S = Sampling frequency

- For most time sweeps with repetition frequencies >10 MHz:

  $F_{IF} < 0.25 \times F_S$

- For CW frequency sweeps and CW power sweeps:

  F_{IF} = 78 kHz; and $F_{IF} < 0.25 \times F_S$

- For both the vector-voltmeter instrument state and the frequency and power instrument state, the value of F_{IF} is as listed below.

Table filter off (signal > 10 MHz): $F_{IF} = 0.25 \times F_S$

Table filter on (signal > 10 MHz): F_{IF} <80 kHz; and

$F_{IF} < 0.25 \times F_S$

(The vector-voltmeter instrument state is initiated by pressing `States` then the `VECTOR VOLTAGE` softkey. The frequency and power instrument state is initiated by pressing the `FREQ & POWER` softkey.)

- F_{IF} values are as listed below for time, frequency, and power sweeps of pulse modulated signals (a) with a PRF < 10 MHz, (b) with the system configured with a source, and (c) with one of the modified synthesizer settings on.

Frequency of carrier ≥500 MHz: $F_{IF} \leq 0.25 \times F_S$

Frequency of carrier < 500 MHz: $0.025 \times F_S \leq F_{IF} \leq 0.475 \times F_S$

(To turn on one of the modified synthesizer settings, press `Pulsgen`, `more 1 of 2`, and `modify: SYNTH`. Then press either `TIME/DIV`, `TRC PTS`, or `SYNTH`.)

Amplitude

Amplitude Uncertainty

The total Amplitude uncertainty is the sum of the individual uncertainties of the following five specification groups. The terms that contribute to Amplitude uncertainty are listed below for each specification group. (The contributions are uncorrelated.)

RF Frequency Response

The RF frequency response contribution to Amplitude uncertainty is composed of one of the following:

- "Absolute Amplitude RF Frequency Response, RF Corrections On"
- "Absolute Amplitude RF Frequency Response, RF Corrections Off"
- "Ratio Amplitude RF Frequency Response"
- zero (This term is zero for measurements where normalization applies.)

IF Flatness

The IF flatness contribution to Amplitude uncertainty is composed of one of the following:

- "IF Absolute Amplitude Frequency Response"
- "IF Step Response, Time Domain"
- "IF Impulse Response, Time Domain"
- zero (This term is zero either when absolute measurements are made at F_{IF} < 80 kHz, or when relative measurements are made at the same IF frequency.)

Input Power Level

The input power level contribution to Amplitude uncertainty is composed of "Amplitude Accuracy vs Input Power Level."

Mismatch (see Input Match, VSWR)

The mismatch contribution to Amplitude uncertainty is composed of "Mismatch Effects on Amplitude Measurements."

Repeatability, Trace Noise (see Noise)

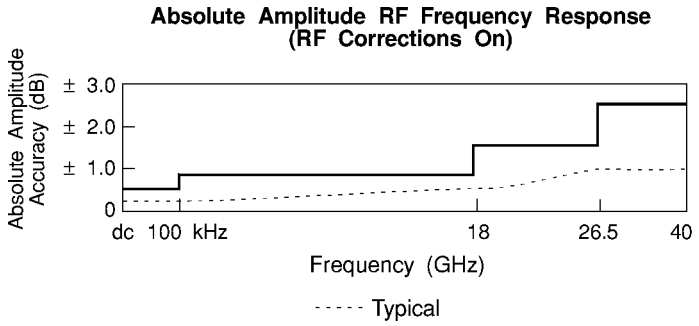
The trace noise repeatability contribution to Amplitude uncertainty is composed of one of the following:

- "Noise Floor"
- "Relative Noise Level, CW Input"
- "Relative Noise Level, Pulsed-RF Input"

RF Frequency Response

Absolute Amplitude RF Frequency Response, RF Corrections On (Ch1, Ch2)

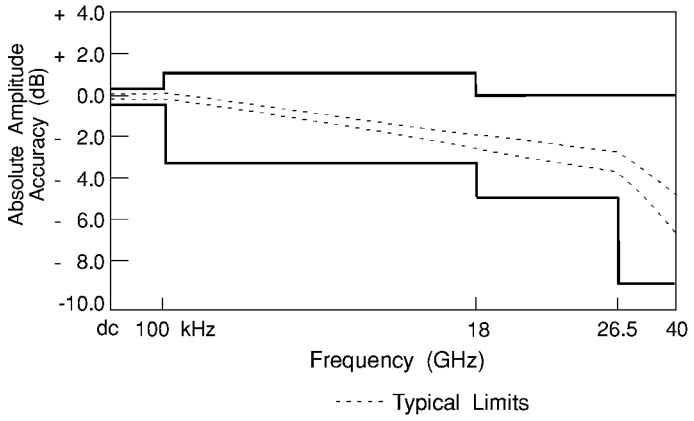
Input Frequency	Absolute Amplitude Accuracy
dc ≤ Input Frequency ≤ 100 kHz	±0.5 dB
100 kHz < Input Frequency ≤ 18 GHz	±1.0 dB*
18 GHz < Input Frequency ≤ 26.5 GHz	±1.5 dB
26.5 GHz < Input Frequency ≤ 40 GHz	±2.5 dB
* From 1—10 MHz: ±1.5 dB for 0 °C—55 °C; ±1.0 dB for ±5 °C from IF cal temperature	



Absolute Amplitude RF Frequency Response, RF Corrections Off (Ch1, Ch2)

Input Frequency	Absolute Amplitude Accuracy
dc ≤ Input Frequency ≤ 100 kHz	±0.5 dB
100 kHz < Input Frequency ≤ 18 GHz	+1, −3.5 dB*
18 GHz < Input Frequency ≤ 26.5 GHz	+0, −5 dB
26.5 GHz < Input Frequency ≤ 40 GHz	+0, −9 dB
* From 1—10 MHz: ±1.5 dB for 0 °C—55 °C; ±1.0 dB for ±5 °C from IF cal temperature	

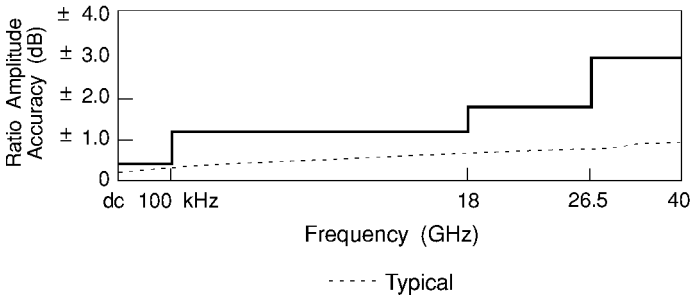
Absolute Amplitude RF Frequency Response (RF Corrections Off)



Ratio Amplitude RF Frequency Response (Ch1/Ch2, Ch2/Ch1)

Input Frequency	Ratio Amplitude Accuracy
dc ≤ Input Frequency ≤ 100 kHz	±0.5 dB
100 kHz < Input Frequency ≤ 18 GHz	±1.2 dB*
18 GHz < Input Frequency ≤ 26.5 GHz	±1.8 dB
26.5 GHz < Input Frequency ≤ 40 GHz	±3.0 dB
* From 1—10 MHz: ±1.5 dB for 0 °C—55 °C; ±1.2 dB for ±5 °C from IF cal temperature	

Ratio Amplitude RF Frequency Response



IF Amplitude Flatness (19 MHz $\leq F_S \leq$20 MHz)

IF Absolute Amplitude Frequency Response (Ch1, Ch2)

This term should be used for CW measurements and for pulsed-RF measurements after the pulse has been on and has reached steady state.

Signal Frequency in IF (F_{IF})	IF Absolute Amplitude Accuracy	
	±5 °C from IF cal	0 °C—55 °C
$F_{IF} < 0.25 \times F_S$	±0.5 dB	±0.8 dB
$0.25 \times F_S < F_{IF} < 0.4 \times F_S$	±0.75 dB	±1.2 dB
$0.4 \times F_S < F_{IF} < 0.5 \times F_S$	+1.5, −2 dB	+2, −3 dB

IF Step Response, Time Domain (Ch1, Ch2)

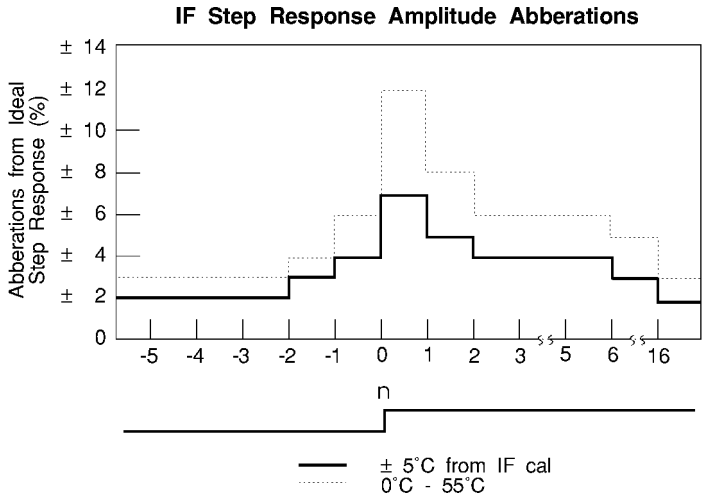
(measured with the HP 70820A cal signal)

Use the step response term to determine uncertainty near the edge of baseband signals in time sweep operation.

For IF step response as shown below, n has the following values (n = 0 for the first trace point or interval after the pulse edge):

n = each trace point, for input frequencies > 10 MHz or in single-shot acquisition mode.

n = $1/F_S$ intervals (typically 50 ns), for input frequencies (or PRF) ≤ 10 MHz.



IF Impulse Response, Time Domain (Ch1, Ch2)

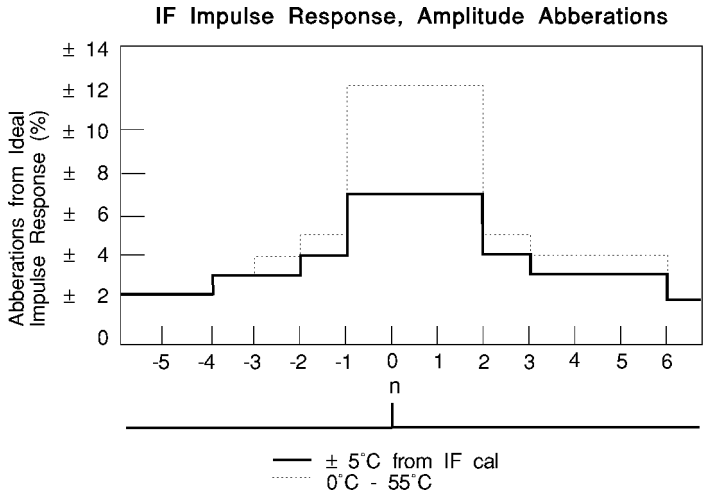
(measured with the cal signal of the HP 70820A)

Use the IF impulse response to determine the uncertainty of a measurement near the edge of a pulse-modulated signal. (Use the IF absolute frequency response for points farther from the pulse edge than shown in the graph below.)

For IF impulse response as shown below, n has the following values (n = 0 for the first trace point or interval after the pulse edge):

n = each trace point, for input frequencies > 10 MHz or in single-shot acquisition mode.

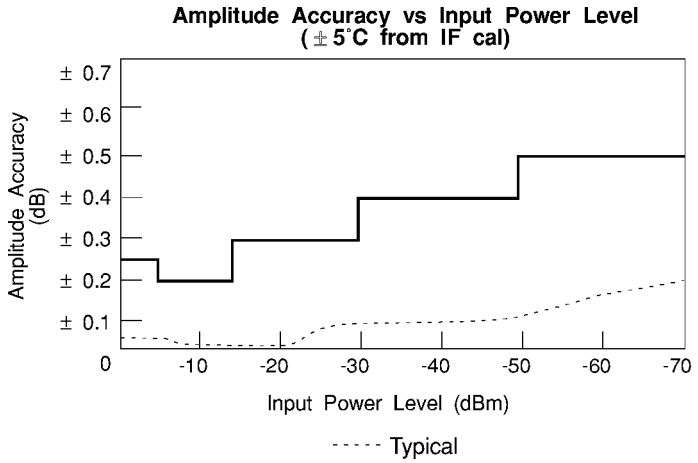
n = $1/F_S$ intervals (typically 50 ns), for input frequencies (or PRF) $\leq$ 10 MHz.



Amplitude Accuracy vs Input Power Level (Ch1, Ch2)

(Measured with auto-ranging on, F_{IF} < 80 kHz; valid for the largest signal present, not valid for small signals in the presence of a large signal.)

Input Power Level	Amplitude Accuracy	
	±5 °C from IF cal	0 °C—55 °C
0 dBm ≥ Input Power Level > −5 dBm	±0.25 dB	±0.35 dB
−5 dBm ≥ Input Power Level ≥ −15 dBm	±0.2 dB	±0.30 dB
−15 dBm > Input Power Level ≥ −30 dBm	±0.3 dB	±0.50 dB
−30 dBm > Input Power Level ≥ −50 dBm	±0.4 dB	±0.60 dB
−50 dBm > Input Power Level ≥ −70 dBm	±0.5 dB	±0.70 dB



Ratio Phase (Ch1/Ch2, Ch2/Ch1)

Ratio Phase Uncertainty

The total Ratio Phase uncertainty is the sum of the individual uncertainty of the following six specification groups. The terms that contribute to Ratio Phase uncertainty are listed below for each specification group. (The contributions are uncorrelated.)

Time Delay between Channels

The time delay between channels contribution to Ratio Phase uncertainty is composed of one of the following:

- "Time Delay between Channels"
- zero (This term is zero for measurements where normalization applies.)

RF Frequency Response

The RF frequency response contribution to Ratio Phase uncertainty is composed of one of the following:

- "Ratio Phase RF Frequency Response, RF Corrections On"
- zero (This term is zero for measurements where normalization applies.)

IF Flatness

The IF flatness contribution to Ratio Phase uncertainty is composed of one of the following:

- "IF Ratio Phase Flatness"
- zero (This term is zero when ratio measurements are made at the same IF frequency. Ratio measurements are usually made at the same IF frequency.)

Input Power Level

The input power level contribution to Ratio Phase uncertainty is composed of "Ratio Phase Accuracy vs Input Power Level."

Mismatch (see Input Match, VSWR)

The mismatch contribution to Ratio Phase uncertainty is composed of "Mismatch Effects on Phase Measurements."

Repeatability, Trace Noise (see Noise)

The trace noise repeatability contribution to Ratio Phase uncertainty is composed of one of the following:

- "Noise Floor"
- "Relative Noise Level, CW Input"
- "Relative Noise Level, Pulsed-RF Input"

Time Delay between Channels

Time delay between channels (uncorrected): < 10 ps

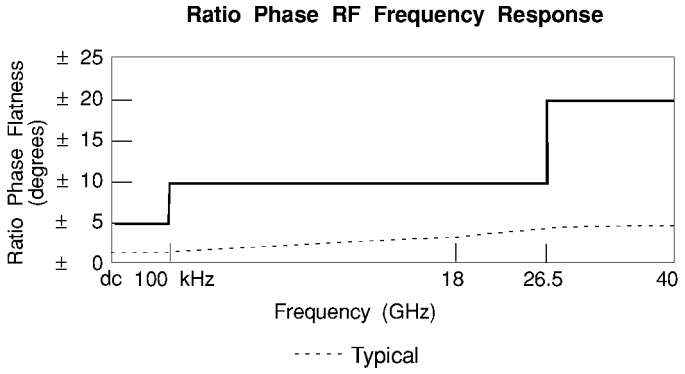
Time delays of up to $\pm 20\%$ of the timespan (including external delays) can be corrected for.

Phase error due to time delay is:

Phase error (deg) = Time delay (s) $\times$ Frequency (Hz) $\times 360^{\circ}$

Ratio Phase RF Frequency Response, RF Corrections On

Input Frequency	Ratio Phase Flatness
dc $\leq$ Input Frequency $\leq$ 100 kHz	$\pm 5°$
100 kHz $<$ Input Frequency $\leq$ 26.5 GHz	$\pm 10°$
26.5 GHz $<$ Input Frequency $\leq$ 40 GHz	$\pm 20°$



IF Ratio Phase Flatness

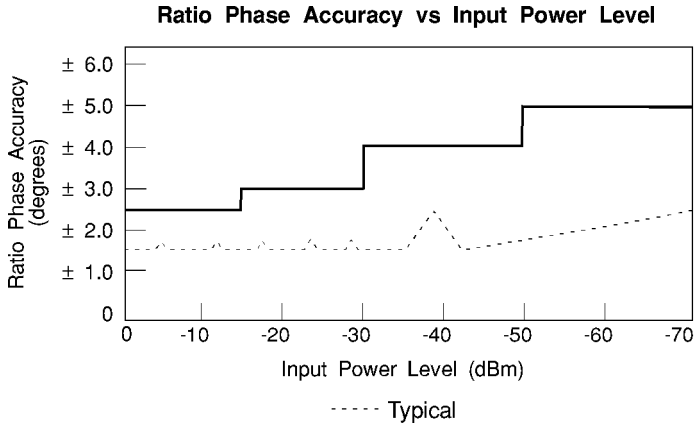
(19 MHz $\leq F_S \leq$ 20 MHz)

Signal Frequency in IF (F_{IF})	IF Ratio Phase Flatness	
	±5 °C from IF cal	0 °C—55 °C
$F_{IF} \leq 0.25 \times F_S$	±5°	±8°
$F_{IF} > 0.25 \times F_S$	±10°	±15°

Ratio Phase Accuracy vs Input Power Level

(Measured with auto-ranging on, $F_{IF} < 80$ kHz; valid for the largest signal present, not valid for small signals in the presence of a large signal.)

Input Power Level	Ratio Phase Accuracy
0 dBm $\geq$ Input Power Level $\geq$ −15 dBm	±2.5°
−15 dBm > Input Power Level $\geq$ −30 dBm	±3°
−30 dBm > Input Power Level $\geq$ −50 dBm	±4°
−50 dBm > Input Power Level $\geq$ −70 dBm	±5°



Input Channels

Operating input range: < 0 dBm (±320 mV, dc + ac pk, includes the dc offset)

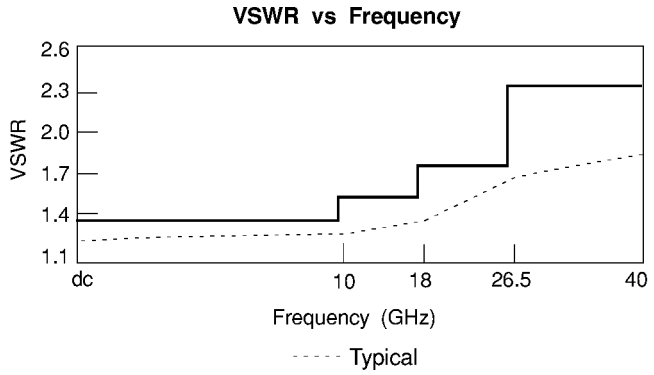
Maximum safe input without damage: 16 dBm peak (±2 V pk-pk)

Caution Inputs are dc coupled

Number of input channels: 2
Input connectors: 2.4 mm (m)
Input crosstalk: <−70 dB
Nominal input impedance: 50 Ω
Programmable dc Offset: ±320 mV

Input Match

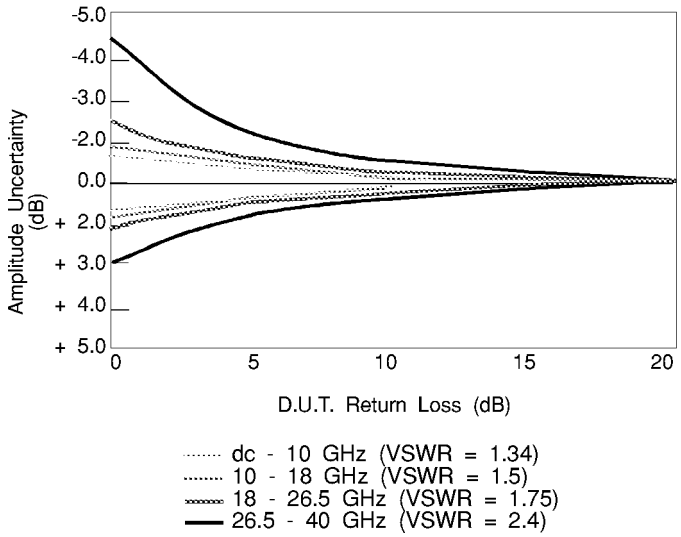
Input Frequency	VSWR (50 Ω source)
dc ≤ Input Frequency ≤ 10 GHz	<1.34:1
10 GHz < Input Frequency ≤ 18 GHz	<1.5:1
18 GHz < Input Frequency ≤ 26.5 GHz	<1.75:1
26.5 GHz < Input Frequency ≤ 40 GHz	<2.4:1



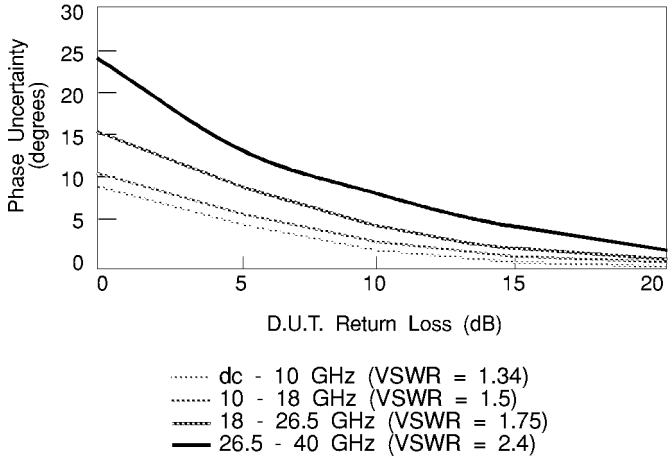
Mismatch Effects

Measurement uncertainty due to mismatch between a source or device under test (DUT) and the HP 70820A, based on HP 70820 input VSWR specifications, is shown below.

Mismatch Effects on Amplitude Measurements



Mismatch Effects on Phase Measurements



Noise

Two components contribute to the noise:

1. The noise floor: An absolute power level, which dominates the relative noise component at lower frequencies (< 1 GHz).
2. The relative noise: A noise level that is proportional to the input-signal voltage, and which dominates the noise-floor component when measuring larger signals at higher frequencies (>4 GHz).

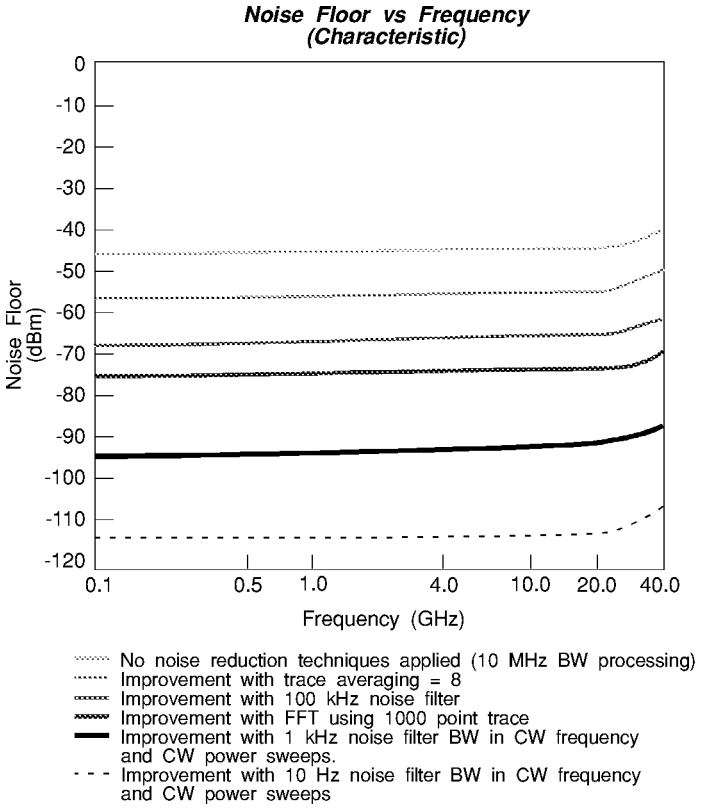
Refer to "Noise Example" for more information about the effect of input power level on composite noise level calculation.

Noise Floor

The noise floor should be considered when determining:

1. Dynamic range
2. Sensitivity
3. Trace noise

Frequency	Noise Floor
1 GHz	(10 MHz BW processing) <−44 dBm (1.4 mV rms)



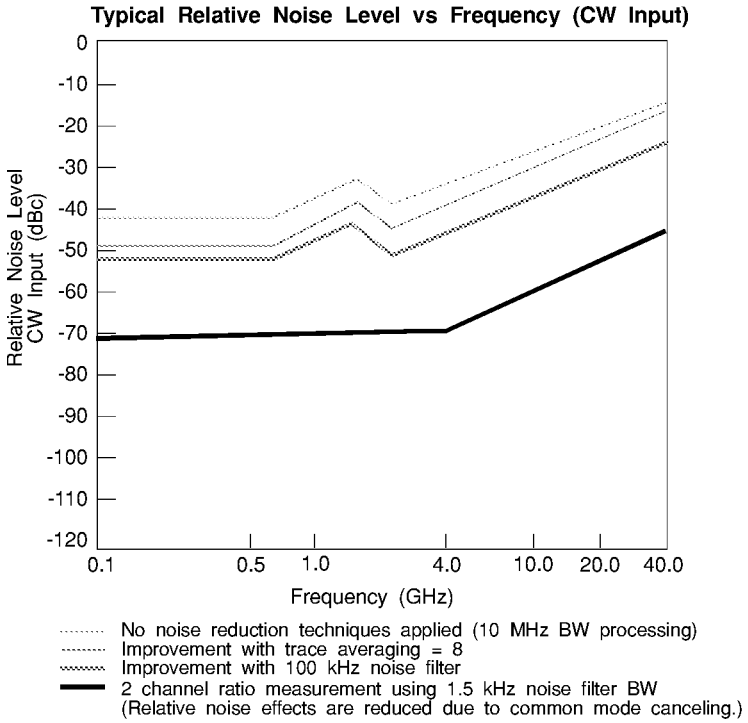
Relative Noise Level

The relative noise, if greater than the noise floor, should be considered when determining:

1. Trace noise
2. Dynamic range of the FFT

Relative Noise Level, CW Input

CW Input Frequency	Relative Noise Level (0 dBm input, 10 MHz BW processing)
100 MHz	−38 dBc
500 MHz	−35 dBc
1 GHz	−28 dBc
4 GHz	−32 dBc
40 GHz	−12 dBc



Ratio Measurement Trace Noise

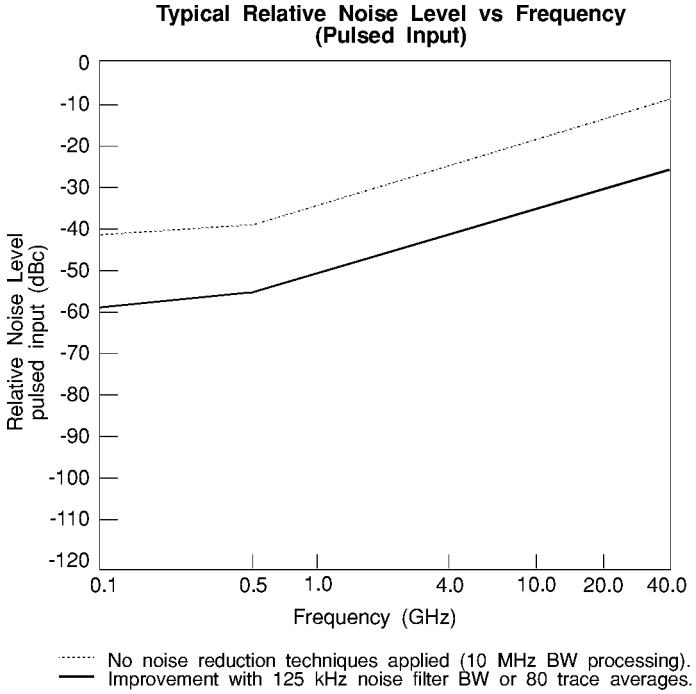
(Measured with −10 dBm into both inputs; 1 kHz noise filter BW.)

CW Input Frequency	Trace Noise	
	Gain	Phase
100 MHz	0.015 dB rms	0.15° rms
40 GHz	0.1 dB rms	0.75° rms

Relative Noise Level, Pulsed-RF Input

The relative noise with pulsed-RF input, if greater than the noise floor, should be considered when determining the trace noise of a pulsed-RF waveform.

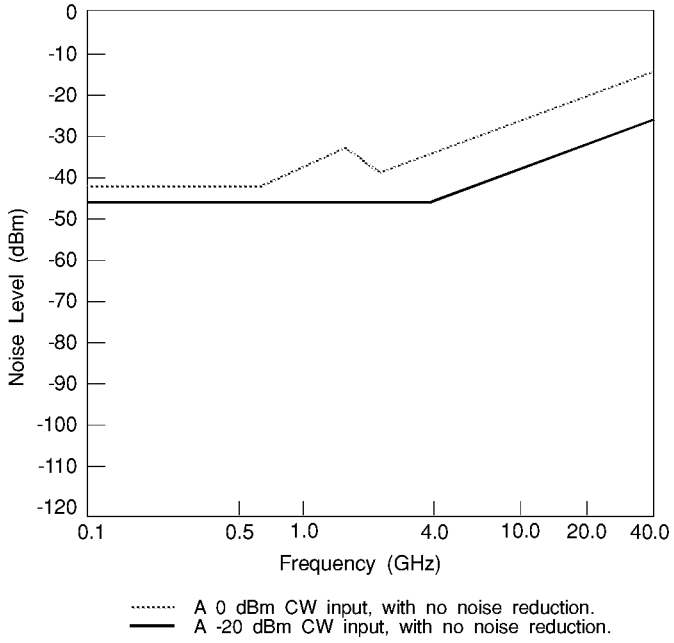
Carrier Input Frequency	Relative Noise Level
	(0 dBm input, 10 MHz BW processing)
100 MHz	−38 dBc
500 MHz	−35 dBc
1 GHz	−33 dBc
4 GHz	−23 dBc
40 GHz	−3 dBc



Noise Example

The graph in this example shows the result of combining the noise floor with the relative noise level for two different input power levels.

Example of Composite Noise Level
(No noise reduction techniques applied)



For an approximate conversion of signal-to-noise ratio (SNR) to trace noise, use the following table.

SNR	Trace Noise	
	Amplitude	Phase
20 dB	1.0 dB	10°
40 dB	0.1 dB	1°
60 dB	0.01 dB	0.1°

or,

Amplitude trace noise = $20 \log (1 + 10^{-\mathrm{SNR}/20})$ dB

Phase trace noise = $\arctan (10^{-\mathrm{SNR}/20})$ radians

SNR (dB) = Signal level (dBm) − composite noise level (dBm)

Residuals

The residuals are ≤ -55 dBm.

Distortion

RF Compression at 0 dBm

Signal Frequency in IF (F_{IF})	Compression	
	Amplitude	Phase
$F_{IF} \leq 100$ kHz	<0.25 dB	<3°
100 kHz < F_{IF} < 10 MHz	<0.35 dB	<3°

Harmonic Distortion

(2nd and 3rd harmonics, autoranging on, −20 dBm input)

Input Frequency	Distortion Products
≤10 MHz	<−35 dBc
>10 MHz	<−45 dBc

Trigger

Phase Trigger Sensitivity

(for a signal from a synthesizer that is sharing a common time base with the HP 70820A module)

Input Frequency	Sensitivity
20 MHz—40 GHz	−40 dBm (7 mV_{p-p})

Edge Trigger Sensitivity

(for a signal from a synthesizer that is sharing a common time base with the HP 70820A module)

Input Frequency	Sensitivity
dc ≤ Input Frequency < 10.3 MHz	−20 dBm
10.3 MHz ≤ Input Frequency ≤ 10 GHz (noise filter on)	−40 dBm (7 mV_{p-p})

Internal Frequency Reference

Frequency:	10 MHz (nominal)
Stability	
Aging rate:	$<5 \times 10^{-10}$/day after 24 hour warm-up. $<1 \times 10^{-7}$/year for continuous operation.
Temperature:	$<4.5 \times 10^{-9}$ over the range 0 °C to 70 °C.
Short term:	$<5 \times 10^{-12}$ for 1 s averaging time.
Warm-up:	$<5 \times 10^{-10}$ of final value 10 minutes after turn-on, at 25 °C. Mainframe's external power pack keeps oven warm while line is plugged in but front-panel power is off.

Time Scale

Definitions

E_R = Frequency reference accuracy (expressed as a relative number)

E_{TS} = Time scale accuracy (expressed as a relative number)

F_{aa} = Frequency accuracy of the auto-acquire routine (F_{AA}, see Signal Acquisition) without the frequency reference error:

F_{aa} = 10 MHz; for 500 Hz $\leq$ CW signals $\leq$ 10 MHz
F_{aa} = 15 Hz + (0.035 ppm $\times$ F_{IN}); for 10 MHz $<$ CW signals $\leq$ 40 GHz

F_{IF} = Frequency of the signal in the IF.

F_{Drift} = Change in frequency of the signal from the initial frequency measurement.

Time Scale Range

(full scale is 10 divisions)
5 ps/div to 100 s/div

Time Scale Accuracy (E_{TS})

Measurement Setup	Time Scale Accuracy (E_{TS})
1. (Recommended setup) Frequency entered identically matches frequency of source, and HP 70820A shares common frequency reference with source.	E_R
2. Auto-acquire determines frequency, and HP 70820A shares common frequency reference with source.	$(F_{aa}/F_{IF}) + E_R$
3. Auto-acquire determines frequency; HP 70820A and source do not share common frequency reference.	$[(Faa + F_{Drift})/F_{IF}] + E_R$

Delta Time Measurement Accuracy

The greater of: < (ETS × reading) + timespan/number of trace points;
or
1 ps

Time Delay Range, Repetitive Acquisition

Signal Frequency (PRF for pulsed signals)	Delay Range
>10 MHz	−(1/2 × timespan) to +(1,000 × timespan)
≤10 MHz	−2 signal periods to +2 signal periods

Signal Acquisition

There are two modes of signal acquisition, find-signals mode and signal-track mode (which initiates an auto-acquire routine). The find-signals mode is initiated by pressing the `FIND SIGNALS` softkey; the signal track mode by pressing the `sig trk ON|OFF` softkey until ON is underlined.

The `FIND SIGNALS` and `sig trk ON|OFF` softkeys can be accessed by pressing `Main` (time mode), `more 1 of 2`, `FIND SIGNALS` or `sig trk ON|OFF`.

Frequency Accuracy (F_{AA})

(of initial acquisition, for CW signals >−20 dBm)

Input Frequency	Frequency Uncertainty (F_{AA}), (rms)
500 Hz—10 MHz	±10 mHz ± (E_R × F_{IN})
>10 MHz—40 GHz	±15 Hz ± [(0.035 ppm + E_R) × F_{IN}]
Table mode (filter on, typical)	
>10 MHz—40 GHz	±(0.0035 ppm + E_R) × F_{IN}

Where: E_R = Frequency reference accuracy (expressed as a relative number)

F_{IN} = Input frequency being measured

Sensitivity (sinusoids)

Input Frequency	Sensitivity
500 Hz to 40 GHz	−40 dBm (7 mV_{p-p})

Outputs/Inputs

Modulator Output (Characteristics)

Repetition frequency:	*152.9 Hz—5 MHz*
Repetition period:	*6.553 ms—200 ns*
Pulse width:	*6.552 ms—100 ns*
Level:	*TTL into 50 Ω*
Transition time:	*<5 ns*
Connector:	*Rear panel, SMB (m)*

The pulse generator is phase locked to the 10 MHz reference. Pulse width and repetition period are adjustable in 100 ns steps. Inaccuracies in the pulse width are dominated by the transition times (<5 ns).

IF Calibrator Output

Connector:	Front panel, SMA (f)

Reference Output

Connector:	Rear panel, SMB (m)
Frequency:	10 MHz (nominal)
Amplitude:	0.45 $V_{p\text{-}p}$ square wave (−2 dBm fundamental) into 50 Ω. 0.55 $V_{p\text{-}p}$ (0 dBm), typical.

External Reference Input

Connector:	Rear panel, SMB (m)
Frequency:	10 MHz
Amplitude:	0 ±5 dBm (0.13 V_{rms} to 0.4 V_{rms}) sine wave or square wave (ECL) into 50 Ω.

DAC Output (Characteristics)

(accessible only through HP-IB programming)

Voltage range:	*0 V—10 V*
D/A resolution:	*12 bits*
Connector:	*Rear panel, SMB (m)*
Drive capability:	*5 mA*

Probe Power Supplies (Characteristics)

Supply	Tolerance	Current Drive
+15 V	*±0.5 V*	*source 130 mA*
–12.5 V	*±0.5 V*	*sink 45 mA*

SYNC INPUT

Connector:	*rear panel SMB (male)*
Input level required:	*TTL (into high impedance)*
Sync Modes:	*Force Sweep;\Arm internal trigger*
Nominal delay from sync input to channel input to A/D:	*280 ns, 10 MHz IF*
	450 ns, 7 MHz IF
	11 μs, 100 kHz IF
Forced sweep mode:	
Forced sweep occurs on:	*Transition from low to high of sync input. Must remain high for 250 ns.*
Forced sweep uncertainty:	*±100 ns*
Minimum pulse width:	*250 ns*
Maximum pulse width:	*Determined by sweep time. Next sweep will not occur until the next low-to-high transition.*
Arm internal trigger mode:	
Arm sweep on:	*High level of sync input.*
Minimum delay from sync input going high to internal trigger event:	*100 ns*
External power input	

General Specifications and Characteristics

Environmental Conditions

Temperature

Operating:	0 °C to +55 °C (+32 °F to +131 °F)
Storage:	−40 °C to +75 °C (−40 °F to +158 °F)

Altitude

Operating:	Up to 4,600 meters (15,000 ft)
Storage:	Up to 15,300 meters (50,000 ft)

EMI

Conducted and radiated interference is in compliance with CISPR Publication 11 (1975); FTZ 526/79; and MIL-STD 461C, REO2/part 7.

Power Requirements

HP 70820A	90 W, supplied by mainframe
HP 71500A	
Volts:	100, 120, 220, or 240 V ac (±10%, 47 Hz—66 Hz and 400 Hz)
Power:	260 W, 350 VA maximum
External power pack	
Volts:	100, 120, 220, or 240 V ac (44 Hz—444 Hz)

Weight (Characteristics)

HP 70820A	*9 kg (20 lb)*
HP 71500A	*29 kg (64 lb)*

Dimensions (Characteristics)

HP 70820A	*4/8-width module*
HP 70004A and Mainframe	*222.0 mm (8.74 in.) high* *425.4 mm (16.75 in.) wide* *526.0 mm (20.7 in.) long*
HP 70001A Mainframe	*177.0 mm (6.97 in.) high* *425.4 mm (16.75 in.) wide* *526.0 mm (20.7 in.) long*

Regulatory Information

The information on the following pages apply to these products:

- HP 71500A microwave transition analyzer
- HP 71501A eye diagram analyzer
- HP 70820A microwave transition analyzer module

Declaration of Conformity

DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	Hewlett-Packard Co.
Manufacturer's Address:	1212 Valley House Drive Rohnert Park, California 94928-4999 U.S.A.

Declares that the product:

Product Name:	Microwave Transition Analyzer
Model Numbers:	HP 71500A, HP 71501A, and HP 70820A
Product Options:	This declaration covers all options of the above products.

Conforms to the following product specifications:

Safety:	IEC 348(1978) / HD 401 S1
EMC:	EN 55011 / CISPR 11(1990) Group 1, Class A EN 50082-1(1992) IEC 801-2(1991), 8 kV AD IEC 801-3(1984), 3 V/m IEC 801-4(1988), 500 V signal, 1 kV ac power

Supplementary Information:

These products were tested in HP 70004A color displays.

Rohnert Park, California	10-5-92	Dixon Browder
Location	**Date**	**Dixon Browder / QA Manager**

Notice for Germany: Noise Declaration

LpA < 70 dB
am Arbeitsplatz (operator position)
normaler Betrieb (normal position)
nach DIN 45635 T. 19 (per ISO 7779)

2

Menu Maps

The menu maps that are in this chapter graphically represent the softkey menus that are located under the (MENU) key. Maps for each left-side softkey are shown in alphabetical order.

Analyze Menu

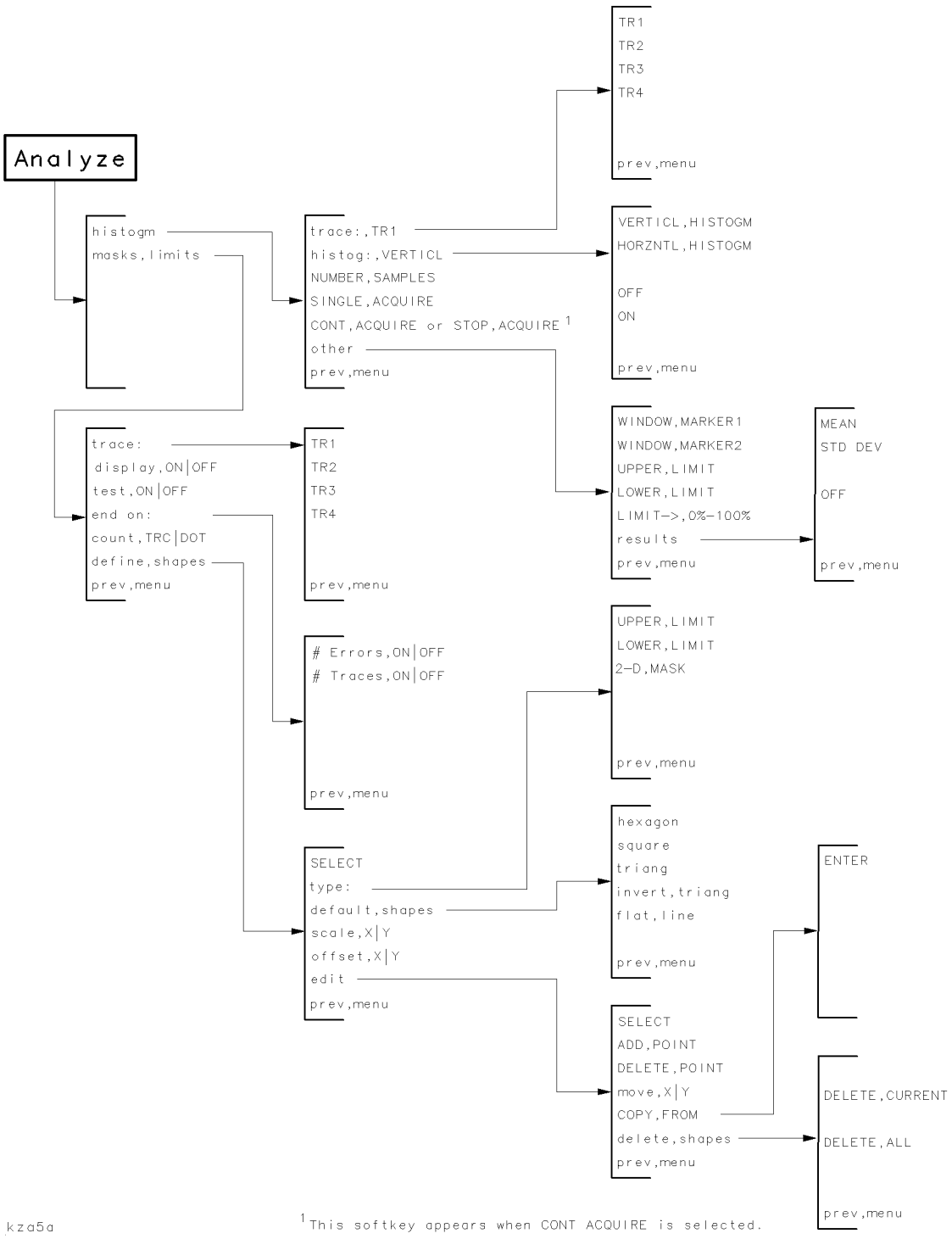
The Analyze menu contains functions that analyze histograms and creates and tests masks or limit-lines.

The Histogm menu performs automatic histogram analysis.

Histogram analysis can be performed on any of the four traces and two input channels. In order to perform histogram analysis on a trace, the trace must be displayed on the screen.

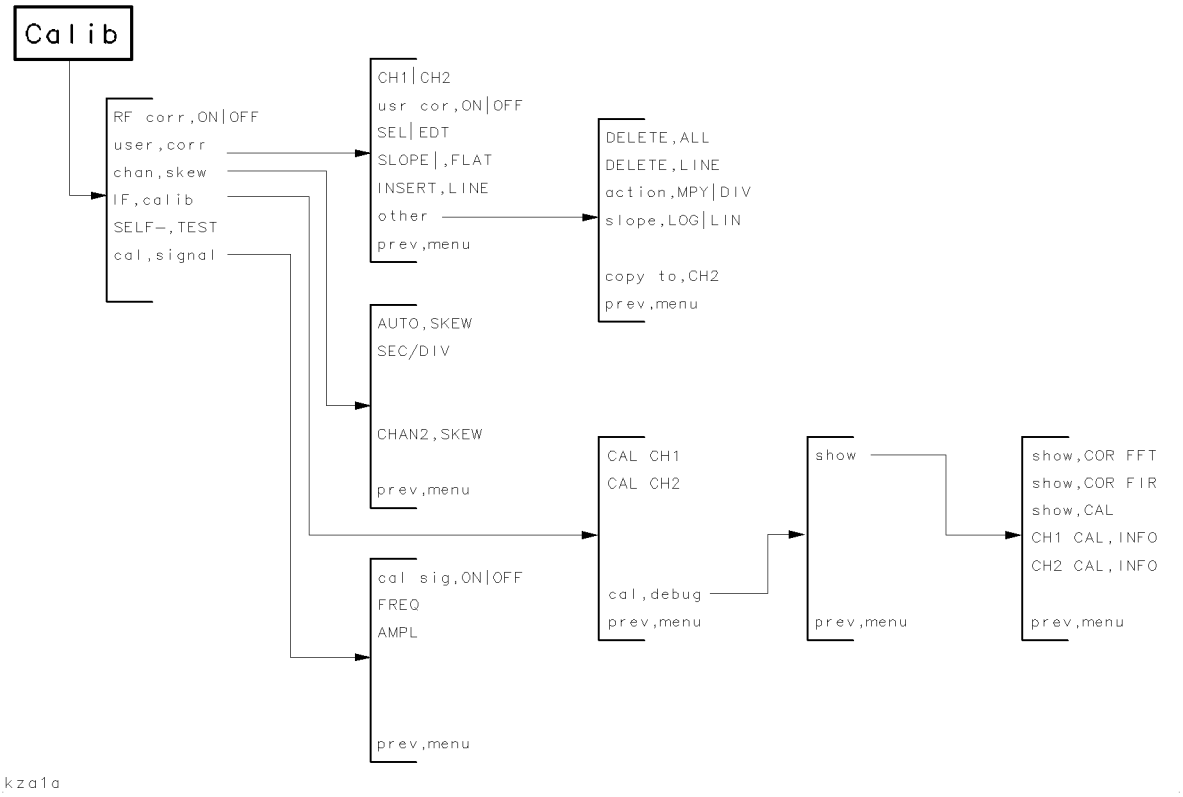
The masks limits menu performs limit-line checking or mask testing.

Analyze Menu



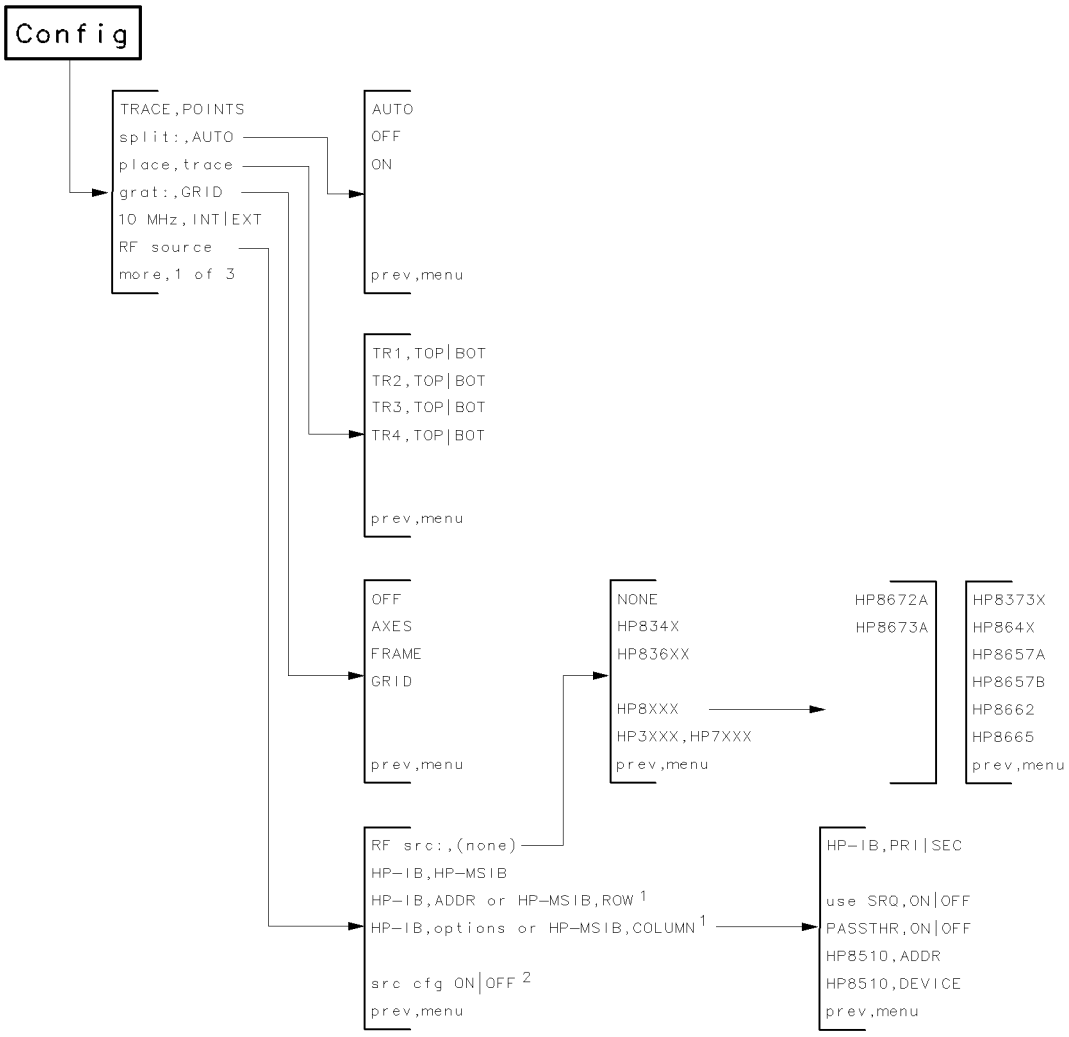
Calib Menu

The Calib menu contains functions used to calibrate the microwave transition analyzer. These functions include creating user correction data for channel 1 and channel 2, adjusting time skew for channel alignment, and a calibrator signal.



Config Menu

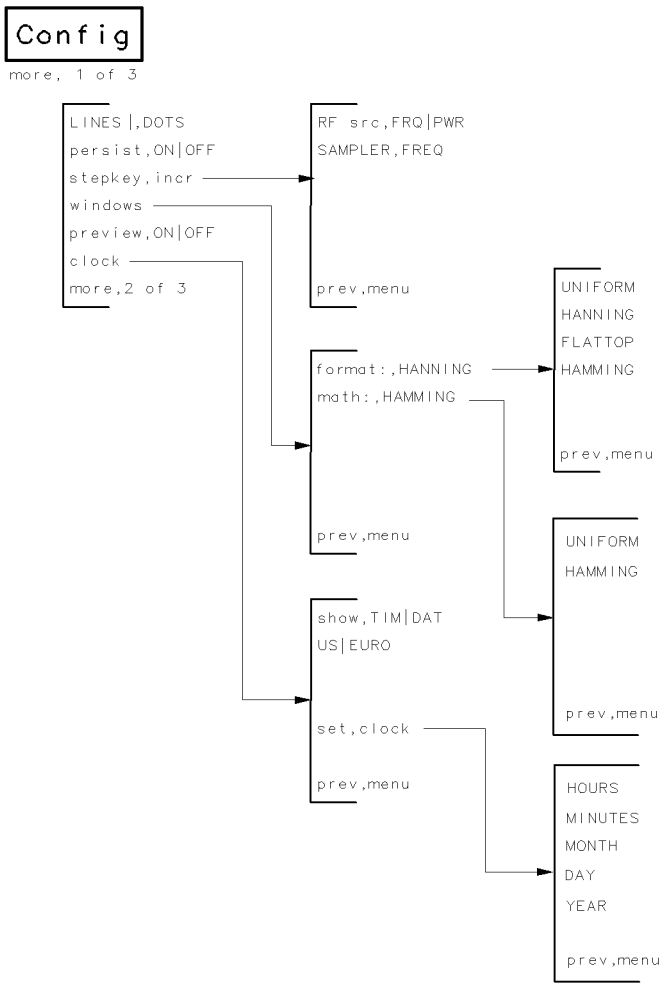
The Config menu properly configures the microwave transition analyzer's display and measurement control functions. Configuration includes selecting the external RF source controlled by the microwave transition analyzer.



1. This softkey appears when HP-MSIB is selected as the control bus.
2. This softkey appears when an instrument is selected.

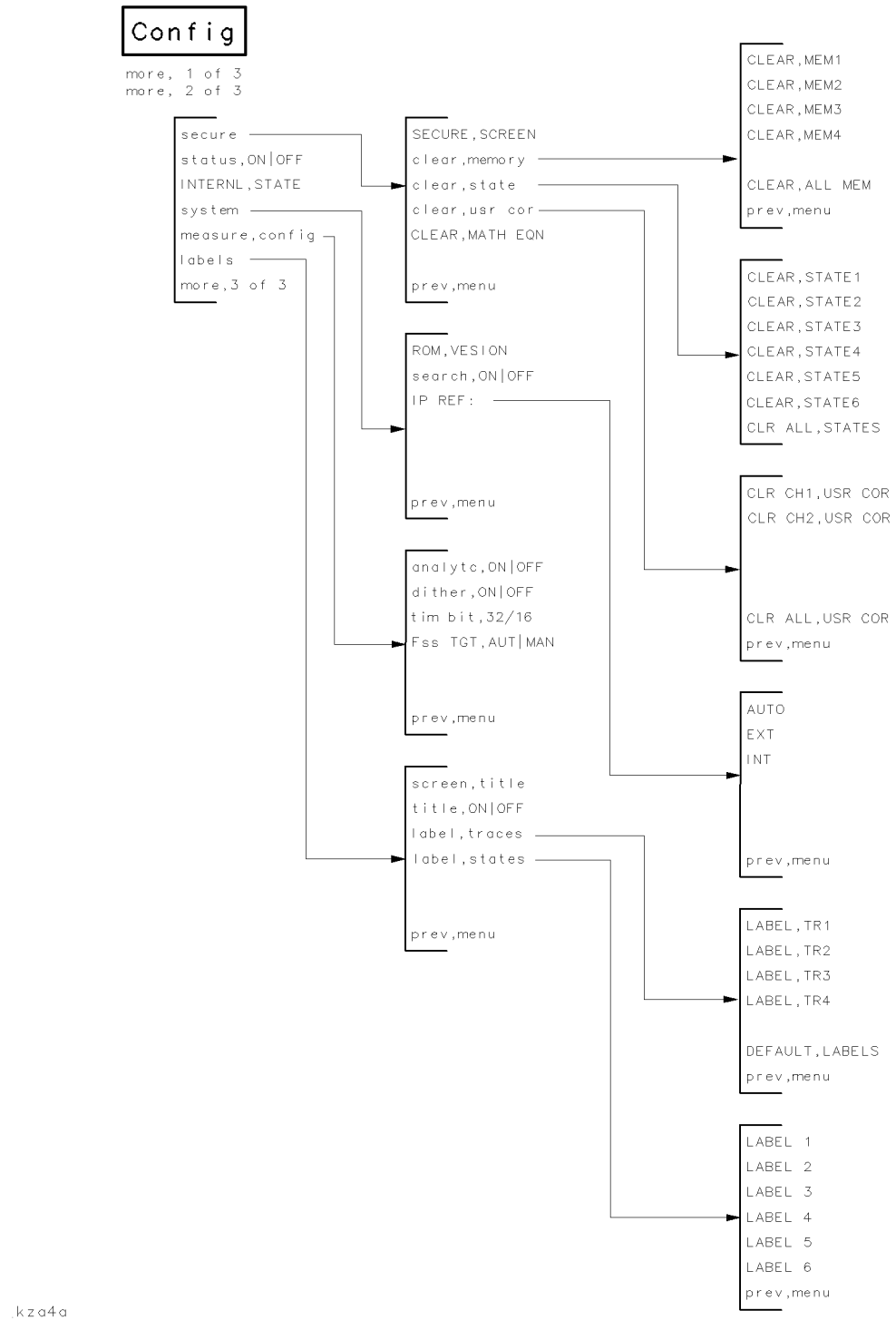
kza2a

Config Menu (cont'd)



Config Menu (cont'd)

Config Menu


Config
more, 1 of 3
more, 2 of 3
secure
status,ON|OFF
INTERNL,STATE
system
measure,config
labels
more,3 of 3
SECURE,SCREEN
clear,memory
clear,state
clear,usr cor
CLEAR,MATH EQN
prev,menu
ROM,VESION
search,ON|OFF
IP REF:
prev,menu
analytc,ON|OFF
dither,ON|OFF
tim bit,32/16
Fss TGT,AUT|MAN
prev,menu
screen,title
title,ON|OFF
label,traces
label,states
prev,menu
CLEAR,MEM1
CLEAR,MEM2
CLEAR,MEM3
CLEAR,MEM4
CLEAR,ALL MEM
prev,menu
CLEAR,STATE1
CLEAR,STATE2
CLEAR,STATE3
CLEAR,STATE4
CLEAR,STATE5
CLEAR,STATE6
CLR ALL,STATES
CLR CH1,USR COR
CLR CH2,USR COR
CLR ALL,USR COR
prev,menu
AUTO
EXT
INT
prev,menu
LABEL,TR1
LABEL,TR2
LABEL,TR3
LABEL,TR4
DEFAULT,LABELS
prev,menu
LABEL 1
LABEL 2
LABEL 3
LABEL 4
LABEL 5
LABEL 6
prev,menu
kza4a

Main Menu

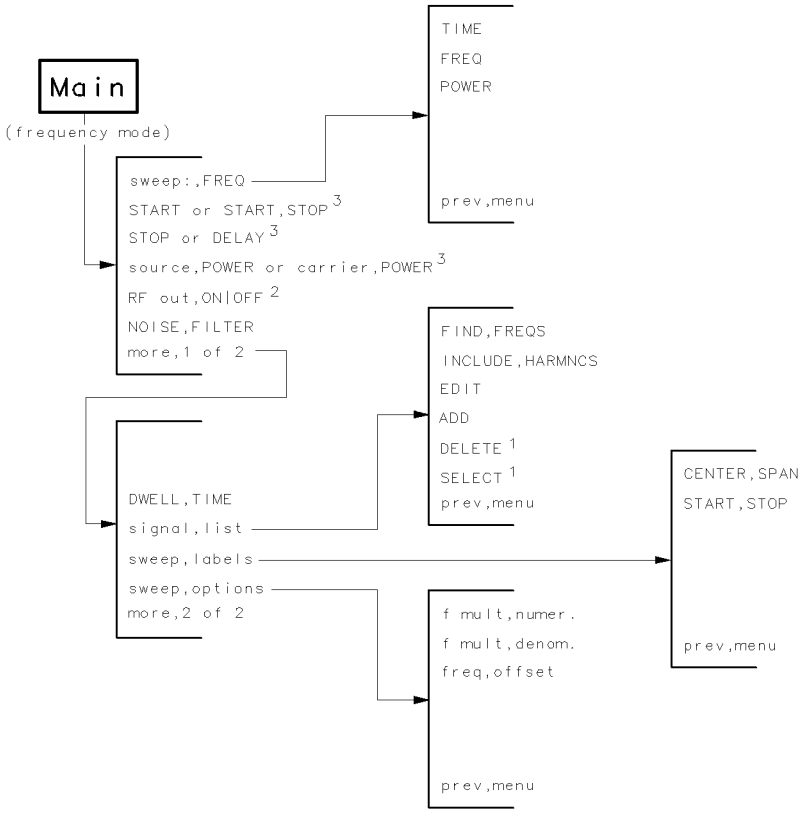
The Main menu defines the type of horizontal sweep used.

The instrument provides three types of sweeps: frequency, power, and time. The default sweep mode is time.

Main Menu (frequency mode)

The frequency mode menu labels the horizontal axis in frequency units. (The start frequency is on the left side of the display, and the stop frequency on the right.) The microwave transition analyzer displays frequency per division in the center of the horizontal axis.

The microwave transition analyzer sends the appropriate HP-IB commands via the system HP-IB bus to control the RF source's frequency. During sweeps, the RF source's frequency is stepped between the selected start and stop frequency.



1 These softkeys appear with multiple signals in list.
2 These softkeys appear in a source-configured system.
3 These softkeys appear in pluse modulation mode.

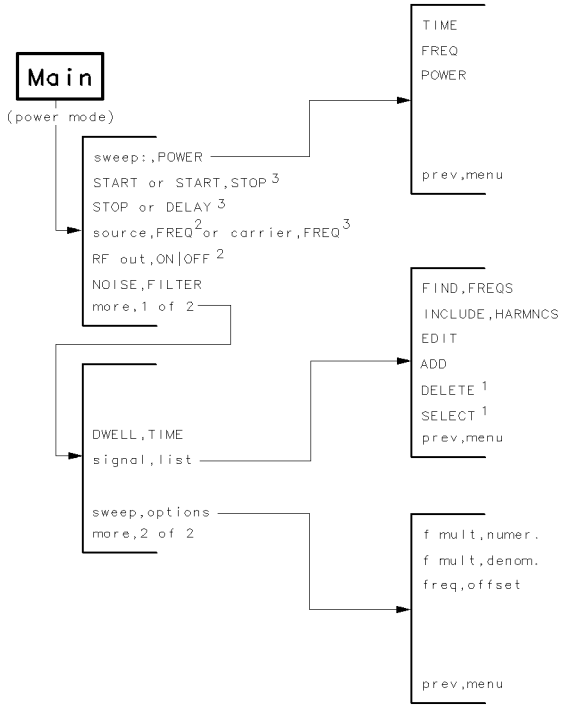
kza6a

Main Menu (power mode)

The power mode menu labels the horizontal axis in power units. (The start power is shown on the left side of the display, and the stop power is shown on the right.) Power per division is displayed in the center of the horizontal axis.

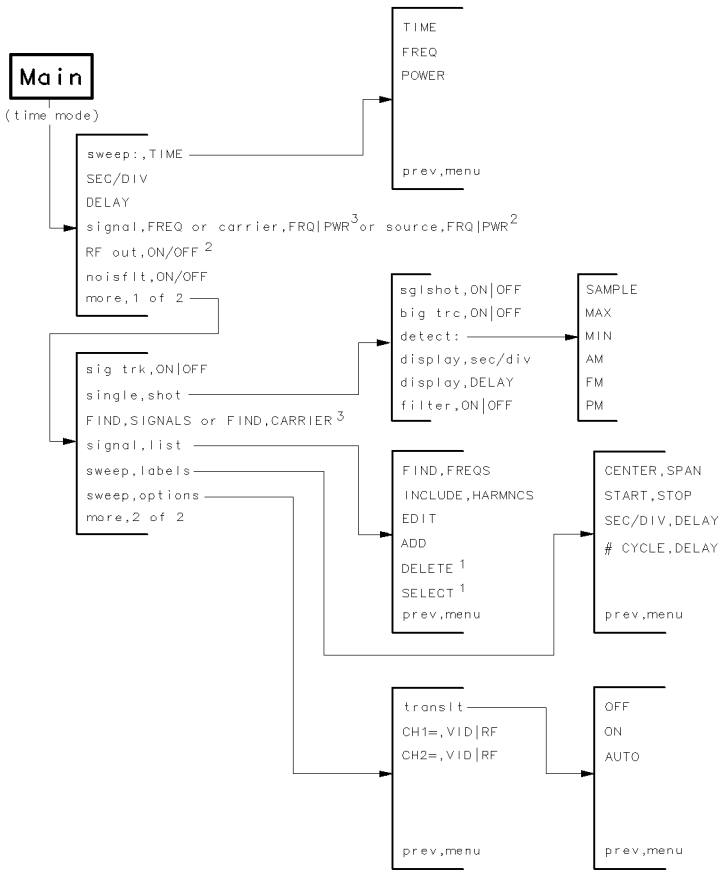
The microwave transition analyzer sends the appropriate HP-IB commands via the system HP-IB bus to control the RF source's frequency. During sweeps, the RF source's frequency is stepped between the selected start and stop frequency.

The microwave transition analyzer sends the appropriate HP-IB commands via the system HP-IB bus to control the RF source's power. During sweeps, the RF source's power is stepped between the selected start and stop powers.



Main Menu (time mode)

The time mode menu labels the horizontal axis in time units. The microwave transition analyzer displays information as amplitude (vertical) versus time (horizontal).



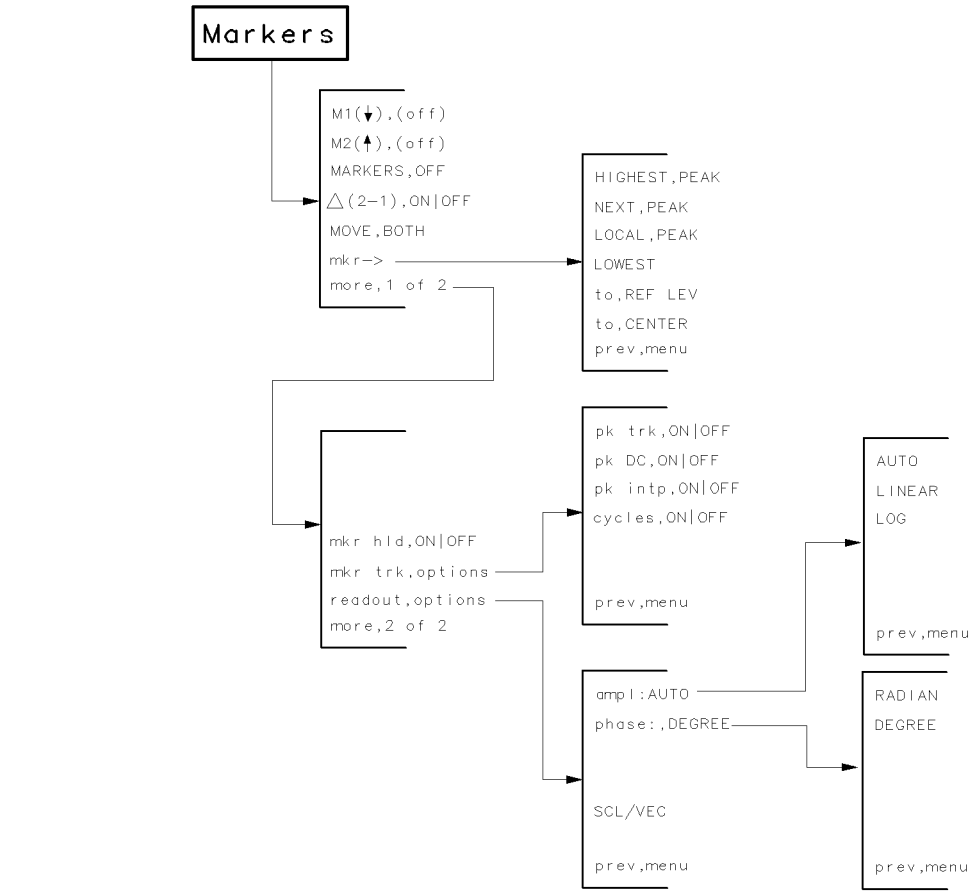
1 These softkeys appear with multiple signals in list.
2 These softkeys appear in a source-configured system.
3 These softkeys appear in pluse modulation mode.

kza8a

Markers Menu

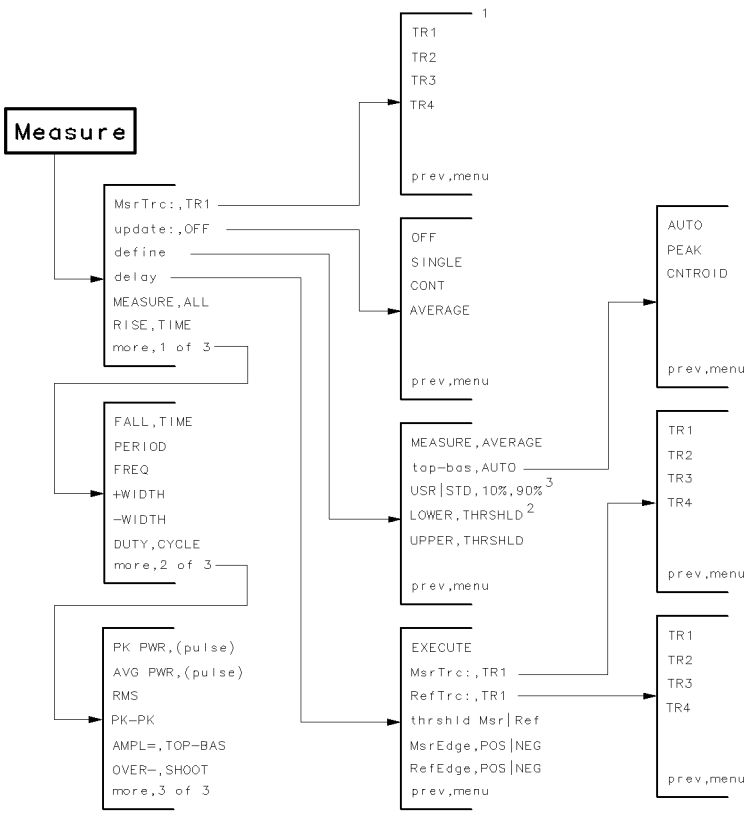
The Markers menu displays and configures trace markers.

The microwave transition analyzer has two markers: M1 and M2. The marker indicators are ↑ for M1 and ↓ for M2.



Measure Menu

The Measure menu performs predefined automatic measurements on the displayed trace.



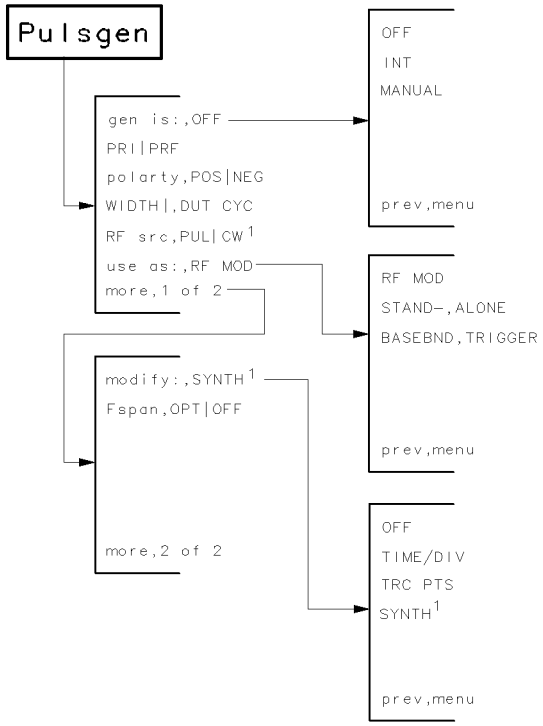
[1] TR1,TR2,TR3 and TR4 are displayed if active.
[2] These softkeys appear when USR is selected.
[3] The 10%,90% appears when STD is selected.

kza11a

Pulsgen Menu

The Pulsgen menu controls the microwave transition analyzer's internal pulse generator.

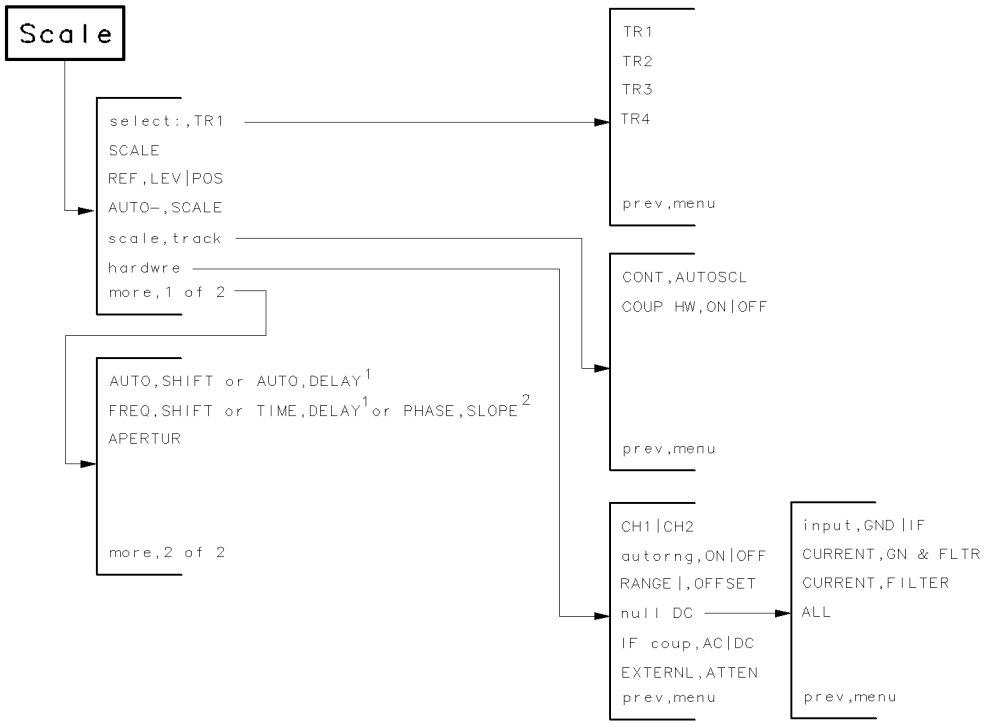
The pulse generator's modulation output is available at the rear-panel MOD OUT connector. The output frequency ranges from 200 Hz to 10 MHz and is TTL compatible into a 50 Ω load. Both the period and duty cycle can be set in 100 ns steps.



kza12a

Scale Menu

The Scale menu controls the vertical display scale. The trace information on the display can be scaled to suit the application. Each trace may be scaled independently.



[1] These softkeys appear in frequency sweep mode.

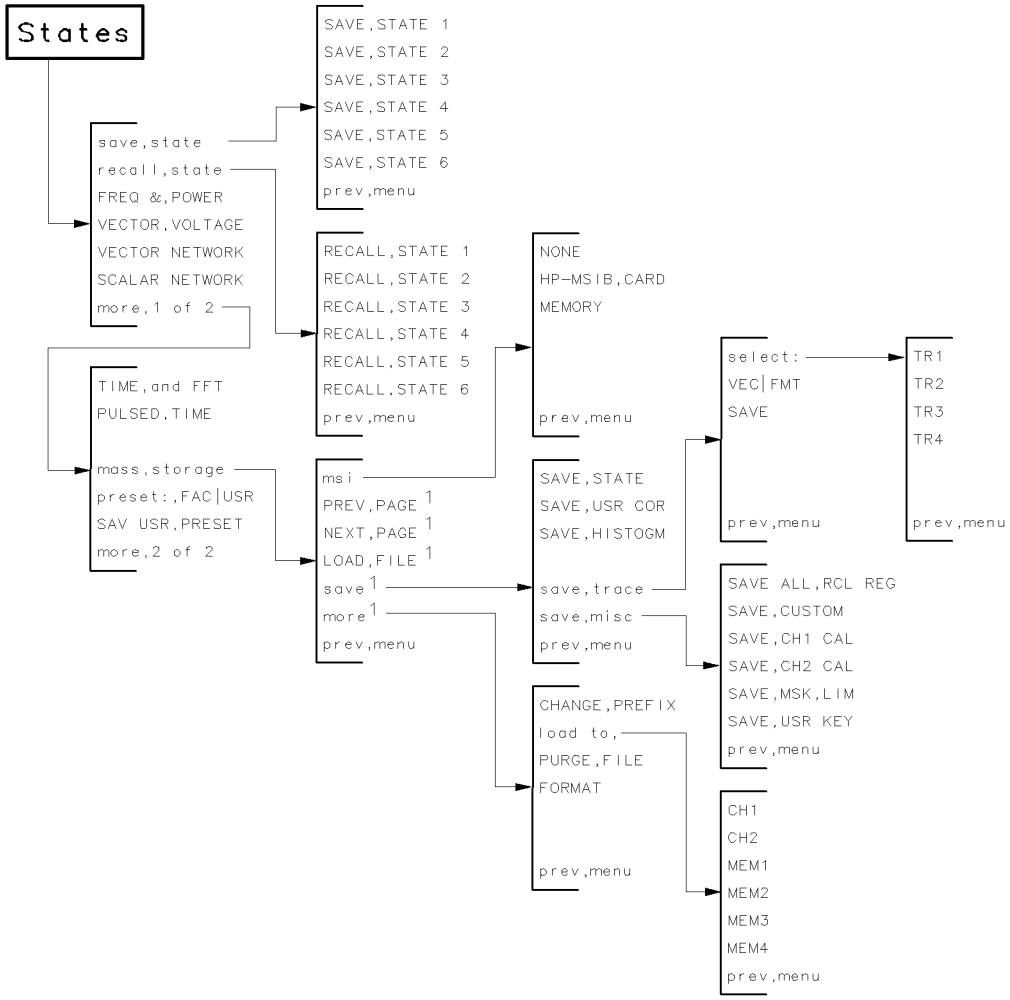
[2] These softkeys appear when trace data is not time nor frequency (for example,TR1=5)

kza13a

States Menu

The States menu provides one-button solutions for displaying a signal and performing a measurement. These solutions greatly decrease the time required to perform common analysis of signals. Up to six user-specified instrument states can be saved in dedicated memory registers. These states can then be recalled to instantly configure the instrument.

This menu also provides access to the mass-storage capabilities and user-defined presets.



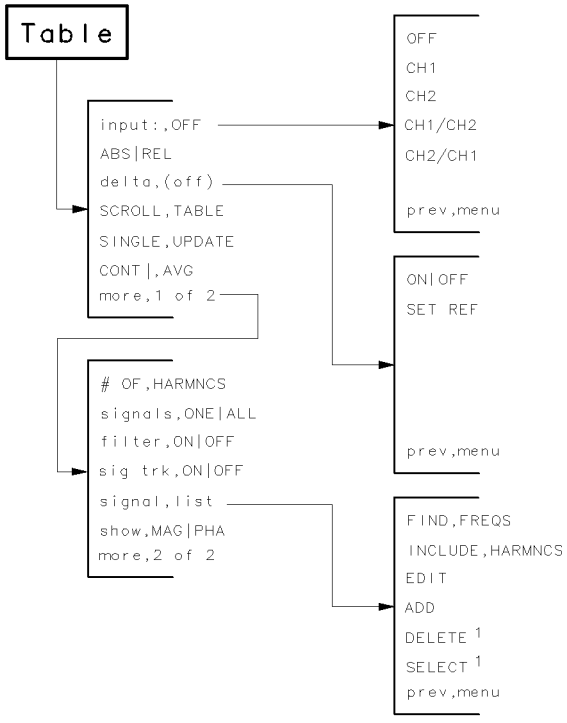
[1] Softkey displayed if msi is selected.

kza14a

Table Menu

The Table menu lists input signals and their harmonics.

The table is turned off by default. Table data can be generated from channel one, channel two, or a comparison of channels one and two. In the default mode, the table lists the power and phase of all input signals. The fundamental signal's amplitude is listed in dBm with a phase of 0.0 degrees. Harmonics of this signal are displayed relative to the fundamental.



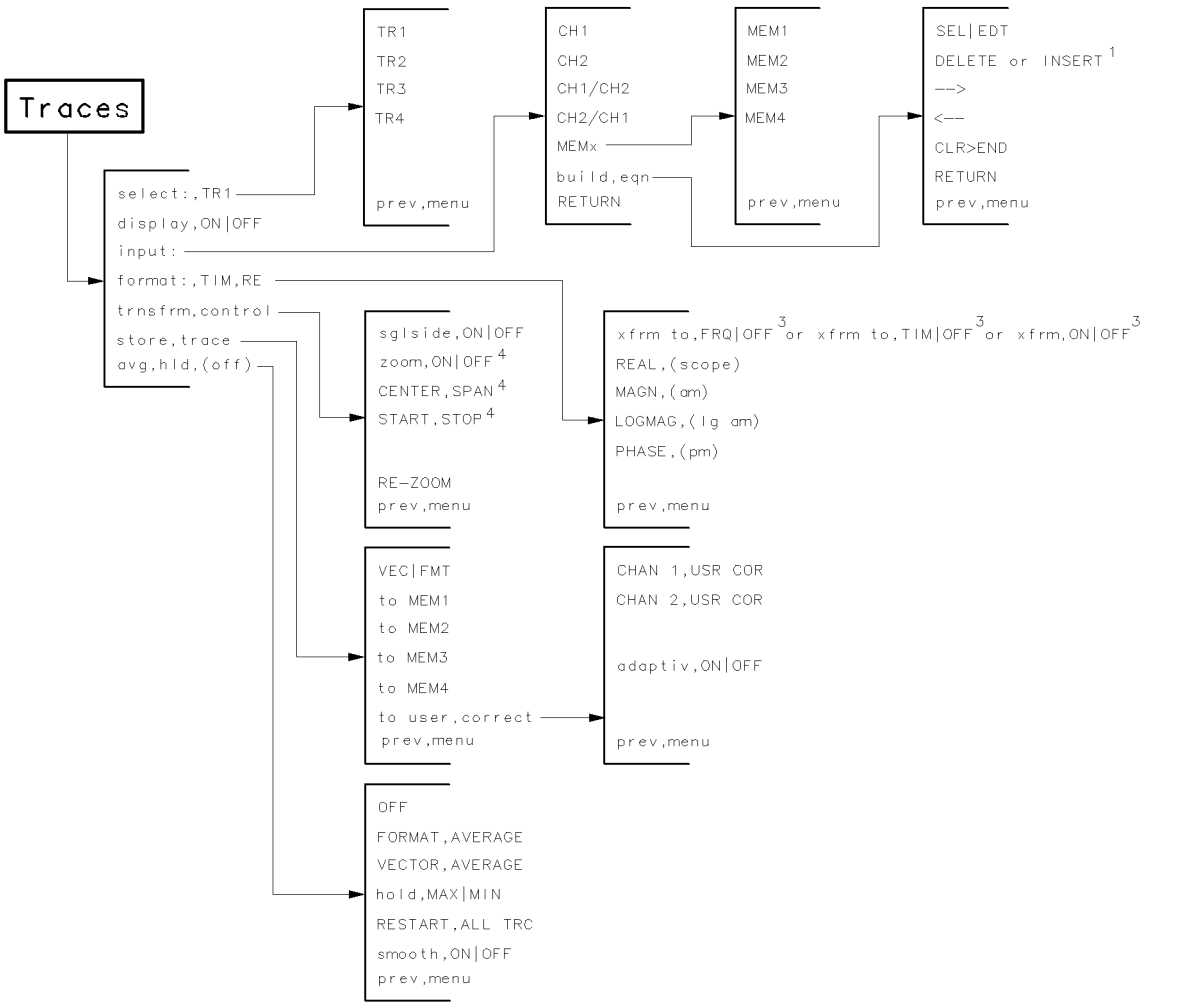
[1] DELETE AND SELECT appear when ADD is pressed.

kza15a

Traces Menu

The Traces menu displays and activates traces for manipulation by other menus.

The microwave transition analyzer uses four traces: TR1, TR2, TR3, and TR4. These trace labels are displayed on the bottom of the display when active. Each trace may be uniquely defined.



[1] Displayed softkey depends on SEL|EDT mode.

[2] Text in parentheses not displayed in xfrm to FRQ mode or if time signal is not complex.

[3] Dependent upon the data type.

[4] Displayed only if the trace is channel dependent.

kza16a

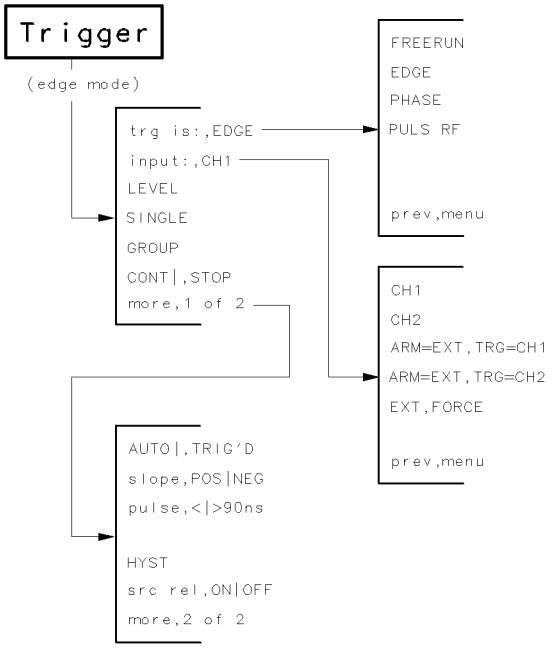
Trigger Menu

The Trigger menu controls instrument sweep. The triggering selections are edge, freerun, phase, or pulsed RF. The `trg is:` softkey determines the type of triggering used.

Trigger Menu (edge mode)

The edge mode menu controls edge triggering on the selected signal.

Edge triggering occurs on either the positive or negative edge of the selected trigger signal.

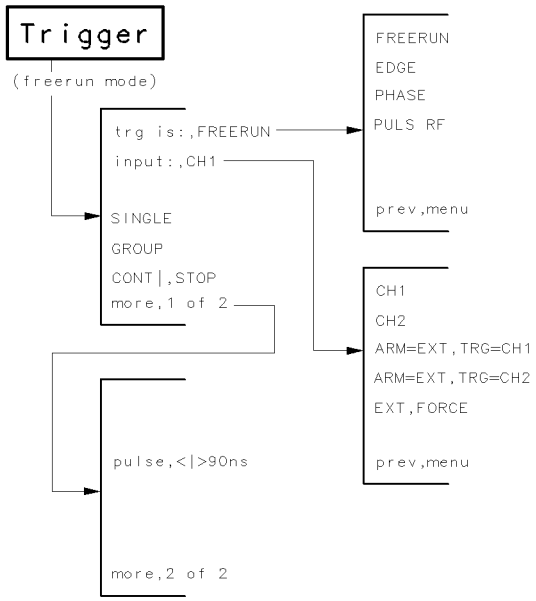


kza17a

Trigger Menu (freerun mode)

The freerun mode menu controls freerun triggering.

Freerun triggering allows the system to run continually without the need for any type of internal or external trigger. The system sweeps at the fastest possible speed.

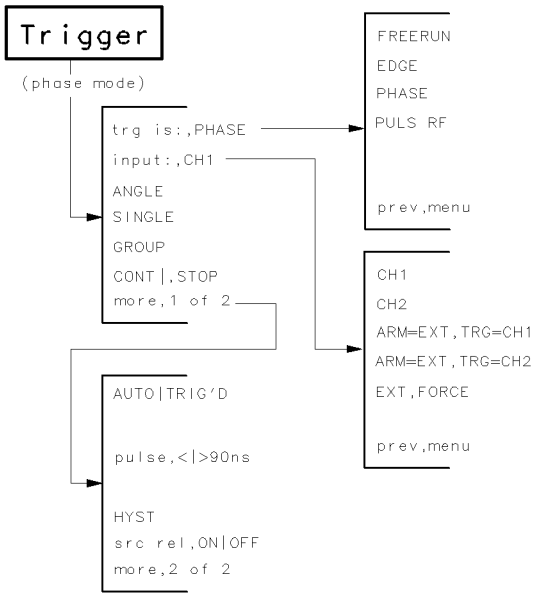


kza18a

Trigger Menu (phase mode)

The phase mode menu controls phase triggering on the selected signal.

With phase triggering, the microwave transition analyzer performs an FFT of the trace and triggers on a particular phase of the input signal. The phase is selected by the user. The default phase is zero degrees. Phase triggering is useful when looking at low level signals where signal to noise considerations make edge triggering impractical.

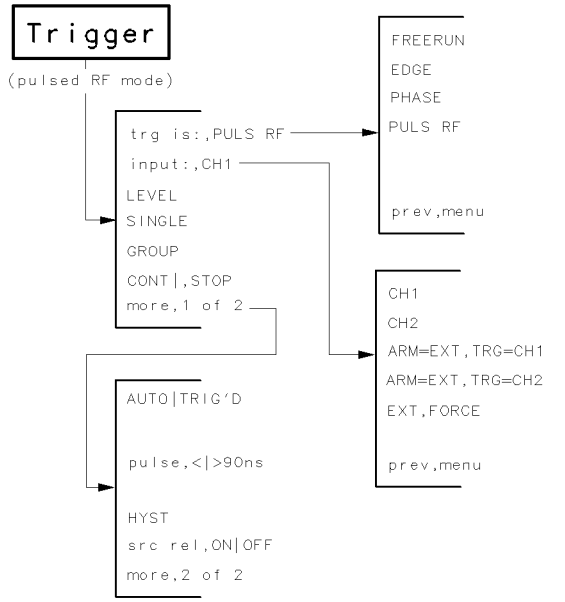


kza19a

Trigger Menu (pulsed RF mode)

The pulsed RF mode menu controls pulse triggering on the selected signal.

Use pulse triggering to examine pulsed RF signals. The microwave transition analyzer triggers on the leading edge of the pulse envelope.



[1]Power sweeps in pulse modulation mode.
[2]Frequency sweeps in pulse modulation mode.

kza20a

3

Dictionary Reference

This chapter is an alphabetical listing of all softkeys and front-panel keys with corresponding definitions included. Note that with the exception of a few front-panel keys, softkeys control all instrument functions.

This chapter is designed or quick access of information. For example, during operation you may find a softkey or hardkey whose function is unfamiliar to you. Note the key name, find the key in this chapter, and read the brief definition. In several places you'll find more multiple definitions for a one softkey. This occurs whenever two softkeys have the same name but different functions. Make sure you have found the applicable definition. Keys that begin with a symbol are listed at the front of the chapter.

Note Throughout this chapter, HP 71500 Series refers to the HP 70820A microwave transition analyzer configured with the HP 70004A display.

Alphabetical Listing

(←)

Use the (←) (backspace) front-panel key to backspace the cursor while entering text. This key also moves control from a lower level softkey menu to a previous level.

(▲) (▼)

The step keys increase or decrease active parameter values.

For example, if (SEC/DIV) is the active parameter, pressing (▲) increases the sweep time; pressing (▼) decreases the sweep time.

—>

Softkey that moves the cursor forward through the trace equation.

Key Path

Press `Traces`, `input:`, `build eqn`, `-->`.

<—

Softkey that moves the cursor backward through the trace equation.

Key Path

Press `Traces`, `input:`, `build eqn`, `<--`.

CYCLE

This softkey is displayed only in the time sweep mode when the `# CYCLES DELAY` grouping is selected via the `sweep labels` softkey. When active, it allows the user to select the number of waveform cycles for display. Once specified, the number of cycles remains constant even if the input frequency changes. The instrument automatically computes the required seconds/division to display the correct number of cycles.

Key Path

Press `Main`, `# CYCLE`.

Related Programming Command

```
SWEep:TIME:RANGe
```

See Also

 # CYCLE DELAY in this chapter.

CYCLE DELAY

Softkey that selects the cycles mode of operation for controlling the horizontal scale in the time sweep mode.

Key Path

Press `Main` (time mode), `sweep labels`, `# CYCLE DELAY`.

Related Programming Command

```
SWEep:TIME:CYCLes
```

See Also

 # CYCLE and *Delay* in this chapter.

errors ON|OFF

Softkey that, when ON, sets the number of mask and limit violations which can occur before trace acquisition is stopped during mask and limit-line tests.

Key Path

Press `Analyze`, `masks limits`, `end on`, `# errors ON|OFF`.

Related Programming Command

```
LIMit:ERRor:STOP
LIMit:ERRor:COUNt
```

of HARMNCS

Softkey that selects the number of harmonics displayed in the signal list table.

The default number of harmonics displayed is four. Use the front-panel knob or numeric keypad to change the value.

Key Path

Press `Table`, `more 1 of 2`, `# of HARMNCS`.

Related Programming Command

```
TABLe:HARMonics
```

traces ON|OFF

Softkey that, when ON, sets the number of traces which will be acquired before trace acquisition is stopped during mask and limit-line tests.

Key Path

Press `Analyze`, `masks limits`, `end on`, `# traces ON|OFF`.

Related Programming Command

```
LIMit:TRACe:STOP
LIMit:TRACe:COUNt
```

10 MHZ INT|EXT

Softkey that selects either the internal or an external 10 MHz Oscillator for use as the time base.

Two HP 70820A rear-panel connectors provide access for time base signals: 10 MHz REF INPUT and 10 MHz REF OUTPUT. The 10 MHz REF OUTPUT connector supplies a 10 MHz signal for locking the frequency of external RF sources to the HP 70820A. The 10 MHz REF INPUT connector allows you to lock to a house standard or the 10 MHz reference of an external RF source.

Key Path

Press `Config` , `10 MHZ INT|EXT` .

Related Programming Command

```
SWEep:REFerence
```

Δ(2-1) ON|OFF

Softkey that enables and disables the delta marker function.

Both x and y delta values are displayed at the top of the display. Marker M1 is always the reference marker. This is indicated by the (REF) notation to the right of M1. The delta function may be used to monitor points on two traces at the same x position.

Key Path

Press `Markers` , `Δ(2-1) ON|OFF` .

Related Programming Command

```
MARK:DELTa
```

ABS|REL

Softkey that allows you to select the reference signal in the table from which all other table data is relative.

The default mode is ABS (absolute). The fundamental is in dBm. All harmonics are listed relative to the fundamental signal. In REL mode, all signals (fundamental and harmonics) in the table are shown relative to the selected (highlighted) signal.

Key Path

Press `Table` , `ABS|REL` .

Related Programming Command

```
TABLe:MODE
TABLe:REFerence
```

action MPY|DIV

Softkey that determines how user corrections are applied when enabled. The options are MPY (MULTIPLY) and DIV (DIVIDE).

MULTIPLY The input data is multiplied by the user correction data. This is typically used to apply filtering operations to the input data.

DIVIDE The input data is divided by the user correction data. This is typically used to normalize input data.

Key Path

Press `Calib`, `user corr`, `other`, `action MPY|DIV`.

Related Programming Command

```
CALibrate:USER:MODE
```

adaptiv ON|OFF

Softkey that controls how trace data is stored into user corrections. When OFF, if the trace is small enough, all of the trace data is stored; otherwise, an interpolated version of the trace data that is above the threshold is stored. If there is too much data, only the first portion of the trace is stored (that is, no interpolation is done).

Key Path

Press `Traces`, `store trace`, `to user correct`, `adaptiv ON|OFF`.

Related Programming Command

```
CALibrate:USER:ADAPtive
CALibrate:USER:THReshold
```

ADD

Softkey that adds a signal to the signal list table. When pressed, `ADD` inserts a dummy signal into the signal list. Use the `EDIT` softkey to change the signal to the desired frequency.

Key Path

Press `Main`, `more 1 of 2`, `signal list`, `ADD`.

Press `Table`, `more 1 of 2`, `signal list`, `ADD`.

Related Programming Command

```
SWEep:SLISt
```

ADD POINT

Softkey that adds a point (vertex) to the displayed limit line or mask.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `edit`, `ADD POINT`.

Related Programming Command

```
LIMit:DATA
```

ALL

Softkey that compensates for DC drifts of the internal gain and filter circuits. This is caused by temperature changes. It requires the most time compared to `CURRENT FILTER` and `CURRENT GN&FLTR` (about five minutes).

Key Path

Press `Scale`, `hardwre`, `null DC`, `ALL`.

Related Programming Command

```
CHANx:NULL
```

See Also

CURRENT FILTER and *CURRENT GN&FLTR* in this chapter.

AM

Softkey that returns the amplitude demodulation of the data when selected as the detection mode for large trace mode.

Key Path

Press `Main` (time mode), `more 1 of 2`, `single shot`, `detect:`, `AM`.

Related Programming Command

```
SWEep:TIME:OVERsweep:DETect
```

AMPL

Softkey that sets the calibrator amplitude from position 0 to position 4.

Key Path

Press `Calib`, `cal signal`, `AMPL`.

Related Programming Command

```
CALibrate:SIGNal:AMPLitude
```

ampl:

Softkey that allows you to select between AUTO, LINEAR, and LOG marker readout amplitude options. For LINEAR, marker amplitude readout is in linear units (for example, volts). For LOG, marker amplitude readout is in logarithmic units (for example, dBm). For AUTO, the linear or logged status matches the trace on which the marker is positioned.

Key Path

Press `Markers`, `more 1 of 2`, `readout options`, `ampl:`.

Related Programming Command

```
MARKx:READout
```

AMPL = TOP-BAS

Softkey that automatically measures the waveform's amplitude that is defined as the difference between the top and base of the trace.

The measurement is performed on the trace defined by the `Msr Trc:` softkey. The measurement updates the display as defined by the `update:` softkey.

Key Path

Press `Measure`, `more 1 of 3`, `more 2 of 3`, `AMPL= TOP-BAS`.

Related Programming Command

```
MEASure:VAMPlitude
```

analytc ON|OFF

Softkey that turns the analytic signal on and off. The default mode for the analytic signal is ON.

Analytic signal ON allows the HP 71500 Series to perform magnitude and phase demodulation on a waveform representing a single carrier frequency with sidebands.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `measure config`, `analytc ON|OFF`.

Related Programming Command

```
SWEep:TIME:ANALytic
```

Analyze

Softkey that accesses the menus used for creating histograms, masks, and limit lines.

ANGLE

Softkey that defines the phase of the signal fundamental to be considered the trigger point.

This feature is only available with phase triggering. Use the numeric front-panel key pad or knob to enter the angle.

Key Path

Press `Trigger`, `ANGLE`.

Related Programming Command

```
TRIGger:ANGle
```

APERTUR

Softkey that sets the number of trace points (between end points) when computing finite differences for the DELTA( ), FM( ), and TD( ) operations.

Key Path

Press `Scale`, `more 1 of 2`, `APERTUR`.

Related Programming Command

```
FUNCx:APERture
```

ARM = EXT TRG = CH1

Softkey that selects a gated trigger mode of operation. In this mode, the trigger is defined as the SYNC input, being a logic 1, and the signal on CH1 meeting the trigger level requirements.

When this is selected, the `input:` softkey displays XCH1.

Key Path

Press `Trigger`, `input:`, `ARM=EXT TRG=CH1`.

Related Programming Command

```
TRIGger:SOURce GATE1
```

ARM = EXT TRG = CH2

Softkey that selects a gated trigger mode of operation. In this mode, the trigger is defined as the SYNC input, being a logic 1, and the signal on CH2 meeting the trigger level requirements.

When this is selected, the `input:` softkey displays XCH2.

Key Path

Press `Trigger`, `input:`, `ARM=EXT TRG=CH1`.

Related Programming Command

```
TRIGger:SOURce GATE2
```

AUTO

When this softkey is selected, the display automatically splits when one or more traces, which are on, are positioned in each of the top and bottom screens as defined in `place trace`.

Key Path

Press `Config`, `split:`, `AUTO`.

See Also

split: in this chapter.

AUTO

When this softkey is selected,

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `system`, `IP REF:`, `AUTO`.

Related Programming Command

```
SYSTem:REFerence
```

AUTO

When this mode is selected, the HP 70820A determines when it is appropriate to turn translate mode on and off.

Key Path

Press `Main` (time mode), `more 1 of 2`, `sweep options`, `translt`, `AUTO`.

See Also

translt in this chapter.

AUTO

This softkey selects the amplitude units based on the format of the trace.

Key Path

Press `Markers`, `more 1 of 2`, `readout options`, `ampl: AUTO`, `AUTO`.

See Also

ampl: in this chapter.

AUTO

This softkey selects either the peak or centroid method of computing top and base.

Key Path

Press `Measure`, `define`, `top-bas`, `AUTO`.

AUTO DELAY

This softkey appears in frequency sweep mode. This softkey flattens out the phase trace by adding electrical delay to the data (flatten phase over the entire trace). If neither marker is on the trace, the entire trace is used. If one marker is on the trace, approximately 10% of the trace, centered on the marker, is used. If two markers are on the trace, the interval between the markers is used.

Key Path

Press `Scale`, `more 1 of 2`, `AUTO DELAY`.

Related Programming Command

```
WAVeform:ZPHase
```

autorng ON|OFF

Softkey that turns the autorange function on or off.

When activated, the microwave transition analyzer automatically selects the appropriate hardware gain and offset to maximize the signal at the ADC converter regardless of the input signal's amplitude.

Key Path

Press `Scale`, `hardwre`, `autorng ON|OFF`.

Related Programming Command

```
CHANx:AUTorange
```

AUTO-SCALE

Softkey that automatically adjusts the trace scale factor and reference level for optimum display.

Signals are autoscaled once when the softkey is pressed and not on a continual basis. If you change the amplitude of the input signal, it will not be autoscaled. All of the scaling for this function is accomplished by digital processing. No hardware settings are changed.

Key Path

Press `Scale`, `AUTO-SCALE`.

Related Programming Command

```
DISPlay:xxx:TRACk
```

See Also

CONT AUTOSCL in this chapter.

AUTO SHIFT

Softkey that automatically shifts (frequency) the trace data to flatten the `PHASE` display in time sweep mode. If neither marker is on the trace, the entire trace is used. If one marker is on the trace, approximately 10% of the trace, centered on the marker, is used. If two markers are on the trace, the interval between the markers is used.

Key Path

Press `Scale`, `more 1 of 2`, `AUTO SHIFT`.

Related Programming Command

```
WAVeform:ZPHase
```

AUTO SKEW

Softkey that automatically adjusts time skew of CH2 to align the channels. Signals must be present on CH1 and CH2. Also, the SEC/DIV must be properly set.

Key Path

Press `Calib`, `chan skew`, `AUTO SKEW`.

Related Programming Command

```
CALibrate:ALIGn
```

AUTO|TRG'D

Softkey that enables either the auto triggering mode or the triggered mode.

In the AUTO triggering mode, the HP 71500 Series will not wait indefinitely for the trigger conditions to be met before generating a sweep. This is similar to the auto triggering mode of an oscilloscope.

When the TRIGGERED mode is active, the HP 71500 Series waits for the trigger conditions selected before taking a sweep.

Key Path

Press `Trigger`, `more 1 of 2`, `AUTO|TRG'D`.

Related Programming Command

```
SWEep:MODE
```

AVERAGE

Softkey that enables a running average of the measurement values on each sweep. The averaging count is set by `MEASURE AVERAGE`.

Key Path

Press `Measure`, `update:`, `AVERAGE`.

See Also

update: in this chapter.

avg hld

Softkey that selects the type of averaging and hold functions used for the trace data.

Key Path

Press `Traces`, `avg hld`.

AVG PWR (pulse)

Softkey that automatically measures the average power of a trace.

The measurement is performed on the trace defined by the `Msr Trc:` softkey. The measurement updates the display as defined by the `update:` key.

Key Path

Press `Measure`, `more 1 of 3`, `more 2 of 3`, `AVG PWR (pulse)`.

Related Programming Command

```
MEASure:PAVG
```

AXES

Softkey that places one vertical and one horizontal graticule line on the display.

Key Path

Press `Config`, `grat:`, `AXES`.

Related Programming Command

```
DISPlay:GRAT
```

BASEBND TRIGGER

When this softkey is selected and the `Pulsgen` is `INT` or `MANUAL`, the signal is assumed to be a non-RF pulse with a signal frequency matching the pulse generator.

Key Path

Press `Pulsgen`, `use as:`, `BASEBND TRIGGER`.

big trc ON|OFF

Softkey that enables or disables the large trace mode. When ON, up to 250,000 points of data can be acquired in a single measurement. `sglshot ON|OFF` must be set to ON.

Key Path

Press `Main` (time mode), `more 1 of 2`, `single shot`, `big trc ON|OFF`.

Related Programming Command

```
SWEep:TIME:OVERsweep:STATe
```

build eqn

Softkey that allows you to build a unique definition for any of the four available traces.

Key Path

Press `Traces`, `input:`, `build eqn`.

CAL CHx

Softkey that selects channel 1 or channel 2 for calibration.

Key Path

Press `Calib`, `IF calib`, `CAL CH1`.

Related Programming Command

```
CAL:ALL
```

cal debug

Softkey that leads to a menu that is used for displaying calibration data.

Key Path

Press `Calib`, `IF calib`, `cal debug`.

Calib

Softkey that accesses softkeys used for calibration.

cal signal

The `cal signal` softkey accesses the softkeys used to control the CALIBRATOR OUTPUT.

Key Path

Press `Calib`, `cal signal`.

cal sig ON|OFF

Softkey that is used to turn the CALIBRATOR OUTPUT signal on and off.

Key Path

Press `Calib`, `cal signal`, `cal sig ON|OFF`.

Related Programming Command

```
CALibrate:SIGNal:STATe
```

carrier FREQ

Softkey that defines the carrier frequency for an RF pulse signal, when the pulse generator is on.

Key Path

Press `Main`, `carrier FREQ`.

Related Programming Command

```
PULSe:CARRier
```

carrier FRQ|PWR

Softkey that controls the synthesizer frequency and power. The synthesizer frequency also defines the carrier frequency for an RF pulse.

Key Path

Press `Main` (time mode), `carrier FREQ|PWR`.

Related Programming Command

```
SOURce:FREQuency:CW
SOURce:POWer:LEVel
```

carrier POWER

Softkey that defines the carrier power for an RF pulse signal.

Key Path

Press `Main` (frequency mode), `carrier POWER`.

Related Programming Command

```
PULSe:CARRier
```

(CENTER)

In frequency sweep mode, this key defines the frequency represented at the center of the display. In time sweep mode this key defines the time represented at the center of the screen. When activated, the time at center screen can be changed using the front-panel numeric keypad. Use this function to set the delay from the zero trigger point.

Pressing the (CENTER) key automatically activates the `Main` menu.

CENTER SPAN

Softkey that enables the center span mode of entry.

Time Sweep Mode

The CENTER function defines the time represented at the center of the screen. The SPAN function defines the time span of the display's horizontal axis.

Frequency Sweep Mode

The CENTER function defines the frequency represented at the center of the display. The SPAN function defines the frequency of the display's horizontal axis.

Key Path

Press `Main` (time or frequency mode), `more 1 of 2`, `sweep labels`, `CENTER SPAN`.

Related Programming Command

```
SWEep:FREQuency:CENTer
```

CENTER SPAN

Softkey that enables control of the center frequency and frequency span for the zoom transform.

Key Path

Press `Traces`, `trnsfrm control`, `CENTER SPAN`.

Related Programming Command

```
SWEep:TIME:ZOOM:CENTer
CHANx:ZOOM:CENTer
FUNCx:ZOOM:CENTer
SWEep:TIME:ZOOM:SPAN
```

```
FUNCx:ZOOM:SPAN
SWEep:TIME:ZOOM:SPAN
```

CHx

Softkey that selects channel one or channel two.

Key Path

Press `Table` , `input:` , `CH1` . Press `Traces` , `input:` , `CH1` . Press `Trigger` , `input:` , `CH1` . Press `States` , `mass storage` , `more` , `load to` , `CHx` .

CHx CAL INFO

Softkey that displays calibration data for channel 1 or channel 2. The last calibration date and the standard deviation for the gains are some of the data displayed.

Key Path

Press `Calib` , `IF calib` , `cal debug` , `show` , `CHx CAL INFO` .

CH1|CH2

Softkey that switches between displaying the user correction data for CH1 and CH2.

Key Path

Press `Calib` , `user corr` , `CH1|CH2` .

Related Programming Command

```
CALibrate:USER:DATA
```

CH1|CH2

Softkey that selects one of two hardware channels for hardware control.

Channel 1 is associated with the top front-panel input connector. Channel 2 is associated with the bottom input connector.

Key Path

Press `Scale` , `hardwre` , `CH1|CH2` .

Related Programming Command

```
CHANx:
```

CH1/CH2

Softkey that displays channel 1 data divided by channel 2 data in tabular form in the lower half of the screen.

Key Path

Press `Table`, `input:`, `CH1/CH2`.

See Also

input: (Table menu) in this chapter.

CH1/CH2

When this softkey is pressed, the active trace is defined as channel 1 divided by channel 2.

Key Path

Press `Traces`, `input:`, `CH1/CH2`.

See Also

input: (`Trace` menu) in this chapter.

CH1 = VID|RF

For pulsed RF, when the noise filter is on, the user can view the DC (video feedthru) component or the carrier (RF) component. Otherwise, this controls whether the channel is measuring baseband components (defined by signal) or carrier frequency.

Key Path

Press `Main`, `sweep options`, `CH1=VID|RF`.

Related Programming Command

```
SWEep:TIME:FILter:VIDeo
```

CH2/CH1

Softkey that displays channel 2 data divided by channel 1 data in tabular form in the lower half of the screen.

Key Path

Press `Table`, `input:`, `CH2/CH1`.

See Also

input: (`Table` menu) in this chapter.

CH2/CH1

When this softkey is pressed, the active trace is defined as channel 2 divided by channel 1.

Key Path

Press `Traces`, `input:`, `CH2/CH1`.

See Also

input: (`Trace` menu) in this chapter.

CH2 = VID|RF

For pulsed RF, when the noise filter is on, the user can view the DC (video feedthru) component or the carrier (RF) component. Otherwise, this controls whether the channel is measuring baseband components (defined by signal) or carrier frequency.

Key Path

Press `Main`, `more 1 of 2`, `sweep options`, `CH2=VID|RF`.

Related Programming Command

```
SWEep:TIME:FILter:VIDeo
```

chan skew

Softkey that accesses a menu used to adjust time skew for channel alignment.

Key Path

Press `Calib`, `chan skew`.

CHAN 1 USR COR

Softkey that stores the active trace into user correction data for channel 1.

Key Path

Press `Traces`, `store trace`, `to user correct`, `CHAN 1 USR COR`.

Related Programming Command

```
STORe
```

CHAN 2 USR COR

Softkey that stores the active trace into user correction data for channel 2.

Key Path

Press `Traces`, `store trace`, `to user correct`, `CHAN 2 USR COR`.

Related Programming Command

```
STORe
```

CHAN2 SKEW

Softkey that allows the user to specify the time skew between channel 1 and channel 2. In subsequent measurements, the module attempts to align the channels by shifting the data of the appropriate channel by the specified time.

Key Path

Press `Calib`, `chan skew`, `CHAN2 SKEW`.

Related Programming Command

```
CALibrate:SKEW
```

CHANGE PREFIX

Softkey that changes the prefix used for the default filenames for save operations.

Each file has an identifying prefix, which distinguishes one type of file, and its contents, from the other file types.

File Prefixes

File Type	File Prefix
Calibration data	c_
Instrument state	s_
Mask/Limit line	m_
Program	d_
Trace	t_
(USER) menu	k_

`CHANGE PREFIX` activates character-editing softkeys that are used to modify characters in the default file prefixes. These editing softkeys are also used for the title softkey functions.

Key Path

Press `States`, `more 1 of 2`, `mass storage`, `more`, `CHANGE PREFIX`.

CLEAR ALL MEM

Softkey that erases all of the trace data in MEM1 through MEM4.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `clear memory`, `CLEAR ALL MEM`.

See Also

clear memory in this chapter.

CLEAR MATH EQ

Softkey that erases any user-created math equations stored in memory.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `CLEAR MATH EQN`.

Related Programming Command

`SECure:MATH`

clear memory

Softkey that accesses a menu used to erase data in any or all of MEM1, MEM2, MEM3, or MEM4. All trace data is permanently lost when a trace storage area is cleared.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `clear memory`.

Related Programming Command

`SECure:MEMory`

CLEAR MEMx

Softkey that erase the trace data in the specified memory.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `clear memory`, `CLEAR MEMx`.

See Also

clear memory in this chapter.

clear state

Softkey that accesses a menu used to clear any or all of the four save states registers.

The state registers are used to store instrument settings. These settings can be recalled at a later time to configure the microwave transition analyzer's state.

All state register data is permanently lost when one of the state register softkeys is pressed.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `clear state`.

Related Programming Command

`SECure:STATe`

CLEAR STATEx

Softkey that erases all corresponding instrument setting data.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `clear state`, `CLEAR STATEx`.

See Also

clear state in this chapter.

clear usr cor

Softkey that accesses a menu used to erase user correction data for either input channel.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `clear usr cor`.

Related Programming Command

```
SECure:UCAL
```

clock

Softkey that selects a menu for controlling the microwave transition analyzer's internal clock. The clock's visibility, time, date, and format can be altered using this menu.

Key Path

Press `Config`, `more 1 of 3`, `clock`.

CLR ALL STATES

Softkey that erases all of the instrument setting data in STATE1 through STATE6.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `clear state`, `CLR ALL STATES`.

See Also

clear state in this chapter.

CLR ALL USR COR

Softkey that erases all user correction data for channel 1 and channel 2.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `clear usr cor`, `CLR ALL USR COR`.

See Also

clear usr cor in this chapter.

CLR CH1 USR COR

Softkey that erases the user correction data for channel 1 input.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `clear usr cor`, `CLR CH1 USR COR`.

CLR CH2 USR COR

Softkey that erases the user correction data for channel 2 input.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `clear usr cor`, `CLR CH2 USR COR`.

CLR>END

Softkey that clears all characters in the equation from the cursor position to the end of the equation.

Character immediately under the curser will be cleared.

Key Path

Press `Traces`, `input:`, `build eqn`, `CLR>END`.

CNTROID

Softkey that selects the centroid method of computing the top and base of a trace.

Key Path

Press `Measure`, `define`, `top-bas`, `CNTROID`.

Config

Softkey that displays the configuration menu.

Use the `Config` menu to properly configure the microwave transition analyzer's display and measurement control. Configuration includes selecting the external RF source controlled by the microwave transition analyzer.

CONT

Softkey that updates measurement data on each sweep.

Key Path

Press `Measure`, `update:`, `CONT`.

See Also

update: in this chapter.

CONT ACQUIRE

Softkey that continuously performs histogram analysis on the selected trace or channel.

The microwave transition analyzer performs a histogram analysis and displays the results. As soon as the data is displayed, another histogram is performed. Histogram analysis continuously repeats until you press `STOP ACQUIRE`.

Key Path

Press `Analyze`, `histogm`, `CONT ACQUIRE`.

Related Programming Command

```
MASK:HISTogram:STARt
```

CONT AUTOSCL

Softkey that enables continuous autoscaling of the input signal.

When this option is chosen, the input is autoscaled after each sweep. No hardware is changed. If you want the input scaled with the hardware, refer to `Scale`, `hardwre`, and `AUTORNG`.

Key Path

Press `Scale`, `scale track`, `CONT AUTOSCL`.

Related Programming Command

```
DISPlay:xxx:TRACk
```

See Also

AUTORNG in this chapter.

CONT|AVG

Softkey that selects CONT (continuous) or AVG (averaged) updating of the signal list table.

With continuous updating, each trace reading updates the table. With averaged updating, the table is updated with data averaged from several readings.

The current number of averaged readings is displayed at the top-left corner of the table. The number of averaged readings can be changed anytime the AVG function is active. Simply use the front-panel knob or numeric keypad to enter a new value.

Key Path

Press `Table`, `CONT|AVG`.

Related Programming Command

```
TABle:COUNt
TABle:TYPE
```

CONT|STOP

Softkey that places the HP 71500 Series into the continuous or stopped sweep mode.

In continuous mode, sweeps occur as soon as the selected triggering conditions are met. Repeated sweeps occur continuously as long as the trigger conditions are met.

Key Path

Press `Trigger`, `CONT|STOP`.

Related Programming Command

```
RUN
SWEep:MODE
STOP
```

COPY FROM

Softkey that copies a limit line to the current mask or limit line.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `edit`, `COPY FROM`.

Related Programming Command

```
LIMit:COPY
```

copy to CH2

Softkey that appears if user correction data for CH1 is selected.

This softkey copies CH1 user correction data to CH2 user correction data. In addition, `copy to CH1` appears if user correction data for CH2 is selected.

Key Path

Press `Calib`, `user corr`, `other`, `copy to CH2`.

Related Programming Command

```
CALibrate:USER:DATA
```

count TRC|DOT

Softkey that sets the limit line acquisition count mode. In DOTS mode, the individual trace points which violate the limit line are counted separately for the limit line hit count. In trace mode, the hit count is the number of measurement traces which have violated the mask.

Key Path

Press `Analyze`, `masks limits`, `count TRC|DOT`.

Related Programming Command

```
LIMit:COUNt
```

COUP HW ON|OFF

Softkey that couples the scale and reference level to the corresponding hardware range and offset. Changing the range and offset will automatically change the scale at the reference level; but changing the scale at the reference level will not change the range and offset.

You can change the step gain settings of the instrument's hardware via the hardware menu (`Scale`, `hardwre`).

Note The `SCALE` function will not change instrument hardware setting regardless of the setting of `COUP HW ON|OFF`.

Key Path

Press `Scale`, `scale track`, `COUP HW ON|OFF` (only if trace=CH1 or CH2).

Related Programming Command

```
DISPlay:xxx:TRACk
```

CURRENT FILTER

Softkey that measures and compensates for DC drifts of all internal gain stages caused by temperature changes. However, this is only with the currently used filter circuits.

Key Path

Press `Scale`, `hardwre`, `null DC`, `CURRENT FILTER`.

Related Programming Command

```
CHANx:NULL
```

CURRENT GN&FLTR

Softkey performs the fastest compensation routine. It compensates for DC drifts of the currently used internal gain and filter circuits.

Key Path

Press `Scale`, `hardwre`, `null DC`, `CURRENT GN&FLTR`.

Related Programming Command

```
CHANx:NULL
```

cycles ON|OFF

When on, the marker position stays at the same relative position on the waveform as signal frequency is changed. That is, the same phase.

When off, the marker maintains the same time position as the signal frequency is changed.

Key Path

Press `Markers`, `more 1 of 2`, `mkr trk options`, `cycles ON|OFF`.

Related Programming Command

```
MARKx:POSition
```

DAY

Softkey that sets the day value of the HP 70820A's system clock.

Key Path

Press `Config`, `more 1 of 3`, `clock`, `set clock`, `DAY`.

See Also

set clock in this chapter.

DEFAULT LABELS

Softkey that sets the trace labels displayed at the bottom of the screen to their default values.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `labels`, `label traces`, `DEFAULT LABELS`.

Related Programming Command

```
FUNCx:LABel
```

default shapes

Softkey that leads to a menu for selecting default masks or limit-line. The available shapes include a hexagon, square, triangle, inverted triangle, and flat line.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `default shapes`.

Related Programming Command

```
LIMit:DEFault
```

define

Softkey that accesses a menu used to change the default top–base algorithm and threshold voltages.

Key Path

Press `Measure` , `define` .

define shapes

Softkey that presents a menu for designing custom masks or limit lines. You can selected a default mask from a submenu. The scale or offset of the displayed mask can be adjusted. Using the `edit` softkey, any point can be moved.

Key Path

Press `Analyze` , `masks limits` , `define shapes` .

Related Programming Command

```
LIMit:SELect
LIMit:TYPE
LIMit:DEFault
```

DEGREE

Softkey that sets marker phase readout to degrees.

Key Path

Press `Markers` , `more 1 of 2` , `readout options` , `phase: DEGREE` , `DEGREE` .

See Also

phase: in this chapter.

(DELAY)

The (DELAY) front-panel key adjusts the trigger delay and automatically activates the `Main` menu.

See Also

DELAY in this chapter.

DELAY

Softkey that adjusts the trigger delay. The trigger always occurs at t=0. This key also switches to seconds per division and delay mode.

The `DELAY` softkey is displayed in the time sweep mode and in the power and frequency sweep modes when in pulse mode.

Key Path

Press `Main` (time mode), `DELAY`.

Related Programming Command

`SWEep:TIME:DELay`

See Also

sweep labels in this chapter.

delay

Softkey that presents a menu for trace and edge options for waveform measurements.

Key Path

Press `Measure`, `delay`.

DELETE

Softkey that deletes the selected frequency from the signal list table.

This softkey appears whenever more than one signal is in the list.

Key Path

Press `Main`, `more 1 of 2`, `signal list`, `DELETE`.

Press `Table`, `more 1 of 2`, `signal list`, `DELETE`.

Related Programming Command

`SWEep:SLISt`

DELETE

Softkey that deletes the character displayed in inverse video from the trace equation.

Key Path

Press `Traces`, `input:`, `build eqn`, `DELETE`.

DELETE ALL

Softkey that deletes all user correction data for the currently selected channel.

Key Path

Press `Calib`, `user corr`, `other`, `DELETE ALL`.

Related Programming Command

`SECure:UCAL`

DELETE ALL

Softkey that deletes all masks and limit lines.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `edit`, `delete shapes`, `DELETE ALL`.

Related Programming Command

```
LIMit:DELete
```

DELETE CURRENT

Softkey that deletes the currently selected mask or limit line.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `edit`, `delete shapes`, `DELETE CURRENT`.

Related Programming Command

```
LIMit:DELete
```

DELETE LINE

Softkey that deletes the currently selected line segment of user correction data.

Key Path

Press `Calib`, `user corr`, `other`, `DELETE LINE`.

Related Programming Command

```
CALibrate:USER:DATA
```

DELETE POINT

Softkey that deletes the currently selected point on the mask or limit line.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `edit`, `DELETE POINT`.

Related Programming Command

```
LIMit:DATA
```

delete shapes

Softkey that leads to a menu for deleting limit lines or masks. The `DELETE ALL` softkey deletes every mask and limit line. `DELETE CURRENT` deletes only the currently selected mask or limit line.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `edit`, `delete shapes`.

Related Programming Command

```
LIMit:DELete
```

delta

Softkey that allows you to view changes of signal amplitude and phase over time.

When first turned on, the `SET REF` function is required to store reference data into memory for comparison during the table delta function. Then, the table continually displays the signal values relative to the stored settings. Any value displayed other than zero indicates a change in the input signal.

Key Path

Press `Table`, `delta`.

See Also

SET REF in this chapter.

detect:

Softkey that selects the detection mode for large trace mode.

SAMPLE	The data is uniformly spaced.
MAX	When decimating (that is, keeping 1 of N points) for each N points, use the point with maximum value.
MIN	When decimating (that is, keeping 1 of N points) for each N points, use the point with minimum value.
AM	Returns the amplitude demodulation of the data.
FM	Returns the frequency demodulation of the data.
PM	Returns the phase demodulation of the data.

Key Path

Press `Main` (time mode), `more 1 of 2`, `single shot`, `detect:`.

Related Programming Command

```
SWEep:TIME:OVERsweep:DETect
```

DISPLAY

This front-panel key presents a menu for controlling system level functions such as: HP-MSIB addressing, communication, and configuration.

The DISPLAY front-panel key accesses all system and display functions. (The MENU front-panel key accesses instrument functions.) Press the MENU key to return to the HP 71500 Series menus.

See Also

The *HP 70004A Display Operation Manual.*

display DELAY

Softkey that, in conjunction with `display SEC/DIV`, selects the subset of data to display for large trace mode.

Key Path

Press `Main` (time mode), `more 1 of 2`, `single shot`, `display DELAY`.

Related Programming Command

```
SWEep:TIME:OVERsweep:OFFSet
```

display ON|OFF

Softkey that turns the active trace display on or off.

When a trace is activated, its label is displayed in the bottom of the screen. Only traces which are turned on will have labels displayed on the lower portion of the screen.

Key Path

Press `Traces`, `display ON|OFF`.

Related Programming Command

```
BLANK
VIEW
```

display ON|OFF

Softkey that turns on or off the mask display.

Key Path

Press `Analyze`, `masks limits`, `display ON|OFF`.

Related Programming Command

```
LIMit:SHOW
```

display SEC/DIV

Softkey that, in conjunction with `display DELAY`, selects the subset of data to display for large trace mode.

Key Path

Press `Main` (time mode), `more 1 of 2`, `single shot`, `display SEC/DIV`.

Related Programming Command

```
SWEep:TIME:OVERsweep:DECimate
```

dither ON|OFF

Softkey that turns acquisition DC dithering on or off. When dither is ON, a pseudo-random offset is applied to the input DAC each time a measurement is taken. This will tend to remove inaccuracies caused by quantization errors in the DAC. Dithering is generally used in conjunction with averaging.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `measure config`, `dither ON|OFF`.

Related Programming Command

```
ACQuire:DITHer
```

DUTY CYCLE

Softkey that automatically measures the waveform duty cycle.

The measurement is performed on the trace defined by the `Msr Trc:` softkey. The measurement updates the display as defined by the `update:` key.

Key Path

Press `Measure`, `more 1 of 3`, `DUTY CYCLE`.

Related Programming Command

```
MEASure:DUTY
```

DWELL TIME

Softkey that sets system settling times. This softkey is only displayed in frequency and power sweep modes.

Frequency Sweeps The `DWELL TIME` softkey allows you to define the settling time after the RF source's frequency has been stepped. The HP 71500 Series waits for this specified period of time before making any measurements at the new stepped frequency value.

Power Sweeps The `DWELL TIME` softkey allows you to define the settling time after the RF source's power has been stepped. The HP 71500 Series waits for this specified period of time before making any measurements at the new stepped power value.

Key Path

Press `Main` (frequency or power mode), `more 1 of 2`, `DWELL TIME`.

Related Programming Command

```
SWEep:FREQ:DWELl
SWEep:POWer:DWELl
```

EDGE

Softkey that selects edge triggering on the selected signal.

Edge triggering occurs on either the positive or negative edge of the selected trigger signal.

Related Programming Command

```
TRIGger:TYPE
```

Key Path

Press `Trigger`, `trg is:`, `EDGE`.

See Also

input: and *slope POS|NEG* in this chapter.

EDIT

Softkey that enables you to edit selected (highlighted) frequencies in the signal list.

You can change the frequency of any signal listed in the table. When the frequency is changed, the signal values at that frequency will be listed in the table. Inverse video indicates the signal activated for editing. Scroll through the list using the front-panel knob or step keys.

Key Path

Press `Main`, `more 1 of 2`, `signal list`, `EDIT`.

Press `Table`, `more 1 of 2`, `signal list`, `EDIT`.

Related Programming Command

```
SWEep:SIGnal
```

edit

Softkey that presents a menu for editing the shape of masks or limit lines.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `edit`.

end on

Softkey that presents a menu for defining the conditions that will stop the acquisition or the number of violations for limit lines or masks.

Key Path

Press `Analyze`, `masks limits`, `end on`.

Related Programming Command

```
LIMit:ERRor:STOP
LIMit:ERRor:COUNt
LIMit:TRACe:STOP
LIMit:TRACe:COUNt
```

EXECUTE

The `EXECUTE` softkey initiates the delay measurement. The delay measurement is defined by `MsrTrc:`, `MsrEdge`, and `thrshld Msr`.

Key Path

Press `Measure`, `delay`, `EXECUTE`.

Related Programming Command

```
MEASure:DELay
```

EXTERNL ATTEN

Softkey that allows you to specify any external attenuation between the source and the microwave transition analyzer's ch1 or ch2 input connectors.

When an attenuation value is specified, the HP 71500 Series adjusts all displayed amplitudes to correctly reflect signal levels before the attenuator. The default value is 0.

Key Path

Press `Scale`, `hardwre`, `EXTERNL ATTEN`.

Related Programming Command

```
CHANx:PROBe
```

EXT FORCE

Softkey that changes the trigger input mode. The rear-panel SYNC input can then force a trigger when a transition from logic 0 to logic 1 (or 1 to 0 depending on POS|NEG) occurs.

Key Path

Press `Trigger`, `input:`, `EXT FORCE`.

FALL TIME

Softkey that automatically measures the fall time of a pulse.

The measurement is performed on the trace defined by the `Msr Trc:` softkey. The measurement updates the display as defined by the `update:` key.

Key Path

Press `Measure`, `more 1 of 3`, `FALL TIME`.

Related Programming Command

```
MEASure:FALL
```

filter ON|OFF

Softkey that turns the internal 100 kHz hardware filter on or off. This softkey also changes some measurement modes.

Key Path

Press `Table`, `more 1 of 2`, `filter ON|OFF`.

Related Programming Command

```
TABLe:FILter
```

filter ON|OFF

Softkey that enables or disables a software filter for the large trace mode.

Key Path

Press `Main` (time mode), `more 1 of 2`, `single shot`, `filter ON|OFF`.

Related Programming Command

```
SWEep:TIME:OVERsweep:FILTer:STATe
```

FIND CARRIER

Softkey that measures the carrier frequency of an RF pulse. This operation assumes the carrier is on the channel defined by the trigger source and the modulation source is present on the other channel.

Key Path

Press `Main` (time mode), `more 1 of 2`, `FIND CARRIER`.

Related Programming Command

```
AUTo
```

FIND FREQS

Softkey that places the HP 71500 Series into an auto-search mode looking for all signals present at the input. At the end of the search, the instrument displays the highest amplitude signal. The maximum number of signals identified is five.

After identifying the largest signal, the horizontal scale adjusts to correctly display the signal.

Key Path

Press `Main`, `more 1 of 2`, `signal list`, `FIND FREQS`.

Press `Table`, `more 1 of 2`, `signal list`, `FIND FREQS`.

Related Programming Command

```
TABLe:FIND
```

FIND SIGNALS

Softkey that places the HP 71500 Series into an auto-search mode looking for all signals present at the input. At the end of the search, the instrument displays the highest amplitude signal. The maximum number of signals identified will be five.

After identifying the largest signal, the HP 71500 Series adjusts the scale to correctly display the signal. If you wish to check if other signals were identified, use the signal list key located in the second level of the sweep menu.

Key Path

Press `Main` (time mode), `more 1 of 2`, `FIND SIGNALS`.

Related Programming Command

```
AUTo
```

See Also

signal list in this chapter.

FLATTOP

Softkey that selects the flattop window to be used when transforming a time domain trace to the frequency domain with the `format:` and `xfrm to FRQ|OFF` softkeys located in the `Traces` menu.

Key Path

Press `Config`, `more 1 of 3`, `windows`, `format:`, `FLATTOP`.

flat line

Softkey that enters and displays a flat limit line.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `default shapes`, `flat line`.

Related Programming Command

```
LIMit:DEFault
```

FM

Softkey that returns the frequency demodulation of the data when selected as the detection mode for large trace mode.

Key Path

Press `Main` (time mode), `more 1 of 2`, `single shot`, `detect:`, `FM`.

Related Programming Command

```
SWEep:TIME:OVERsweep:DETect
```

f mult denom.

Softkey that sets the denominator in the sweep equation.

$$RF = \frac{numerator}{denominator} \times FREQ + offset$$

Where:
RF is the expected frequency at the HP 70820A input.
FREQ is the synthesized frequency.

Key Path

Press `Main` (frequency or power sweep mode), `more 1 of 2`, `sweep options`, `f mult denom`.

Related Programming Command

```
SWEep:FREQuency:DIVisor
```

f mult numer.

Softkey that sets the numerator in the sweep equation.

$$RF = \frac{numerator}{denominator} \times FREQ + offset$$

Where:
RF is the expected frequency at the HP 70820A input.
FREQ is the synthesized frequency.

Key Path

Press `Main` (frequency or power sweep mode), `more 1 of 2`, `sweep options`, `f mult numer.`.

Related Programming Command

```
SWEep:FREQuency:MULTiplier
```

FORMAT

Softkey that formats the selected mass storage. For example, if a card is selected by the `msi:` softkey, pressing `FORMAT` erases all files on a card. Of course, a card must first be inserted in the front-panel card slot.

Key Path

Press `States`, `more 1 of 2`, `mass storage`, `more`, `FORMAT`.

Related Programming Command

```
MMEMory:INITialize
```

format:

Softkey that formats the trace in any of the following modes: transform to frequency, transform to time, real, magnitude, log magnitude, and phase.

The line below the `format:` softkey shows the currently selected format of the active trace.

Key Path

Press `Traces`, `format:`.

Related Programming Command

```
WAVeform:DOMain
WAVeform:MAGNitude
```

format:

Softkey that allows the changing of the window used when transforming a time domain trace to the frequency domain with the `format:` and `xfrm to FRQ|OFF` softkeys. The line below the `format:` softkey shows the currently selected window.

Key Path

Press `Config`, `more 1 of 3`, `windows`, `format:`.

Related Programming Command

```
WINDow:TYPE
```

FORMAT AVERAGE

Softkey that turns averaging on for formatted data.

The data is averaged after it has been converted to MAGN, LOGMAG, or PHASE format and is ready to be displayed.

Key Path

Press `Traces`, `avg hld`, `FORMAT AVERAGE`.

Related Programming Command

```
ACQuire:COUNt
ACQuire:TYPE
CHANx:TYPE
CHANx:COUNt
FUNCx:TYPE
FUNCx:COUNt
WAVeform:TYPE
```

FRAME

Softkey that removes all graticules from the display and leaves graticule marks around the screen's border.

Key Path

Press `Config`, `grat:`, `FRAME`.

FREERUN

Softkey that selects freerun triggering.

Freerun triggering allows the system to sweep continually without the need for any type of internal or external trigger. The system sweeps at the fastest possible speed.

Key Path

Press `Trigger`, `trg is:`, `FREERUN`.

Related Programming Command

```
TRIGger:TYPE
```

FREQ

Softkey that is used to adjust the calibrator frequency from 153 Hz to 5 MHz.

Key Path

Press `Calib`, `cal signal`, `FREQ`.

Related Programming Command

```
CALibrate:SIGNal:FREQuency
```

FREQ

Softkey that automatically measures the frequency of a time waveform trace.

The measurement is performed on the trace defined by the `Msr Trc:` softkey. The measurement updates the display as defined by the `update:` key. Two rising or two falling edges must be displayed for the measurement to be performed.

Key Path

Press `Measure`, `more 1 of 3`, `FREQ`.

Related Programming Command

```
MEASure:FREQ
```

FREQ

Softkey that selects frequency sweeps and displays the measurement data as amplitude (vertical) versus frequency (horizontal).

The HP 71500 Series sends the appropriate commands via the system bus to step the RF source's frequency. The start frequency is displayed on the left side of the display and the stop frequency on the right. The frequency per division is shown at the center of the horizontal scale.

Frequency sweep measures magnitude and phase at a specific RF frequency for each trace point.

Key Path

Press `Main`, `sweep:`, `FREQ`.

Related Programming Command

```
SWEep:TYPE
```

freq offset

Softkey that specifies the frequency offset in the sweep equation.

$$RF = \frac{numerator}{denominator} \times FREQ + offset$$

Where:
RF is the expected frequency at the HP 70820A input.
FREQ is the synthesized frequency.

Key Path

Press `Main` (frequency or power sweep mode), `more 1 of 2`, `sweep options`, `freq offset`.

Related Programming Command

```
SWEep:FREQuency:OFFSet
```

FREQ & POWER

Softkey that configures the instrument to measure the frequency and power of an input signal.

Key Path

Press `States`, `FREQ & POWER`.

See Also

"Predefined Measurement States" in Chapter 5 of this manual for information about the default settings for the various measurement states.

FREQ SHIFT

Softkey that enters frequency shifts to flatten the phase for further analysis.

The `FREQ SHIFT` softkey is displayed only if the trace data is time domain.

Key Path

Press `Scale`, `more 1 of 2`, `FREQ SHIFT`.

Related Programming Command

```
WAVeform:FSHift
```

Fspan OPT|OFF

When in the OPT position, the start and stop frequencies during a pulsed frequency sweep are altered to give best possible performance. Typically, spacing is a multiple of the sampling frequency.

Key Path

Press `Pulsgen`, `more 1 of 2`, `Fspan OPT|OFF`.

Related Programming Command

```
SWEep:OPTimize
```

Fss TGT AUT|MAN

Softkey that .

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `measure config`, `Fss TGT AUT|MAN`.

Related Programming Command

```
SWEep:TIME:TARGet[:STATe]
SWEep:TIME:TARGet[:SRATe]
```

gen is:

Softkey that turns the internal pulse generator on or off. The current status is displayed under the key label. Choices are as follows:

OFF The `OFF` softkey turns the internal pulse generator off and informs the HP 71500 Series that no pulse generator is

used in the measurements.

INT The `INT` softkey turns the internal pulse generator on and informs the HP 71500 Series to use the internal pulse generator for measurements. This information provides special software couplings in certain measurement applications.

MANUAL The `MANUAL` softkey turns the internal pulse generator off and informs the microwave transition analyzer that an external pulse generator is used.

Use this feature if an external pulse generator is used. Entered pulse generator parameters (like PRI) will be used for internal calculations only.

Key Path

Press `Pulsgen`, `gen is:`.

Related Programming Command

```
MODulator:STATe
```

grat:

Softkey that changes the displayed graticule.

Choices of graticule types include AXES, FRAME, GRID, and OFF. The AXES option places one vertical and one horizontal graticule line on the display.

The FRAME option removes all graticules from the display and leaves graticule marks around the screen's border.

The GRID option places a grid of horizontal and vertical graticule lines on the screen.

The OFF option removes all graticules and screen borders from the display.

Key Path

Press `Config`, `grat:`.

Related Programming Command

```
DISPlay:GRAT
```

GRID

Softkey that places a grid of horizontal and vertical graticule lines on the screen.

Key Path

Press `Config`, `grat:`, `GRID`.

GROUP

Softkey that initiates a series of sweeps.

Use group triggering in single sweep mode with averaging enabled. It completes a required number of sweeps and stops. The number of sweeps is determined by the maximum number of averages. This feature is similar to pressing a single trigger key but usually more than one sweep is taken to accomplish the acquiring of data for display.

Key Path

Press `Trigger`, `GROUP`.

Related Programming Command

```
DIGitize
```

HAMMING

Softkey that is used when performing FFT transform operations in the math system.

Key Path

Press `Config`, `more 1 of 3`, `windows`, `math:`, `HAMMING`.

Press `Config`, `more 1 of 3`, `windows`, `format:`, `HAMMING`.

HANNING

Softkey that selects the hanning window to be used when transforming a time domain trace to the frequency domain with `format:` and `xfrm to FRQ|OFF` softkeys located in the `Traces` menu.

Key Path

Press `Config`, `more 1 of 3`, `windows`, `format:`, `HANNING`.

hardwre

Softkey that displays a menu for controlling specific hardware features.

Key Path

Press `Scale`, `hardwre`.

hexagon

Softkey that enters and displays a hexagon mask.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `default shapes`, `hexagon`.

Related Programming Command

```
LIMit:DEFault
```

See Also

default shapes in this chapter.

HIGHEST PEAK

Softkey that places the marker on the highest displayed peak. If the trace is a transformed frequency spectrum format and `pk intp ON|OFF` is ON, an interpolation procedure is used to more accurately determine the peak amplitude and frequency. If not, the marker is placed at the trace point with the maximum value.

Key Path

Press `Markers`, `mkr->`, `HIGHEST PEAK`.

Related Programming Command

```
MARKx:PEAK
```

histog:

Softkey that selects the type of histogram. Choices of histogram type are vertical or horizontal.

Key Path

Press `Analyze`, `histogm`, `histog:`.

Related Programming Command

```
HISTogram:WINDow
```

histogm

Softkey that presents a menu for performing automatic histogram analysis.

Histogram analysis can be performed on any of the four traces.

Key Path

Press `Analyze`, `histogm`.

(HOLD)

The (HOLD) front-panel key (on the HP 70004A display) deactivates an active function to prevent further control setting changes.

For example, if the SEC/DIV function in the Main menu has just been set to 100 ns, it remains the active function. So if the knob is turned or the step keys are pressed accidentally, the time-per-division will change to a new value. (HOLD) disables the active function, protecting it from accidental changes. (HOLD) also removes the active function readout from the display, and turns off the inverse video of an active softkey. If (HOLD) is pressed twice, the menu keys, on the right-hand side of the display will be blanked.

hold MAX|MIN

Softkey that enables max or min hold. Activate both parameters by repeated presses of the key until both MAX and MIN are underlined.

Press the RESTART ALL TRC softkey to reset the MAX|MIN hold.

Key Path

Press Traces, avg hld, hold MAX|MIN.

Related Programming Command

```
ACQuire:TYPE
CHANx:TYPE
FUNCx:TYPE
WAVeform:TYPE
```

HORZNTL HISTOGM

Softkey that sets the histogram type to horizontal.

The histogram is generated along the display's horizontal axis. It shows the amplitude distribution of the data samples having values between the two horizontal window markers.

Key Path

Press Analyze, histogm, histog, HORZNTL HISTOGM.

HOURS

Softkey that sets the hour value of the HP 70820A's system clock.

Key Path

Press Config, more 1 of 3, clock, set clock, HOURS.

See Also

set clock in this chapter.

HP 8510 ADDR

Softkey that is used when the RF synthesizer is located on the private HP-IB port of an HP 8510 network analyzer. Use this softkey to enter the address of the network analyzer. The default address is set to 16.

See Also

HP-IB options in this chapter.

Key Path

Press `Config`, `RF source`, `HP-IB options`, `HP 8510 ADDR`.

HP 8510 DEVICE

Softkey that is used when the RF synthesizer is located on the private HP-IB port of an HP 8510 network analyzer. Use this softkey to enter the address of the synthesizer. The default address is set to 19.

See Also

HP-IB options in this chapter.

Key Path

Press `Config`, `RF source`, `HP-IB options`, `HP 8510 DEVICE`.

HP-IB ADDR

Softkey that allows you to enter the HP-IB address of an external RF source. This softkey appears when the selected bus type is HP-IB. The microwave transition analyzer needs to know the HP-IB address of an external RF source before it can control the source.

Key Path

Press `Config`, `RF source`, `HP-IB ADDR`.

Related Programming Command

```
SOURce:CONFigure:ADDR
```

HP-IB HP-MSIB

Softkey that selects either the HP-IB or HP-MSIB bus for communication with an external RF source.

When activated, an additional menu softkey appears allowing you to enter the RF source's HP-IB or HP-MSIB address.

Related Programming Command

```
SOURce:CONFigure:BUS
```

Key Path

Press `Config`, `RF source`, `HP-IB HP-MSIB`.

HP-IB options

Softkey that presents a menu for controlling an RF synthesizer that is shared between the microwave transition analyzer and an HP 8510 network analyzer. Connect the network analyzer to the microwave transition analyzer's private HP-IB connector. The RF synthesizer is connected to the network analyzer's private HP-IB connector. Control passes through the network analyzer to the synthesizer.

Because SRQ is not passed from the synthesizer through the HP 8510, set the `use SRQ ON|OFF` softkey to `OFF`. Set the `PASSTHR ON|OFF` softkey to `ON`. Use `HP8510 ADDR` to enter the HP-IB address of the HP 8510. The default value is 16. Use `HP8510 DEVICE` to enter the HP-IB address of the synthesizer. The default value is 19. After setting these softkeys, press `prev menu`, and the press `HP-IB ADDR` and enter an address that is one value higher than the address of the HP 8510 network analyzer.

The `HP-IB options` softkey only appears when `HP-IB HP-MSIB` is set to `HP-IB`.

Key Path

Press `Config`, `RF source`, `HP-IB options`.

See Also

HP-IB PRI|SEC and *use SRQ ON|OFF* in this chapter.

HP-IB PRI|SEC

Softkey that is used when an RF source requires extended addressing on the HP-IB. Press the `HP-IB PRI|SEC` softkey so that `SEC` (secondary) is underlined. Normally, primary (`PRI`) addressing is used.

Key Path

Press `Config`, `RF source`, `HP-IB options`, `HP-IB PRI|SEC`.

Related Programming Command

```
SOURce:CONFigure:ADDR
```

HP-MSIB CARD

Softkey that selects a memory card as the mass storage device.

Key Path

Press `States`, `more 1 of 2`, `mass storage`, `msi`, `HP-MSIB CARD`.

Related Programming Command

```
MMEMory:MSIS
```

HP-MSIB COLUMN

Softkey that allows you to enter the HP-MSIB column address of an external RF source.

This softkey appears when the selected bus type is HP-MSIB. The microwave transition analyzer needs to know the column address of an external RF source before it can control the source over HP-MSIB.

Key Path

Press `Config`, `RF source`, `HP-MSIB COLUMN`.

Related Programming Command

```
SOURce:CONFigure:COLumn
```

HP-MSIB ROW

Softkey that allows you to enter the HP-MSIB row address of an external RF source.

This softkey appears when the selected bus type is HP-MSIB. The microwave transition analyzer needs to know the row address of an external RF source before it can control the source over HP-MSIB.

Key Path

Press `Config`, `RF source`, `HP-MSIB ROW`.

Related Programming Command

```
SOURce:CONFigure:ROW
```

HYST

Softkey that sets the trigger hysteresis. The hysteresis can be set from 1% to 100% in steps of 1 percentage point.

Related Programming Command

```
TRIGger:HYSTeresis
```

Key Path

Press `Trigger`, `more 1 of 2`, `HYST`.

IF calib

Softkey that executes an IF calibration test.

Key Path

Press `Calib`, `IF calib`.

Related Programming Command

```
CALibrate:ALL?
```

IF coup AC|DC

Softkey that allows you to change the hardware input coupling between the front-panel channel connectors and the remaining circuits inside the instrument. Selections are AC coupling or DC coupling.

Key Path

Press `Scale`, `hardwre`, `IF COUP AC|DC`.

Related Programming Command

```
CHANx:COUPling
```

INCLUDE HARMNCS

Softkey that determines if the signal list table displays harmonics of the input signals.

The underlined softkey indicates harmonics are included in the signal list.

Key Path

Press `Main`, `more 1 of 2`, `signal list`, `INCLUDE HARMNCS`.

Press `Table`, `more 1 of 2`, `signal list`, `INCLUDE HARMNCS`.

Related Programming Command

```
TABle:INCLude
```

input:

Softkey that selects the input channel or ratio of channels used for the table.

This softkey turns the table function off or on. The table is turned on when you select channel one, channel two, or a ratio of channels one and two as the source for the table. The HP 71500 Series displays the table in the lower half of the screen.

Most of the time you'll set the table input to the displayed trace. However, the data displayed in the table need not be from the channel displayed on the screen. This means that the displayed trace(s) and the table data can be unrelated.

The softkey line below `input:` shows the currently active selection.

Key Path

Press `Table`, `input:`.

Related Programming Command

```
TABLe:CLEAr
TABLe:SOURce
```

input:

Softkey that allows you to define the input source for the active trace. The active trace is a trace which has been selected using the `Traces` softkey. The `input:` softkey allows you to display either CH1, CH2, or traces stored in memory registers.

This softkey displays a menu showing the current trace assignments. You can define traces to be one of the following:

CH1	The trace is equal to the data coming directly from hardware channel 1.
CH2	The trace is equal to the data coming directly from hardware channel 2.
CH1/CH2	The trace is equal to the data coming directly from hardware channel 1 divided by the data from channel 2.
CH2/CH1	The trace is equal to the data coming directly from hardware channel 2 divided by the data from channel 1.
MEMx	The trace is defined to be the data stored in a memory register.
build eqn	This allows definition of new equations that will be added to the screen. The softkey line below `input:` shows the selected trace definition. Note that labels are abbreviated to seven characters maximum.
RETURN	This softkey saves the current equation and returns the user to the previous menu.

The `input:` softkey also allows selection, via the front-panel knob or step keys, of any equation on screen (either standard or user added equations).

Key Path

Press `Traces`, `input:`.

Related Programming Command

```
FUNCx:DEFine
```

input:

Softkey that determines the signal used for edge, pulse, and phase triggering. (`EXT FORCE` is edge triggering only.)

In freerun triggering, the `input:` softkey does not function.

The softkey line below `input:` shows the currently selected trigger input source.

Key Path

Press `Trigger`, `input:`.

Related Programming Command

```
TRIGger:SOURce
```

input GND|IF

Softkey that selects the 0 DC reference input for the compensation routine. Selections are `GND` (an internal ground), and `IF` (this is where a 50Ω load is connected to the channel input connector). Although selecting `GND` is not as accurate as `IF`, it does not require disconnecting any measurement cables you may have connected.

Key Path

Press `Scale`, `hardwre`, `null DC`, `input GND|IF`.

Related Programming Command

```
CHANx:NULL
```

INSERT

Softkey that inserts the highlighted token into a trace equation at the cursor location.

The token is selected by the front-panel knob or step keys. It can be a function trace, constant, or arithmetic symbol.

In addition, numbers from the numeric keypad are automatically inserted into the trace equation at the cursor location (without using the `INSERT` softkey).

Key Path

Press `Traces`, `input:`, `build eqn`, `INSERT` (SEL mode).

INSERT LINE

Softkey that adds a new frequency line to the user corrections table before currently selected frequency.

Key Path

Press `Calib`, `user corr`, `INSERT LINE`.

Related Programming Command

```
CALibrate:USER:DATA
```

INSTR

The INSTR (instrument) front-panel key (on the HP 70004A display) assigns the HP 70004A's front-panel keys (and optional keyboard) to selected master modules. When the INSTR key is pressed, the display draws colored boarders around the currently defined windows. Window location, pen number, and the normal colors assigned to those windows are defined in Table 3-1.

Table 3-1. INSTR Key Window Assignments

Window	Location	Pen Number	Normal Color
1	Lower Left	2	Yellow
2	Upper Left	3	Cyan
3	Upper Right	4	Pink
4	Lower Right	5	Green

In the softkey location nearest each of these windows is a menu key containing the first seven characters in the instrument's model number on the first line, and the module's HP-MSIB address (row, column) on the second. The menu key is displayed in reverse video in the same color as the associated window border. If any of the menu keys is pressed, the keyboard is offered to that window's instrument. If the instrument accepts the keyboard, it displays its menu keys as if the MENU key had been pressed.

See Also

Chapter 9, "Front-Panel Fixed-Label Keys," and Chapter 7, "Address Map Menu," in the *HP 70004A Display Operation Manual*.

INSTR PRESET

The INSTR PRESET (instrument preset) front-panel key (on the HP 70004A display) resets the control settings of the HP 71500A to a known preset state.

Pressing INSTR PRESET aborts any current operations and clears the HP-IB output queue. This function will not modify the HP-IB or HP-MSIB interfaces, the display's address map, or calibration data.

Related Programming Command

```
RST
```

INT

Softkey that turns the internal pulse generator on and informs the HP 71500 Series to use the internal pulse generator for measurements. This information provides special software couplings in certain measurement applications.

Key Path

Press `Pulsgen`, `gen is:`, `INT`.

See Also

gen is: in this chapter.

INTERNL STATE

Softkey that lists the internal conditions of the microwave transition analyzer on the display. Interpreting the data requires a detailed knowledge of the sampling techniques employed by the microwave transition analyzer.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `INTERNL STATE`.

Related Programming Command

```
SYSTem:STATus?
```

invert triang

Softkey that enters and displays an inverted triangle mask.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `default shapes`, `invert triang`.

Related Programming Command

```
LIMit:DEFault
```

See Also

default shapes in this chapter.

IP REF:

Softkey that selects the 10 MHz reference signal used upon an instrument preset and power on. Choices are AUTO, INTernal, and EXTernal. In AUTO mode, an external signal is used if present. Otherwise, the internal reference is used.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `system`, `IP REF:`.

Related Programming Command

```
SYStem:REFerence
```

labels

Softkey that presents a menu for writing a title on the screen and for entering trace and state labels.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `labels`.

label states

Softkey that allows you to enter custom softkey label to identify a saved instrument state. Labels are not affected by an instrument preset or by turning the line power off.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `labels`, `label states`.

Related Programming Command

```
FUNCx:LABel
```

label traces

Softkey that allows you to enter custom labels for each trace. The label is displayed with the trace identification located at the bottom of the screen. Labels are not affected by an instrument preset. Turning the line power off erases custom labels.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `labels`, `label traces`.

Related Programming Command

```
FUNCx:LABel
```

LCL

The LCL (local) front-panel key (on the HP 70004A display) returns the module to local if not in local lockout. This allows front-panel operation of the instrument.

LEVEL

Softkey that allows you to enter the trigger level with the key pad or the front-panel knob.

The HP 71500 Series displays a line on the screen indicating the position of the trigger level if the trigger channel is a displayed trace.

Key Path

Press `Trigger`, `LEVEL`.

Related Programming Command

```
TRIGger:LEVel
TRIGger:RELative:LEVel
```

LIMIT → 0%-100%

When pressed, this softkey uses the bounds set by `UPPER LIMIT` and `LOWER LIMIT` for calculating mean and standard deviation.

Key Path

Press `Analyze`, `histogm`, `other`, `LIMIT → 0%-100%`.

Related Programming Command

```
HISTogram:REFerence
```

See Also

UPPER LIMIT and *LOWER LIMIT* in this chapter.

LINEAR

Softkey that defines the marker amplitude units to be linear. That is, volts or no units.

Key Path

Press `Markers` , `more 1 of 2` , `readout options` , `ampl:` , `LINEAR` .

See Also

ampl: in this chapter.

LINES|DOTS

Softkey that allows you to modify the way traces are constructed on the display.

In the LINES mode, adjacent trace points are connected with a straight line. In the DOTS mode, only the trace points are displayed.

Key Path

Press `Config` , `more 1 of 3` , `LINES|DOTS` .

Related Programming Command

```
DISPlay:CONNect
```

LOAD FILE

Softkey that loads a file from the current mass storage device. Use the ⇧ and ⇩ keys or knob to select the desired file. Recalled file types include states, masks, user menus, traces, and down-loadable programs. Recalled state files immediately set the state of the instrument.

Key Path

Press `States` , `more 1 of 2` , `mass storage` , `LOAD FILE` .

Related Programming Command

```
MMEMory:LOAD:xxx
```

load to

Softkey that determines the destination of recalled trace files. Traces may be recalled to channel 1, channel 2, or memory locations 1 through 4. The default is channel 1.

Key Path

Press `States` , `more 1 of 2` , `mass storage` , `more` , `load to` .

LOCAL PEAK

Softkey that places the marker on the displayed peak closest to the current marker horizontal position.

Key Path

Press `Markers`, `mkr->`, `LOCAL PEAK`.

Related Programming Command

```
MARKx:LPEAk
```

LOG

Softkey that defines the marker amplitude units to be logarithmic. That is, dB or dBm.

Key Path

Press `Markers`, `more 1 of 2`, `readout options`, `ampl:`, `LOG`.

See Also

ampl: in this chapter.

LOGMAG (lg am)

Softkey that displays the logged magnitude of the transformed waveform.

The lg am portion only appears for complex time domain traces.

Key Path

Press `Traces`, `format:`, `LOGMAG (lg am)`.

Related Programming Command

```
WAVeform:DOMain
```

LOWER LIMIT

Softkey that turns on a line marker that can be positioned with keyboard or front-panel knob. It will be either on the X or Y axis depending on whether horizontal or vertical histograms are selected. Also, it can be used to set the lower bound for histogram calculations, including mean and standard deviation.

After acquiring histogram data on a trace, the display may show several places that satisfy the bounds of window markers 1 and 2. Use the `LOWER LIMIT` and `UPPER LIMIT` softkeys to determine the portion of histogram data results that will be used for calculating the mean and standard deviation values.

Lower and upper limit bounds are not used until the `LIMIT — 0%-100%` softkey in the `histogm` menu is activated.

Key Path

Press `Analyze`, `histogm`, `other`, `LOWER LIMIT`.

Related Programming Command

```
HISTogram:LLIMit
HISTogram:PLL?
```

LOWER LIMIT

Softkey that specifies the displayed lines act as lower testing limits.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `type`, `LOWER LIMIT`.

Related Programming Command

```
LIMit:TYPE
```

LOWER THRSHLD

Softkey that defines the amplitude to be used for the lower part of an edge definition, when the `USR|STD` softkey is set to user mode.

Key Path

Press `Measure`, `define`, `LOWER THRSHLD`.

Related Programming Command

```
MEASure:LOWer
```

LOWEST

Softkey that places the marker on the lowest point on the trace.

See Also

mkr-> in this chapter.

Key Path

Press `Markers`, `mkr->`, `LOWEST`.

Related Programming Command

```
MARKx:LOWest
```

M1 M2

The M1 and M2 front-panel keys (on the HP 70004A display) activate the two display markers.

Pressing either of these keys automatically activates the `Markers` menu.

M1 (↓)

Softkey that enables trace marker M1. Repeated presses moves the marker to any other displayed trace.

The active marker is indicated by inverse video. The trace assigned to the marker is indicated under the softkey. When activated, the marker is placed on the lowest numbered trace which is on. On each successive press of the marker key, the marker moves to the next lower displayed trace scrolling between TR1, TR2, TR3, TR4, and TR1 (if all four traces are on). You can adjust the position of active markers on the trace using the front-panel keyboard.

Key Path

Press `Markers` , `M1 (↓)` .

Related Programming Command

```
MARK1:POSition
MARK1:SOURce
```

M2 (↑)

Softkey that enables trace marker M2. Repeated presses moves the marker to any other displayed trace.

The active marker is indicated by inverse video. The trace assigned to the marker is indicated under the softkey. When activated, the marker is placed on the lowest numbered trace which is on. On each successive press of the marker key, the marker moves to the next higher displayed trace scrolling between TR1, TR2, TR3, TR4, and TR1 (if all four traces are on). You can adjust the position of active markers on the trace using the front-panel keyboard.

Key Path

Press `Markers` , `M2 (↑)` .

Related Programming Command

```
MARK2:POSition
MARK2:SOURce
```

MAGN (am)

Softkey that displays the magnitude of the transformed waveform.

The am portion only appears for complex time domain traces.

Key Path

Press `Traces` , `format:` , `MAGN (am)` .

Related Programming Command

```
WAVeform:DOMain
```

Main

Softkey that displays the Main menu.

Use the `Main` menu to select and control time, frequency, and power sweeps.

MANUAL

Softkey that turns the internal pulse generator off and informs the HP 71500 Series that an external pulse generator is used.

The frequency or period must be defined using the `PRI|PRF`.

Key Path

Press `Pulsgen`, `gen is:`, `MANUAL`.

See Also

gen is: in this chapter.

Markers

Softkey that presents a menu for activating and using display markers.

The microwave transition analyzer has two markers: M1 and M2. The marker indicators are ↓ for M1 and ↑ for M2.

MARKERS OFF

Softkey that turns off both markers. To enable only one marker, first turn both markers off, enable the desired marker, and position the marker on the applicable trace.

Key Path

Press `Markers`, `MARKERS OFF`.

Related Programming Command

```
MARK:OFF
```

MASK

Softkey that sets the current limit-line type to mask.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `type`, `MASK`.

Related Programming Command

```
LIMit:TYPE
```

masks limits

Softkey that presents a menu for creating, saving, and editing masks and limit lines.

Key Path

Press `Analyze`, `masks limits`.

mass storage

Softkey that presents a menu for controlling mass storage. For mass storage, you can select internal memory or a device on the HP-MSIB (usually the front-panel card slot). The front-panel card slot is set to the display's address of 4. When mass storage is selected, The display lists names of entries, their size and type.

Key Path

Press `States`, `mass storage`.

math:

Softkey that allows selection of either a uniform (none) or a hamming window to be used when transforming operations in the math system are performed. The current selection is shown below the `math:` softkey.

Key Path

Press `Config`, `more 1 of 3`, `windows`, `math:`.

Related Programming Command

```
WINDow:MATH
```

MAX

Softkey that when decimating (that is, keeping 1 of N points) for each N points, uses the point with the maximum value.

Key Path

Press `Main` (time mode), `more 1 of 2`, `single shot`, `detect:`, `MAX`.

Related Programming Command

```
SWEep:TIME:OVERsweep:DETect
```

MEAN

Softkey that displays the mean (average) and standard deviation values of the histogram data. In addition, it draws a line marker at the mean value. The reference range of the histogram may be modified by the `LIMIT — 0%-100%`.

Key Path

Press `Analyze`, `histogm`, `other`, `results`, `MEAN`.

Related Programming Command

```
HISTogram:MEAN
```

Measure

Softkey that selects a menu for performing predefined automatic measurements.

MEASURE ALL

Softkey that automatically performs all available automatic measurements.

This function enables the markers and lists measurement results in a table on the display.

The measurement updates of the table are defined by the `update:`. To remove the table update, select the `OFF` softkey in the `histogm` menu.

Key Path

Press `Measure`, `MEASURE ALL`.

Related Programming Command

```
MEASure:ALL
```

MEASURE AVERAGE

Softkey that defines the number of averages to perform when `update:AVERAGE` is selected (`Measure` menu).

Key Path

Press `Measure`, `define`, `MEASURE AVERAGE`.

Related Programming Command

```
MEASure:COUNt
```

measure config

Softkey that allows changing of some measurement configurations. This includes disabling the analytic signal operation, switching to 32-bit traces, and enabling dithering.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `measure config`.

MEMORY

Softkey that selects internal RAM for mass storage.

Key Path

Press `States`, `more 1 of 2`, `mass storage`, `msi`, `MEMORY`.

Related Programming Command

```
MMemory:MSIS
```

MEMx

Softkey that accesses trace data stored in a memory register.

Key Path

Press `Traces`, `input:`, `MEMx`.

Press `States`, `more 1 of 2`, `mass storage`, `more`, `load to`, `MEMx`.

See Also

input: (`Traces` menu) in this chapter.

(MENU)

The (MENU) front-panel key (on the HP 70004A display) displays the HP 71500 Series microwave transition analyzer's softkeys.

If the (DISPLAY) front-panel key is pressed, softkey menus dedicated to controlling display functions are displayed. Press the MENU key to return to the HP 71500A menus.

MIN

Softkey that when decimating (that is, keeping 1 of N points) for each N points, uses the point with the minimum value.

Key Path

Press `Main` (time mode), `more 1 of 2`, `single shot`, `detect:`, `MIN`.

Related Programming Command

```
SWEep:TIME:OVERsweep:DETect
```

MINUTES

Softkey that is used to set the minutes value of the HP 70820A's system clock.

Key Path

Press `Config`, `more 1 of 3`, `clock`, `set clock`, `MINUTES`.

See Also

set clock in this chapter.

mkr →

Softkey that displays a menu for moving the marker to the highest peak, next peak, local peak, or lowest point on the trace. Also, it allows the user to move the trace and marker to the reference value position or the center of the screen.

Key Path

Press `Markers`, `mkr →`.

mkr hld ON|OFF

Turning this softkey to ON freezes the active marker and it no longer tracks the trace data. Turning the `mkr hld ON|OFF` softkey to OFF re-enables the marker tracking of the trace data whenever new data is available.

The `HIGHEST PEAK`, `NEXT PEAK`, and `LOCAL PEAK` softkeys automatically turn the marker hold ON. M1 and M2 automatically turn it OFF.

This function is useful for various marker and delta measurements.

Key Path

Press `Markers`, `more 1 of 2`, `mkr hld ON|OFF`.

Related Programming Command

```
MARKx:HOLD
```

mkr trk options

Softkey that provides access to a menu of marker track options.

Key Path

Press `Markers`, `more 1 of 2`, `mkr trk options`.

modify:

Softkey that selects a parameter to be modified if incompatible carrier and pulse repetition frequencies are used.

Due to measurement techniques employed by the microwave transition analyzer, harmonically related carrier and pulse repetition frequencies are incompatible in some modes of operation. For example, a 1 GHz carrier modulated with a PRF of 1 MHz is an incompatible measurement condition when using the noise filter or zero time operation (vector averaging should be used instead for synchronous modulation).

In order to make optimum measurements in these modes, the microwave transition analyzer automatically modifies one of its settings to accommodate as closely as possible the exact measurement. This softkey lets you select one of the following system parameters to be modified:

Disable the modify function (`OFF`)

Time per division (TIM/DIV)

Trace length (TRC PTS)

Synthesizer frequency (SYNTH)

When an external synthesizer is connected, the default selection is SYNTH. If no external synthesizer is connected, the default parameter is TRC PTS.

The current selected parameter is shown below the modify:.

Key Path

Press Pulsgen, more 1 of 2, modify:.

Related Programming Command

SWEep:FUZZy

MONTH

Softkey that is used to set the month value of the HP 70820A's system clock.

Key Path

Press Config, more 1 of 3, clock, set clock, MONTH.

See Also

set clock in this chapter.

more

Softkey that leads to additional functions available for mass storage.

Key Path

Press States, more 1 of 2, mass storage, more.

MOVE BOTH

Softkey that enables both M1 and M2 markers for moving while keeping their relative positions constant. Use the front-panel keypad or knob to move the markers.

M1 and M2 can be on different traces but they must have the same X-axis.

Key Path

Press Markers, MOVE BOTH.

Related Programming Command

MARK:BOTH

move X|Y

Softkey that moves the X or Y position of any mask or limit line point. Use the ⇧ or ⇩ keys to select the point. Then, press `move X|Y` and turn the front-panel knob to position the point.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `edit`, `move X|Y`.

Related Programming Command

`LIMit:DATA`

msi

Softkey that selects mass storage device for saving and recalling data. Choices are none, the HP-MSIB, and internal memory. The HP-MSIB can be set to either the front-panel card slot (this is default address of 4) or any other suitable device connected to the HP-MSIB. Notice that the card slot has the same address as the display.

Key Path

Press `States`, `more 1 of 2`, `mass storage`, `msi`.

Related Programming Command

`MMEMory:MSIS`

MsrEdge POS|NEG

Softkey that defines the positive or negative edge of the trace to be used for delay measurements.

Key Path

Press `Measure`, `delay`, `MsrEdge POS|NEG`.

Related Programming Command

`MEASure:ESTArt`

MsrTrc:

Softkey that allows you to select a trace for measurement.

Any displayed trace can be selected for measurement.

Key Path

Press `Measure`, `MsrTrc:`.

Related Programming Command

`MEASure:SOURce`

MsrTrc:

Softkey that allows you to select a trace for delay measurements. This is identical to the other `MsrTrc:` softkey in the `Measure` menu.

Key Path

Press `Measure`, `delay`, `MsrTrc:`.

NEXT PAGE

Softkey that views the next page of catalog data if it is available.

Key Path

Press `States`, `more 1 of 2`, `mass storage`, `NEXT PAGE`.

Related Programming Command

```
MMEMory:CATalog
```

NEXT PEAK

Softkey that places the marker on the next highest peak when compared to the current position. If the trace is a transformed frequency spectrum format and `pk intp ON|OFF` is ON, an interpolation procedure is used to more accurately determine the peak amplitude and frequency.

Key Path

Press `Markers`, `mkr->`, `NEXT PEAK`.

Related Programming Command

```
MARKx:NEXT
```

noisflt ON|OFF

Adjust the various noise reduction filtering in time sweeps. In normal repetitions or single shot sampling, it enables/disables the use of the 100 kHz analog IF filter.

Key Path

Press `Main` (time mode), `noisflt ON|OFF`.

Related Programming Command

```
SWEep:TIME:FILter:STATe
SWEep:TIME:FILter:BWIDth
```

NOISE FILTER

Softkey that adjusts the bandwidth of the digital IF filter from 10 Hz to 50 kHz.

Key Path

Press `Main` (frequency or power mode), `NOISE FILTER`.

Related Programming Command

```
SWEep:FREQuency:IFB
SWEep:POWer:IFB
```

NONE

Softkey indicating that no mass storage device is used.

Key Path

Press `States`, `more 1 of 2`, `mass storage`, `msi`, `NONE`.

null DC

Softkey that allows the microwave transition analyzer to compensate for any DC drifts in the system hardware.

When one of the softkeys in the `null DC` menu is pressed, the microwave transition analyzer makes appropriate measurements and corrections for DC drifts.

Key Path

Press `Scale`, `hardwre`, `null DC`.

NUMBER SAMPLES

Softkey that displays and allows changing of the number of valid samples required for a complete data sample in the histogram measurement. A valid sample is one that fits into the measurement windows specified by the user. The default number of samples is 1000.

Key Path

Press `Analyze`, `histogm`, `NUMBER SAMPLES`.

Related Programming Command

```
HISTogram:SAMPles
```

See Also

TRACE POINTS in this chapter.

OFF

Softkey that removes all graticules and screen borders from the display.

Key Path

Press `Config`, `grat:`, `OFF`.

OFF

Softkey that is used in relation to the splitting of the screen into separate windows. When selected, only one window is displayed on the screen.

Key Path

Press `Config`, `split:`, `OFF`.

See Also

split: in this chapter.

OFF

Softkey that turns off the mean and standard deviation display.

Key Path

Press `Analyze`, `histogm`, `other`, `results`, `OFF`.

Related Programming Command

```
HISTogram:STATe
```

OFF

Softkey that is generally used for wide band signals (such as 1 GHz square wave).

Key Path

Press `Main` (time mode), `more 1 of 2`, `sweep options`, `translt`, `OFF`.

See Also

translt in this chapter.

OFF

Softkey that turns off measurement update and the display of measurement results.

Key Path

Press `Measure`, `update:`, `OFF`.

See Also

update: in this chapter.

OFF

Softkey that turns off the internal pulse generator.

Key Path

Press `Pulsgen` , `gen is:` , `OFF` .

OFF

Softkey that disables the modify function during measurements using incompatible frequencies. The microwave transition analyzer makes the measurement without changing any of parameters. The carrier frequency component may now mix closer to DC or nyquist in the IF, causing additional inaccuracies or unexpected aliased waveforms.

Key Path

Press `Pulsgen` , `more 1 of 2` , `modify:` , `OFF` .

Related Programming Command

```
SWEep:FUZZy
```

OFF

Softkey that turns off the Table display.

Key Path

Press `Table` , `input:` , `OFF` .

OFF

Softkey that turns off all averaging and holding functions.

Key Path

Press `Traces` , `avg hld` , `OFF` .

Related Programming Command

```
ACQuire:TYPE
FUNCx:TYPE
CHANx:TYPE
```

offset X|Y

Softkey that shifts (transforms) the X or Y position of any mask or limit line. Press `offset X|Y` and turn the front-panel knob to position the graph.

Key Path

Press `Analyze` , `masks limits` , `define shapes` , `offset X|Y` .

Related Programming Command

```
LIMit:OFFSet:X
LIMit:OFFSet:Y
```

ON

Softkey that is part of the `split:` menu which is used to split the screen into separate windows. When selected, the `ON` softkey activates two windows regardless of the number of activated traces.

Key Path

Press `Config`, `split:`, `ON`.

See Also

split: in this chapter.

ON

Softkey that is generally used for either narrow band signals (such as a 1 GHz sine wave or a carrier with narrow band modulation) or for pulsed RF signals.

Key Path

Press `Main` (time mode), {more 1 of 2}}, `sweep options`, `translt`, `ON`.

See Also

translt in this chapter.

ON|OFF

Softkey that turns the table delta mode on and off.

Key Path

Press `Table`, `delta`, `ON|OFF`.

Related Programming Command

```
TABLe:DELTa
```

other

In Calibration menu, this softkey accesses a menu used to manipulate user correction data. This includes deleting, multiplying or dividing input data by user correction data, interpolation of magnitude and phase data between user correction frequencies with either linear or logarithmic frequency axis, and copying channel 1 user correction data to channel 2.

In the Analyze menu, this softkey provides more functions for manipulating histograms.

Key Path

Press `Calib` , `user corr` , `other` .

Press `Analyze` , `histogm` , `other` .

OVER-SHOOT

Softkey that automatically measures the overshoot of a trace.

The measurement is performed on the trace defined by the `Msr Trc:` softkey. The measurement updates the display as defined by the `update:` key.

Key Path

Press `Measure` , `more 1 of 3` , `more 2 of 3` , `OVER-SHOOT` .

Related Programming Command

```
MEASure:OVERshoot
```

PASSTHR ON|OFF

Softkey that is used when the RF synthesizer is located on the private HP-IB port of an HP 8510 network analyzer. This functions allows commands to "pass through" the network analyzer to the synthesizer.

See Also

HP-IB options in this chapter.

Key Path

Press `Config` , `RF source` , `HP-IB options` , `PASSTHR ON|OFF` .

PEAK

Softkey that defines the algorithm used to determine the top and base of a waveform as the peaks in a histogram of the waveform.

Key Path

Press `Measure` , `define` , `top-bas` , `PEAK` .

PERIOD

Softkey that automatically measures the period of a trace.

The measurement is performed on the trace defined by the `Msr Trc:` softkey. The measurement updates the display as defined by the `update:` softkey. Two rising or two falling edges are required for the measurement to be performed.

Key Path

Press `Measure`, `more 1 of 3`, `PERIOD`.

Related Programming Command

```
MEASure:PERiod
```

persist ON|OFF

Softkey that enables or disables display persistence.

With persistence `OFF`, each trace erases the previous trace. With persistence `ON`, previous traces are not erased. You can specify how many sweeps occur before the trace is erased and a new cycle begins. Persistence can range from 1 to infinite sweeps before the trace is erased. During infinite persistence, the trace is not erased until the persistence number is reduced, a measurement parameter is changed, or `RESTART ALL TRC` is pressed.

The persistence mode only works with an HP 70004A display.

Key Path

Press `Config`, `more 1 of 3`, `persist ON|OFF`.

Related Programming Command

```
DISPlay:PERSist
```

PHASE

Softkey that selects phase triggering on the selected signal.

With phase triggering, the microwave transition analyzer performs an FFT of the trace and triggers on a particular phase of the input signal. The phase is selected by the user. The default phase is zero degrees. Phase triggering is useful when looking at low level signals where signal to noise considerations make edge triggering impractical.

Related Programming Command

```
TRIGger:TYPE
```

Key Path

Press `Trigger`, `trg is:`, `PHASE`.

See Also

input: in this chapter.

phase:

Softkey that allows you to select between RADIAN and DEGREE marker phase readouts.

In RADIAN mode, the phase readout is in radians. In DEGREE mode, the phase readout is in degrees.

The line below the `phase:` softkey shows the current selection.

Key Path

Press `Markers`, `more 1 of 2`, `readout options`, `phase:`.

Related Programming Command

`MARKx:READout`

PHASE (pm)

Pressing this softkey displays the phase of the time domain signal.

PHASE Pressing the `PHASE` softkey displays the phase of the trace data.

The (pm) only appears for complex time domain signals.

Key Path

Press `Traces`, `format:`, `PHASE (pm)`.

Related Programming Command

`WAVeform:DOMain`

PHASE SLOPE

Softkey that is used to add phase slope to a trace.

This softkey is available when trace data is not time nor frequency (for example, TR1=5).

Key Path

Press `Scale`, `more 1 of 2`, `PHASE SLOPE`.

Related Programming Command

`WAVeform:PSLope`

pk DC ON|OFF

Select `Markers` then `mkr trk options` to access the `pk DC ON|OFF` softkey. `pk DC ON|OFF` determines whether the peak search and last routine functions ignore any peak at the first bucket.

When the `pk DC ON|OFF` key is set to `OFF`, the three peak search functions ignore any peaks at the first and last points of a frequency trace. These normally correspond to DC (0 Hz) and nyquist (Fs/2). If `pk DC ON|OFF` is set to ON, all peaks are used in the peak search.

Key Path

Press `Markers`, `mkr trk options`, `pk DC ON|OFF`.

Related Programming Command

`MARK:DCPeak`

pk intp ON|OFF

Softkey that turns the peak interpolation algorithm on and off.

When peak interpolation is `ON`, the interpolation algorithm is used for any peak search of a transformed frequency domain trace.

The interpolation algorithm removes the amplitude uncertainty caused by FFT windowing and greatly improves the frequency resolution.

Key Path

Press `Markers`, `more 1 of 2`, `mkr trk options`, `pk intp ON|OFF`.

Related Programming Command

`MARK:INTerpolate`

PK-PK

Softkey that automatically measures the peak to peak voltage of a trace.

The measurement is performed on the trace defined by the `Msr Trc:` softkey. The measurement updates the display as defined by the `update:` key.

Key Path

Press `Measure`, `more 1 of 3`, `more 2 of 3`, `PK-PK`.

Related Programming Command

`MEASure:VPP`

PK PWR (pulse)

Softkey that automatically measures the peak power of a trace.

The measurement is performed on the trace defined by the `Msr Trc:` softkey. The measurement updates the display as defined by the `update:` key.

Key Path

Press `Measure`, `more 1 of 3`, `more 2 of 3`, `PK PWR (pulse)`.

Related Programming Command

`MEASure:PPK`

pk trk ON|OFF

Softkey that causes a peak search to be performed after each sweep.

Key Path

Press `Markers` , `more 1 of 2` , `mkr trk options` , `pk trk ON|OFF` .

Related Programming Command

```
MARKx:AUTopeak
```

place trace

Softkey that accesses the `TRx TOP|BOT` softkeys used to position traces on the top or bottom screen.

Key Path

Press `Config` , `place trace` .

Related Programming Command

```
DISPlay:xxx:POSition
```

(PLOT)

The (PLOT) front-panel key (on the HP 70004A display) plots the display on a Hewlett-Packard plotter.

When pressed, (PLOT) sends vector plot data over HP-IB to the plotter specified in the (DISPLAY) menu. Press the (DISPLAY) front-panel key and then the Hard Copy and plotter address softkeys to change the default plotter address. Press the (MENU) front-panel key to return to the HP 71500 Series menus.

The plotter's default HP-IB address is set to address 5. The default plotter limits are those of the HP 7470A and HP 7475A plotters. These allow 0.5 inch margins on standard A-size paper (8.5 by 11 inches).

See Also

Chapter 3, "Hard Copy Menu," in the *HP 70004A Display Operation Manual*.

PM

Softkey that returns the phase demodulation of the data when selected as the detection mode for large trace mode.

Key Path

Press `Main` (time mode), `more 1 of 2` , `single shot` , `detect:` , `PM` .

Related Programming Command

```
SWEep:TIME:OVERsweep:DETect
```

polarty POS|NEG

Softkey that allows you to choose either positive or negative going pulses.

Key Path

Press `Pulsgen`, `polarty POS|NEG`.

Related Programming Command

```
MODulator:POLarity
```

POWER

Softkey that selects power sweeps and displays the measurement data as amplitude (vertical) versus power (horizontal).

The HP 71500 Series sends the appropriate commands via the system bus to step the RF source's power. The start power is displayed on the left side of the display and the stop power on the right. Power per division is displayed in the center of the horizontal axis.

Key Path

Press `Main`, `sweep:`, `POWER`.

Related Programming Command

```
SWEep:TYPE
```

preset: FAC|USR

The `preset FAC|USR` and `SAV USR PRESET` softkeys allow you to determine the instrument state whenever (INSTR PRESET) is pressed or power is cycled. Configure the instrument to the desired settings, and then save the state by pressing `SAV USR PRESET`. Then, use `preset FAC|USR` to determine whether the factory settings (FAC) or your settings (USR) will be selected when (INSTR PRESET) is pressed or power is cycled.

If (INSTR PRESET) is pressed while powering up, the factory preset will be used and the `preset FAC|USR` softkey is set to FAC.

Key Path

Press `States`, `more 1 of 2`, `preset: FAC|USR`.

Related Programming Command

```
SYSTem:PRESet:TYPE
```

PRINT

The PRINT front-panel key (on the HP 70004A display) prints the display on a Hewlett-Packard graphics printer.

When pressed, PRINT sends raster print data over HP-IB to the printer specified in the DISPLAY menu. Press the DISPLAY front-panel key and then the Hard Copy and printer address softkeys to change the default printer address. Press the MENU front-panel key to return to the HP 71500 Series menus. The printer's default HP-IB address is set to address 1.

Key Path

Press printer types by pressing the DISPLAY front-panel key and then the Hard Copy and printer config softkeys.

See Also

Chapter 3, "Hard Copy Menu," in the *HP 70004A Display Operation Manual*.

PREV PAGE

Softkey that views the previous page of catalog data if it is available.

Key Path

Press `States`, `more 1 of 2`, `mass storage`, `PREV PAGE`.

Related Programming Command

```
MMEMory:CATalog
```

preview ON|OFF

Softkey that allows previewing of remote programming commands. When this mode is turned on, and you press any softkey that has an equivalent command, the command is shown at the bottom of the display.

Key Path

Press `Config`, `more 1 of 2`, `preview ON|OFF`.

PRI|PRF

Softkey that allows you to set the PRI (pulse repetition interval) or the PRF (pulse repetition frequency) of the internal or external pulse generator.

The timing resolution for the PRI is 100 ns for the internal pulse generator.

Key Path

Press `Pulsgen`, `PRI|PRF`.

Related Programming Command

```
MODulator:FREQuency
MODulator:PERiod
```

pulse < | >90ns

Softkey that allows you to set the trigger search algorithm. To reliably trigger on the pulse widths less than 90 ns, set the switch to <90 ns. For wide pulse widths, set >90 ns to allow shorter trigger search time.

Key Path

Press `Trigger`, `more 1 of 2`, `pulse < | >90ns`.

Related Programming Command

```
TRIGger:WIDth
```

PULSED TIME

Softkey that sets up the microwave transition analyzer with a preset state for making pulsed measurements in the time domain.

Key Path

Press `States`, `more 1 of 2`, `PULSED TIME`.

See Also

"Predefined Measurement States" in Chapter 5 of this manual for information about the default settings for the various measurement states.

Pulsgen

Softkey that presents a menu for controlling the microwave transition analyzer's internal pulse generator and pulse operating mode. The pulse generator's modulation output is available at the rear-panel MOD OUT connector. The output frequency ranges from 153 Hz to 5 MHz and is TTL compatible into a 50 ohm load. Both the period and duty cycle can be set in 100 ns steps.

PULS RF

Softkey that selects pulse triggering on the selected signal.

Use pulse triggering to trigger on pulsed RF signals. The microwave transition analyzer triggers on the leading edge of the pulse envelope.

Key Path

Press `Trigger`, `trg is:`, `PULS RF`.

Related Programming Command

```
TRIGger:TYPE
```

See Also

input: in this chapter.

PURGE FILE

Softkey that erases the indicated file from the mass storage device.

Key Path

Press `States` , `more 1 of 2` , `mass storage` , `more` , `PURGE FILE` .

Related Programming Command

```
MMEMory:DELete
```

RADIAN

Softkey that sets the marker phase readout to radians.

Key Path

Press `Markers` , `more 1 of 2` , `readout options` , `phase:` , `RADIAN` .

See Also

phase: in this chapter.

RANGE|OFFSET

Softkey that allows you to set the maximum amplitude range and offset value for input signals or view values selected by the autorange procedure.

If you select a `RANGE` value of 200 mV, the maximum input amplitude at the input connector before signal clipping occurs is 200 mV. The amplitude per division scale automatically adjusts to show the selected range if hardware coupling is on. In this example, the amplitude per division will be 25 mV/div (200 mV/8).

With the `OFFSET` option selected, you can add an offset to change center of screen from the default value of 0.0 volts.

Key Path

Press `Scale` , `hardwre` , `RANGE|OFFSET` .

Related Programming Command

```
CHANx:OFFSet
CHANx:RANGe
```

See Also

COUP HW in this chapter.

readout options

Softkey that accesses a menu of marker readout options.

Key Path

Press `Markers`, `more 1 of 2`, `readout options`.

REAL (scope)

Softkey that displays the real portion of the transformed waveform. The (scope) portion of the softkey only appears for complex time domain signals.

Key Path

Press `Traces`, `format:`, `REAL (scope)`.

Related Programming Command

```
WAVeform:DOMain
```

recall state

Softkey that accesses the `RECALL STATEx` softkeys used to restore the state of the module from a copy stored in local nonvolatile memory.

Key Path

Press `States`, `recall state`.

Related Programming Command

```
*RCL
```

RECALL STATEx

Softkey that s are used to recall instrument state information.

Key Path

Press `States`, `recall state`, `RECALL STATEx`.

RefEdge POS|NEG

Softkey that defines the positive or negative edge on the reference trace to be used for delay measurements.

Key Path

Press `Measure`, `delay`, `RefEdge POS|NEG`.

Related Programming Command

```
MEASure:ESTOp
```

REF LEVEL

The REF LEVEL front-panel key allows you to set the reference level. Simply select REF LEVEL then enter the desired reference level value.

Pressing the REF LEVEL key automatically activates the `Scale` menu.

Related Programming Command

```
DISPlay:xxx:REFerence
```

REF LEV|POS

Softkey that allows you to position a displayed waveform vertically on the display.

REF LEV changes the value of the reference line. POS changes the location of the reference line.

Key Path

Press `Scale` , `REF LEV|POS` .

Related Programming Command

```
DISPlay:xxx:OFFSet
DISPlay:xxx:REFerence
```

RefTrc:

Softkey that accesses a menu used to change the default reference trace to any other displayed trace.

Key Path

Press `Measure` , `delay` , `RefTrc:` .

Related Programming Command

```
MEASure:REFerence
```

RESTART ALL TRC

Softkey that restarts all averaging and holding operations and resets persistence.

Key Path

Press `Traces` , `avg hld` , `RESTART ALL TRC` .

Related Programming Command

```
ACQuire:TYPE
CHANx:TYPE
FUNCx:TYPE
```

results

Softkey that displays a menu for displaying the results of the histogram.

Select either mean or standard deviation results. Results are displayed both graphically and numerically.

Key Path

Press `Analyze`, `histogm`, `other`, `results`.

Related Programming Command

```
HISTogram:MEAN
HISTogram:SIGMa
```

RETURN

Softkey that saves a new or edited trace equation. Also, it places the equation into the `input:` softkey menu.

Key Path

Press `Traces`, `input:`, `build eqn`, `RETURN`.

RE-ZOOM

Softkey that recomputes the zoom transform for the current measurement. `zoom ON|OFF` must be turned `ON` before using this function.

Key Path

Press `Traces`, `trnsfrm control`, `RE-ZOOM`.

Related Programming Command

```
SWEep:TIME:ZOOM:REZoom
```

RF corr ON|OFF

Softkey that enables and disables RF corrections. When ON, the RF corrections are applied based on the start and stop frequencies for the frequency domain trace (for time domain traces, this can be determined by performing an FFT). For example, if the start and stop frequencies are 5 GHz and 25 GHz, the RF corrections between 5 and 25 GHz are used.

Key Path

Press `Calib`, `RF corr ON|OFF`.

Related Programming Command

```
CALibrate:CORRect:RF
```

RF MOD

Softkey that indicates that when the pulse generator is on (INT or MANUAL), the instrument operates in its pulse modulation mode.

Key Path

Press `Pulsgen` , `use as:` , `RF MOD` .

RF out ON|OFF

Softkey that is only present in a source-configured system. This controls the state of the source output.

Key Path

Press `Main` , `RF out ON|OFF` .

Related Programming Command

```
SOURce:POWer:STATe
```

RF source

Softkey that accesses menus for configuring the HP 71500A with an external source.

The HP 71500 Series can be linked to an external RF source through an HP-IB or HP-MSIB bus.

Key Path

Press `Config` , `RF source` .

RF src:

Softkey that allows you to select an external RF source.

After selecting an external source, the microwave transition analyzer automatically outputs the correct HP-IB or HP-MSIB codes to search for the source. If the microwave transition analyzer cannot find the source at the specified address, the source type blinks below the `RF src:` softkey label. This usually indicates the address of the source is not correctly specified or a cable is disconnected. The line below the `RF src:` softkey shows the currently configured source.

Key Path

Press `Config` , `RF source` , `RF src:` .

See Also

HP-IB HP-MSIB in this chapter.

Related Programming Command

```
SOURce:CONFigure:TYPE
```

RF src FRQ|PWR

Softkey that allows you to change the step increment of the external RF source's frequency and power.

This softkey is only meaningful if the external source is in the bundled mode.

Key Path

Press `Config`, `more 1 of 3`, `stepkey incr`, `RF src FRQ|PWR`.

See Also

bundled ON|OFF in this chapter.

RF src PUL|CW

Softkey that is only present in a source-configured system. This softkey turns the source external pulse modulator state on and off.

Key Path

Press `Pulsgen`, `RF src PUL|CW`.

Related Programming Command

```
SOURce:PULSe:STATe
```

RISE TIME

Softkey that automatically measures the rise time of a pulse. The measurement is performed on the trace defined by the `Msr Trc:` softkey. The measurement updates the display as defined by the `update:` key.

Key Path

Press `Measure`, `more 1 of 3`, `more 2 of 3`, `RISE TIME`.

Related Programming Command

```
MEASure:RISE
```

RMS

Softkey that automatically measures the RMS voltage of a trace.

The measurement is performed on the trace defined by the `Msr Trc:` softkey. The measurement updates the display as defined by the `update:` key.

Key Path

Press `Measure`, `RMS`.

Related Programming Command

```
MEASure:VRMS
```

ROM VERSION

Softkey that displays the system display's ROM version.

A date code is displayed along with the ROM version number. The ROM date code is displayed in the following format: YYMMDD

YY refers to the last two digits of the year. MM refers to the month, and DD refers to the day of the month. For example, a date code of 900725 corresponds to July 25, 1990.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `system`, `ROM VERSION`.

Related Programming Command

```
*IDN?
*OPT?
```

SAMPLE

Softkey that uniformly spaces the data when selected as the detection mode for large trace mode.

Key Path

Press `Main` (time mode), `more 1 of 2`, `single shot`, `detect:`, `SAMPLE`.

Related Programming Command

```
SWEep:TIME:OVERsweep:DETect
```

SAMPLER FREQ

Softkey that changes the step increment or decrement of the sampler frequency.

This frequency may vary between 0.1 Hz to 10 MHz.

The sampler frequency is adjusted by turning `sglshot ON|OFF` to ON.

Key Path

Press `Config`, `more 1 of 3`, `stepkey incr`, `SAMPLER FREQ`.

SAV ALL RCL REG

Softkey that saves all state registers in a single file on the mass storage device. Use `LOAD FILE` to reinstall the state registers.

Key Path

Press `States`, `more 1 of 2`, `mass storage`, `save`, `save misc`, `SAV ALL RCL REG`.

SAV USR PRESET

The SAV USR PRESET and preset FAC|USR softkeys allow you to determine the instrument state whenever (INSTR PRESET) is pressed or power is cycled. Configure the instrument to the desired settings, and then save the state by pressing SAV USR PRESET. Then, use preset FAC|USR to determine whether the factory settings (FAC) or your settings (USR) will be selected when (INSTR PRESET) is pressed or power is cycled.

Key Path

Press States, more 1 of 2, SAV USR PRESET.

Related Programming Command

SYSTem:PRESet:SAVE

save

Softkey that presents a menu for saving state registers, user corrections, histograms, traces, limit lines, masks, channel calibrations, and user keys to a mass storage device.

Key Path

Press States, more 1 of 2, mass storage, save.

Related Programming Command

MMEMory:STORE:xxx

SAVE

Softkey that initiates the saving of a trace file to mass storage.

Key Path

Press States, more 1 of 2, mass storage, save, save trace, SAVE.

Related Programming Command

MMEMory:STORE:xxx

SAVE CHx CAL

Softkeys that save channel one or channel two calibration data to a mass storage device.

Key Path

Press States, more 1 of 2, mass storage, save, save misc, SAVE CHx CAL.

Related Programming Command

MMEMory:STORE:xxx

SAVE CUSTOM

Softkey that saves the currently defined custom synthesizer to the mass storage device.

Key Path

Press States, more 1 of 2, mass storage, save, save misc, SAVE CUSTOM.

Related Programming Command

```
MMEMory:STORE:xxx
```

SAVE HISTOGM

Softkey that saves histogram data to a mass storage device.

Key Path

Press States, more 1 of 2, mass storage, save, SAVE HISTOGM.

Related Programming Command

```
MMEMory:STORE:xxx
```

SAVE MSK LIM

Softkey that saves mask and limit line data to a mass storage device.

Key Path

Press States, mor 1 of 2, mass storage, save, save misc, SAVE MSK LIM.

Related Programming Command

```
MMEMory:STORE:xxx
```

save misc

Softkey that presents a menu for saving channel calibration data, user keys, or mask or limit line data to a mass storage device.

Key Path

Press States, more 1 of 2, mass storage, save, save misc.

Related Programming Command

```
MMEMory:STORE:xxx
```

SAVE STATE

Softkey that saves the instrument state in a file on the mass storage device.

Key Path

Press `States`, `more 1 of 2`, `mass storage`, `save`, `SAVE STATE`.

Related Programming Command

`*SAV`

save state

Softkey that accesses the `SAVE STATEx` softkeys used to store the current state of the module in local battery-backed memory.

Key Path

Press `States`, `save state`.

Related Programming Command

`SAV`

SAVE STATEx

Softkey that is used to store the current module state in local battery-backed memory.

Key Path

Press `States`, `save state`, `SAVE STATEx`.

Related Programming Command

`SAV`

save trace

Softkey that presents a menu for saving a trace in a file on the mass storage device.

Key Path

Press `States`, `more 1 of 2`, `mass storage`, `save`, `save trace`.

Related Programming Command

`MMEMory:STORE:xxx`

SAVE USR COR

Softkey that saves user corrections in a file on the mass storage device.

Key Path

Press States, more 1 of 2, mass storage, save, SAVE USR COR.

Related Programming Command

```
MMEMory:STORE:xxx
```

SAVE USR KEY

Softkey that saves user-defined keys in a file on the mass storage device.

Key Path

Press States, more 1 of 2, mass storage, save, save misc, SAVE USR KEY.

Related Programming Command

```
MMEMory:STORE:xxx
```

SCALAR NETWORK

Softkey that presets the instrument to a mode used for scalar network analysis.

Key Path

Press States, SCALAR NETWORK.

See Also

"Predefined Measurement States" in Chapter 5 of this manual for information about the default settings for the various measurement states.

(SCALE)

The (SCALE) front-panel key allows you to change the amplitude per division of the active trace shown on the display.

This function does not affect any hardware because the scaling is accomplished using digital processing of the trace data.

Pressing the (SCALE) key automatically activates the Scale menu.

Scale

This softkey selects the Scale menu.

The scale menu allows you to control the vertical display scale. You can scale the information on the display to suit the application. Each trace may be scaled independently.

SCALE

Softkey that allows you to change the amplitude per division of the active trace shown on the display.

This function does not affect any hardware because the scaling is accomplished using digital processing of the trace data.

Key Path

Press `Scale`, `SCALE`.

Related Programming Command

```
DISPlay:xxx:RANGe
```

scale track

Softkey that displays a menu used for controlling the autoscale functions.

Key Path

Press `Scale`, `scale track`.

scale X|Y

Softkey that scales the X or Y dimension of a mask or limit line. Press `scale X|Y` and turn the front-panel knob to scale the graph.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `scale X|Y`.

Related Programming Command

```
LIMit:SCALe:X
LIMit:SCALe:Y
```

SCL|VEC

Softkey that changes the markers to display either SCaLer (real, magnitude, or phase) or VECtor (complex or polar).

Key Path

Press `Markers`, `more 1 of 2`, `readout options`, `SCL|VEC`.

Related Programming Command

```
MARKx:FORmat
```

screen title

Softkey that places a title in the upper-left corner on the display. Use `title ON|OFF` to turn on or off the title display.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `labels`, `screen title`.

Related Programming Command

```
DISPlay:TITLe[:STRing]
```

SCROLL TABLE

Softkey that allows you to scroll through the signals displayed on a table.

Use the front-panel knob or up down arrow keys to scroll through the list.

Key Path

Press `Table`, `SCROLL TABLE`.

search ON|OFF

Softkey that determines whether or not to perform a standard slave search.

With the `search ON|OFF` softkey set to OFF, the HP 70820A retains the slave configuration defined when power was last turned off. The standard slave search is not performed (that is, a check for modules with row numbers greater than this module and column numbers greater than or equal to this module).

With the `search ON|OFF` softkey set to ON, the HP 70820A performs the standard slave search at power up. If a supported slave is found, it is acquired and used. Otherwise, no slave is acquired and the slave configuration defined when power was last turned off is discarded with one exception: if no supported slave is found in the slave search and the power down slave configuration included a slave (or slaves) on HP-IB, the HP-IB slave configuration is retained.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `system`, `search ON|OFF`.

Related Programming Command

```
CONFigure:SEARch
```

(SEC/DIV)

The (SEC/DIV) front-panel key changes the seconds per division on the horizontal axis.

Pressing the (SEC/DIV) key automatically activates the `Main` menu.

SEC/DIV

Softkey that changes the seconds per division on the horizontal axis.

This softkey is only displayed in the time sweep mode. You can also activate this function by pressing the front-panel SEC/DIV template key.

Key Path

Press `Main` (or `Calib`, `chan skew`), `SEC/DIV`.

Related Programming Command

```
SWEep:TIME:RANGe
```

SEC/DIV DELAY

Softkey that selects the softkeys displayed for controlling the horizontal scale in the time sweep mode.

Key Path

Press `Main` (time mode), `more 1 of 2`, `sweep labels`, `SEC/DIV DELAY`.

Related Programming Command

```
SWEep:TIME:CYCLes
```

See Also

SEC/DIV and *DELAY* in this chapter.

secure

Softkey that accesses a menu that allows blanking of display information and clearing of data stored in memory.

You can secure the screen, clear the memory, or clear the state registers.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`.

SECURE SCREEN

Softkey that blanks any horizontal axis information. The screen remains blanked until the instrument is preset.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `secure`, `SECURE SCREEN`.

Related Programming Command

```
SECure:SCReen
```

SELECT

In the Main or Table menus, this softkey selects a frequency from the signal list table for editing. This softkey only appears when the `ADD` softkey is used.

Key Path

Press `Main`, `more 1 of 2`, `signal list`, `SELECT`.

Press `Table`, `more 1 of 2`, `signal list`, `SELECT`.

SELECT

In the Analyze menu, this softkey selects the displayed mask or limit line. When editing masks and limit lines, this softkey can be used to select the segment for editing.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `SELECT`.

Press `Analyze`, `masks limits`, `define shapes`, `edit`, `SELECT`.

select:

Softkey that allows you to choose the active trace. The active trace may be either TR1, TR2, TR3, or TR4.

The line below the `select` softkey shows the currently active trace.

Key Path

Press `Scale`, `select:`.

Press `Traces`, `select:`.

Press `States`, `more 1 of 2`, `mass storage`, `save`, `save trace`, `select:`.

Related Programming Command

```
DISPlay:xxx
WAVeform:SOURce
```

SEL|EDT

Softkey that allows you to select (SEL) the line or value using the front-panel knob or step keys. In addition, the highlighted value can be edited (EDT) using the front-panel knob or step keys.

Key Path

Press `Calib`, `user corr`, `SEL|EDT`.

Related Programming Command

```
CALibrate:USER:DATA
```

SEL|EDT

Softkey that allows you to select (SEL) parameters to build a trace equation from the screen or edit (EDT) the currently displayed trace equation.

Key Path

Press `Traces`, `input:`, `build eqn`, `SEL|EDT`.

SELF-TEST

Softkey that executes an internal self test.

Key Path

Press `Calib`, `SELF-TEST`.

Related Programming Command

```
*TST?
```

set clock

Softkey that sets the microwave transition analyzer's clock.

This softkey displays a menu for changing the clock's hour, minute, month, day, and year values. The clock is located in the HP 70820A microwave transition analyzer module. This is *not* the display clock in the HP 70004A display. The clock in the HP 70820A is used with the HP 70205A or the HP 70206A display which do not have a clock display.

Key Path

Press `Config`, `more 1 of 3`, `clock`, `set clock`.

Related Programming Command

```
DATE
TIME
```

SET REF

Softkey that stores the current table data as the new reference data into memory for comparison during the table delta function.

This softkey also turns the delta function on.

Key Path

Press `Table`, `delta`, `SET REF`.

Related Programming Command

```
TABLe:SETRef
```

See Also

delta in this chapter.

sglshot ON|OFF

Softkey that turns on single shot mode of operation. When ON is selected, you can adjust the sample frequency.

The time axis is real time and not repetitive effective time. The time per point is greater than or equal to 50 ns.

Key Path

Press `Main` (time mode), `more 1 of 2`, `single shot`, `sglshot ON|OFF`.

Related Programming Command

```
SWEep:SINGle
SWEep:TIME:SRATe
```

sglside ON|OFF

When OFF, the transformed spectrum will be displayed as double sided from −Fm to +Fm.

Key Path

Press `Traces`, `trnsfrm control`, `sglside ON|OFF`.

Related Programming Command

```
WAVeform:PSPectrum
```

show

Softkey that presents a menu for displaying calibration data.

Key Path

Press `Calib`, `IF calib`, `cal debug`, `show`.

SHOW CAL

Softkey that shows a trace of calibration data on the display.

Key Path

Press `Calib`, `IF calib`, `cal debug`, `show`, `SHOW CAL`.

SHOW COR FFT

Softkey that shows a trace of FFT correction data.

Key Path

Press `Calib`, `IF calib`, `cal debug`, `show`, `SHOW COR FFT`.

SHOW COR FIR

Softkey that shows a trace of FIR correction data.

Key Path

Press `Calib`, `IF calib`, `cal debug`, `show`, `SHOW COR FIR`.

show MAG|PHA

Softkey that measurement parameters listed in the signal list table.

You can select MAG (magnitude) or PHA (phase) information. Both magnitude and phase information can be viewed simultaneously. The softkey is underlined indicating the selected parameters.

Key Path

Press `Table`, `more 1 of 2`, `show MAG|PHA`.

Related Programming Command

```
TABLe:AMPLitude
TABLe:PHASe
```

SHOW TIM|DAT

Softkey that turns the display of the clock on or off.

You can select to display either the time, date, or both the time and date. Each successive press of the softkey selects another mode. When no portion of the softkey is underlined, the clock will not be displayed.

Key Path

Press `Config`, `more 1 of 3`, `clock`, `SHOW TIM|DAT`.

Related Programming Command

```
DISPlay:TIME:STATe
DISPlay:DATE:STATe
```

signal FREQ

Softkey that allows you to define the input frequency. This softkey appears when there is not a source configured.

Key Path

Press `Main`, `signal FREQ`.

Related Programming Command

```
SWEep:SIGNal
```

signal list

Softkey that displays the list of signals identified by the `FIND SIGNALS` function. The softkeys shown allow the user to edit, add, delete, or select a particular signal for display.

Key Path

Press `Main`, `more 1 of 2`, `signal list`.

Press `Table`, `more 1 of 2`, `signal list`.

See Also

FIND SIGNALS in this chapter.

signals ONE|ALL

Softkey that determines if one or all signals present at the input are listed in the signal list table.

If three signals are present at the input with ALL selected, the table lists all three fundamentals and their harmonics. With ONE selected, only the currently selected signal (and its harmonics) is listed.

Key Path

Press `Table`, `more 1 of 2`, `signals ONE|ALL`.

Related Programming Command

```
TABLe:MEASure
```

sig trk ON|OFF

Softkey that activates signal tracking in the HP 71500A.

With signal tracking, the HP 71500 Series reacquires the RF input whenever a frequency drift is detected. This allows the HP 71500 Series to track drifts in the RF input signal and to keep the time scale and frequency as accurate as possible.

Key Path

Press `Main`, `more 1 of 2`, `sig trk ON|OFF`.

Press `Table`, `more 1 of 2`, `sig trk ON|OFF`.

Related Programming Command

`SWEep:STRack`

SINGLE

Softkey that updates the current measurement data once each time it is pressed.

Key Path

Press `Measure` , `update:` , `SINGLE` .

See Also

update: in this chapter.

SINGLE

Softkey that places the microwave transition analyzer into the single sweep mode.

In single sweep mode, sweeps are triggered by pressing this softkey.

Key Path

Press `Trigger` , `SINGLE` .

Related Programming Command

`SWEep:MODE`

SINGLE ACQUIRE

Softkey that starts a single histogram measurement.

After the microwave transition analyzer obtains the appropriate number of samples, it displays the histogram. (The `ON|OFF` softkey is automatically set to `ON` .)

Key Path

Press `Analyze` , `histogm` , `SINGLE ACQUIRE` .

Related Programming Command

`HISTogram:SINGle`

single shot

Softkey that displays a menu for controlling single-shot data acquisition.

Key Path

Press `Main` (time mode), `more 1 of 2` , `single shot` .

SINGLE SWEEP

This front-panel key places the HP 70820A microwave transition analyzer into single sweep mode.

In single sweep mode, sweeps are triggered by pressing this key.

Related Programming Command

```
SWEep:MODE
```

SINGLE UPDATE

Softkey that makes a single table update. Each time the softkey is pressed, the table is updated once.

Key Path

Press `Table`, `SINGLE UPDATE`.

Related Programming Command

```
TABLe:TYPE
```

slope LOG|LIN

Interpolation of magnitude and phase data between user correction frequencies can be done with either a linear or logarithmic frequency axis.

Key Path

Press `Calib`, `user corr`, `other`, `slope LOG|LIN`.

Related Programming Command

```
CALibrate:USER:DATA
```

SLOPE|FLAT

Interpolation of magnitude and phase data can be done between frequency points (SLOPE). Flat line (FLAT) is assumed until the next frequency.

Key Path

Press `Calib`, `user corr`, `SLOPE|FLAT`.

Related Programming Command

```
CALibrate:USER:DATA
```

slope POS|NEG

Softkey that specifies which edge of the signal the trigger occurs.

Triggering can be selected for the POS (positive) or NEG (negative) edge.

Key Path

Press `Trigger` (edge mode), `more 1 of 2`, `slope POS|NEG`.

Related Programming Command

```
TRIGger:QUALifier
```

smooth ON|OFF

Softkey that enables and disables the trace smoothing. The HP 71500 Series employs a median smoothing technique.

Smoothing width can be set when ON is selected:

1 - None

N - Where N is number of trace points used to compute the median.

Key Path

Press `Traces`, `avg hld`, `smooth ON|OFF`.

Related Programming Command

```
FUNCx:SMOoth:COUNt
FUNCx:SMOoth:STATe
```

source FREQ

Softkey that is used to set the frequency of the configured source during a power sweep.

Key Path

Press `Main`, `source FREQ`.

Related Programming Command

```
SOURce:FREQuency:CW
SOURce:POWer:LEVel
```

source FRQ|PWR

Softkey that alternates between controlling of the external source's frequency or power.

The active selection (RF frequency or power) is shown in inverse video. Use the HP 71500 Series's front-panel numeric keypad or front-panel knob to enter the desired frequency or power.

The `source FRQ|PWR` softkey is displayed only in the time sweep mode with an external RF source being controlled.

Key Path

Press `Main`, `source FRQ|PWR`.

Related Programming Command

```
SOURce:FREQuency:CW
SOURce:POWer:LEVel
```

source POWER

The `source POWER` softkey controls the power of the external RF source.

This softkey is displayed only in the frequency sweep mode with an external RF source being controlled by the HP 71500 Series.

Key Path

Press `Main` (frequency mode), `source POWER`.

SPAN

Time Sweep Mode The SPAN front-panel key is used in conjunction with the CENTER front-panel key to define the time span of the display's horizontal axis.

If you set the time span to 100 μs, the instrument automatically adjusts the time per division to 10 μs/div (100 μ/10).

Frequency Sweep Mode The SPAN front-panel key is used in conjunction with the CENTER front-panel key to define the frequency span of the display's horizontal axis.

If you set the frequency span to 10 GHz, the instrument automatically adjusts the frequency per division to 1 GHz/div (10 GHz/10).

Pressing the SPAN key automatically activates the `Main` menu.

Related Programming Command

```
SWEep:TIME:SPAN
SWEep:FREQuency:SPAN
SWEep:POWer:SPAN
```

split:

Softkey that splits the display into two separate windows. The line below the softkey shows the current mode.

When the `AUTO` softkey is selected, the display automatically splits when one or more traces, which are on, are positioned in each of the top and bottom screens as defined in `place trace`. In OFF mode, only one window is displayed on the screen. In ON mode, two trace windows are always displayed. The screen remains split regardless of the number of traces enabled.

When two windows are displayed, the upper window displays traces 1 and 3 while the lower window displays traces 2 and 4. This can be modified using `place trace`.

There are three choices for splitting the screen. These choices will appear whenever the `split:` key is pressed.

Key Path

Press `Config`, `split:`.

Related Programming Command

```
DISPlay:FORMat
```

See Also

place trace in this chapter.

square

Softkey that enters and displays a square mask.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `default shapes`, `square`.

Related Programming Command

```
LIMit:DEFault
```

See Also

default shapes in this chapter.

src cfg ON|OFF

Softkey that allows control disabling of the RF source.

When ON, the microwave transition analyzer controls the external RF source over the communication bus.

When OFF, the microwave transition analyzer is prevented from controlling the external source. This allows you to isolate the source without disconnecting the communication bus.

Key Path

Press `Config`, `RF source`, `src cfg ON|OFF`.

Related Programming Command

```
SOURce:COUPle
```

src rel ON|OFF

Softkey that automatically adjusts trigger level when the source power is changed.

This function maintains a reliable trigger level regardless of the adjustment of the source power. If the trigger level were at the 50% level of the source power and the source was increased or decreased, the trigger level would automatically adjust itself to remain at the 50% level.

Key Path

Press `Trigger`, `more 1 of 2`, `src rel ON|OFF`.

Related Programming Command

```
TRIGger:RELative:STATe
```

STAND-ALONE

Softkey that selects the internal pulse generator as a stand-alone pulse generator.

Although the microwave transition analyzer controls all pulse generator settings, the modulator's settings will not be coupled into the instrument's measurements.

Key Path

Press `Pulsgen` , `use as:` , `STAND-ALONE` .

START

The START front-panel key is used to define the start power in the power sweep mode, the start frequency in the frequency sweep mode, and the start time in time sweep mode.

Pressing the START key automatically activates the `Main` menu.

Related Programming Command

```
SWEep:FREQuency:STARt
SWEep:POWer:STArt
```

START

Softkey that defines the start power in the power sweep mode, the start frequency in the frequency sweep mode, and the start time in the time sweep mode if `START/STOP` in the `sweep labels` menu is selected.

Key Path

Press `Main` (time, frequency, or power modes), `START` .

Related Programming Command

```
SWEep:FREQuency:STARt
SWEep:POWer:STArt
```

START STOP

Softkey that is used to enable the start and stop controls in the `Main` menu.

Key Path

Press `Main` (time or frequency mode), `sweep labels` , `START STOP` .

See Also

STOP in this chapter.

START STOP

Softkey that adjusts the start and stop frequency for the zoom transform.

Key Path

Press `Traces`, `trnsfrm control`, `START STOP`.

Related Programming Command

```
SWEep:TIME:ZOOM:STARt
CHANx:ZOOM:STARt
FUNCx:ZOOM:STARt
SWEep:TIME:ZOOM:STOP
FUNCx:ZOOM:STOP
SWEep:TIME:ZOOM:STOP
```

States

Softkey that is used to select pre-defined instrument states. These instrument states include frequency and power, vector voltage, vector network, scalar network, time and FFT, and pulsed time.

In addition, this softkey is used to save and recall states.

status ON|OFF

Softkey that displays the current status of the system.

If status is ON, the current state is displayed in the upper-right corner of the screen. The information includes type of sweep (time, frequency, or power), triggering, and sampling mode.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `status ON|OFF`.

Related Programming Command

```
DISPlay:STATus:STATe
```

STD DEV

Softkey that is used to display two line markers showing the mean plus standard deviation and mean minus standard deviation.

Key Path

Press `Analyze`, `histogm`, `other`, `results`, `STD DEV`.

Related Programming Command

```
HISTogram:SIGMa
```

stepkey incr

Softkey that determines frequency or power step sizes when changing parameters with the front-panel knob or step keys.

Key Path

Press `Config`, `more 1 of 3`, `stepkey incr`.

(STOP)

The (STOP) front-panel key defines the stop time in the time sweep mode, the stop frequency in the frequency sweep mode, and the stop power in power sweep modes.

Pressing the (STOP) key automatically activates the `Main` menu.

Related Programming Command

```
SWEep:POWer:STOP
SWEep:FREQuency:STOP
```

STOP

Softkey that defines the stop time in the time sweep mode, the stop frequency in the frequency sweep mode, and the stop power in power sweep modes.

Key Path

Press `Main`, `STOP`.

Related Programming Command

```
SWEep:POWer:STOP
SWEep:FREQuency:STOP
```

STOP ACQUIRE

Softkey that stops the histogram analysis when in continuous histogram mode.

Key Path

Press `Analyze`, `histogm`, `CONT ACQUIRE`, `STOP ACQUIRE`.

Related Programming Command

```
HISTogram:STOP
```

See Also

CONT ACQUIRE in this chapter.

store trace

Softkey that stores trace data to one of four memory registers: MEM1, MEM2, MEM3, and MEM4, or to user corrections.

Using the `input:` softkey, you can display the data stored in any of these memory registers.

Key Path

Press `Traces` , `store trace` .

Related Programming Command

```
STORe
```

sweep:

Softkey that defines the type of horizontal sweep.

Three types of sweep are available: time, frequency, and power. The default type of sweep upon (IP) is time.

Time Sweep

Pressing the `TIME` softkey selects time sweeps with measurement data displayed as amplitude (vertical) versus time (horizontal).

Frequency Sweep

Pressing the `FREQUENCY` softkey selects frequency sweeps with measurement data displayed as amplitude (vertical) versus frequency (horizontal). The HP 71500 Series sends the appropriate commands via the system bus to step the RF source's frequency. The start frequency is displayed on the left side of the display and the stop frequency on the right. The frequency per division is shown at the center of the horizontal scale.

Power Sweep

Pressing the `POWER` softkey selects power sweeps with measurement data displayed as amplitude (vertical) versus power (horizontal). The HP 71500 Series sends the appropriate commands via the system bus to step the RF source's power. The start power is displayed on the left side of the display and the stop power on the right. Power per division is displayed in the center of the horizontal axis.

Key Path

Press `Main` , `sweep:` .

Related Programming Command

```
SWEep:TYPE
```

sweep labels

Softkey that selects the softkeys for controlling the horizontal-scale. These softkeys appear on page one of the sweep menu. This selection allows you to customize your control over the time or frequency sweeps. Choices for the softkeys are listed below:

Time Sweep Mode
- the SEC/DIV softkey and the DELAY softkey
- the CENTER softkey and the SPAN softkey
- the START softkey and the STOP softkey
- the # CYCLE softkey and the DELAY softkey

Frequency Sweep Mode
- the START softkey and the STOP softkey
- the CENTER softkey and the SPAN softkey

The `sweep labels` softkey is displayed only in the time and frequency sweep modes.

Key Path

Press `Main`, `more 1 of 2`, `sweep labels`.

sweep options

Softkey that allows you to select portions of pulsed RF signals for display, or to define an equation for frequency and power sweeps.

Key Path

Press `Main`, `more 1 of 2`, `sweep options`.

SYNTH

Softkey that selects the frequency of the external synthesizer for modification.

In some measurements, it may be necessary to change one of the following measurement parameters: trace length, time range, or synthesizer frequency.

Key Path

Press `Pulsgen`, `more 1 of 2`, `modify`, `SYNTH`.

Related Programming Command

`SWEep:FUZZy`

system

Softkey that presents a menu system level functions. These include information on the firmware ROM version and the 10 MHz frequency reference selected upon instrument preset. It also includes control on HP-MSIB address map searches when the instrument is powered on.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `system`.

Table

Softkey that displays a menu for listing input signals and their harmonics.

The table is turned off by default. Table data can be generated from channel one, channel two, or a comparison of channels one and two. In the default mode, the table lists the power and phase of all input signals. The fundamental signal's amplitude is listed in dBm with a phase of 0.0 degrees. Harmonics of this signal are displayed relative to the fundamental.

Related Programming Command

```
FMEAsure:CLEAr
FMEAsure:GRAPh
```

test ON|OFF

Softkey that turns limit-line or mask testing on and off.

Key Path

Press `Analyze`, `masks limits`, `test ON|OFF`.

Related Programming Command

```
LIMit:TEST
```

thrshld Msr|Ref

Softkey that defines the amplitude value used for detecting an edge for delay measurements.

Key Path

Press `Measure`, `delay`, `thrshld Msr|Ref`.

Related Programming Command

```
MEASure:VSTOp
```

tim bit 32|16

Softkey that controls the number of bits used in processing time traces. The formats are integer and can be either 16 or 32 bits wide.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `measure config`, `tim bit 32|16`.

Related Programming Command

```
ACQuire:FORMat
```

TIME

Softkey that selects time sweeps and displays the measurement data as amplitude (vertical) versus time (horizontal).

Key Path

Press `Main`, `Sweep:`, `TIME`.

Related Programming Command

```
SWEep:TYPE
```

TIME and FFT

Softkey that presets the state to show both time and frequency domain traces.

Key Path

Press `States`, `more 1 of 2`, `TIME and FFT`.

See Also

"Predefined Measurement States" in Chapter 5 of this manual for information about the default settings for the various measurement states.

TIME DELAY

Softkey that appears for frequency traces. This softkey flattens out the phase trace by adding electrical delay to the data (flatten phase over the entire trace) at the marker position or between the two markers depending on whether marker 1 or 2 is on the trace.

The `TIME DELAY` softkey only appears in the frequency sweep mode.

Key Path

Press `Scale`, `TIME DELAY`.

Related Programming Command

```
WAVeform:DELay
```

TIME/DIV

Softkey that selects the time per division from modification. In some measurements, it may be necessary to change one of the following measurement parameters: trace length, time range, or synthesizer frequency.

Key Path

Press `Pulsgen`, `more 1 of 2`, `modify:`, `TIME/DIV`.

Related Programming Command

```
SWEep:FUZZy
```

title ON|OFF

Softkey that turns on or off the display of a title in the upper-left corner of the screen. Use `screen title` to enter the title.

Key Path

Press `Config`, `more 1 of 3`, `more 2 of 3`, `labels`, `title ON|OFF`.

Related Programming Command

```
DISPlay:TITLi:STATe
```

to CENTER

Softkey that adjusts the sweep parameters to move the current marker X position to the center of the horizontal screen.

Use this function in conjunction with a peak search to center a signal on the display.

Key Path

Press `Markers`, `mkr->`, `to CENTER`.

Related Programming Command

```
MARKx:CENTer
```

See Also

mkr-> in this chapter.

to MEMx

Softkey that allows the user to store the trace data in any of the four trace memory registers.

Key Path

Press `Traces`, `store trace`, `to MEMx`.

Related Programming Command

```
STORe
```

top-bas

Softkey that defines the algorithm used to determine the top and base.

Key Path

Press `Measure`, `define`, `top-bas`.

Related Programming Command

```
MEASure:ALGorithm
```

to REF LEV

Softkey that changes the trace reference value to the marker value. This moves the marker and trace to the reference level position.

Key Path

Press `Markers` , `mkr->` , `to REF LEV` .

Related Programming Command

```
MARKx:REFerence
```

See Also

mkr-> in this chapter.

to user correct

Softkey that stores trace data in the user-correction memory register. This trace data is the user correction data.

Key Path

Press `Traces` , `store trace` , `to user correct` .

TR1, TR2, TR3, TR4

Softkeys used in several menus to indicate one of four traces: TR1, TR2, TR3, or TR4.

trace:

Softkey that accesses softkeys that select the trace or channel data for histogram analysis.

Histogram analysis can be performed on any of four traces. Only one trace at a time may be analyzed.

Key Path

Press `Analyze` , `histogm` , `trace:` .

Related Programming Command

```
HISTogram:SOURce
```

trace:

Softkey that accesses softkeys that select the trace or channel data for masks or limit-lines.

Mask or limit-line testing can be performed on any of four traces. Only one trace at a time may be analyzed.

Key Path

Press `Analyze` , `masks limits` , `trace:` .

Related Programming Command

`LIMit:SOURce`

TRACE POINTS

Softkey that allows you to verify or set the number of measurement points in a trace.

The default number of trace points is 512. The maximum number of trace points is 1024. As the number of trace points is reduced, the measurement resolution between points is also reduced. As a general rule, the smaller the number of trace points, the greater the measurement speed. This is especially true of frequency and power sweeps.

Key Path

Press `Config`, `TRACE POINTS`.

Related Programming Command

`ACQuire:COUNt`

TRACE 1 2 3 4

The TRACE 1 2 3 4 front-panel keys activate traces for manipulation by other menus.

The HP 71500 Series uses four traces: TR1, TR2, TR3, and TR4. These trace labels show on the bottom of the display when active. Each trace may be uniquely defined.

Pressing the TRACE keys automatically activates the `Trace` menu.

Related Programming Command

`WAVeform:PREamble`

Traces

Softkey that displays a menu for displaying and activating traces for manipulation by other menus.

The HP 71500 Series uses four traces: TR1, TR2, TR3, and TR4. These trace labels show on the bottom of the display when active. Each trace may be uniquely defined.

translt

Softkey that controls labeling of the frequency axis as either a baseband (DC -> Fspan) spectrum or a translated spectrum (Fspan around Fcenter). The options are OFF, ON, and AUTO.

The `translt` softkey is displayed only in the time sweep mode.

Key Path

Press `Main` (time mode), `more 1 of 2`, `sweep options`, `translt`.

Related Programming Command

`SWEep:TIME:TRANslate`

TRC PTS

Softkey that selects the trace points for modification.

In some measurements, it may be necessary to change one of the following measurement parameters: trace points, time range, or synthesizer frequency.

Related Programming Command

```
SWEep:FUZZy
SWEep:TIME:SRATe
```

Key Path

Press `Pulsgen`, `more 1 of 2`, `modify:`, `TRC PTS`.

trg is:

Softkey that selects the type of triggering: freerun, edge, phase, or pulse.

Each triggering selection changes the softkeys menu. The line below the softkey shows the current trigger type.

Key Path

Press `Trigger`, `trg is:`.

Related Programming Command

```
TRIGger:TYPE
```

triang

Softkey that enters and displays a triangle mask.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `default shapes`, `triang`.

Related Programming Command

```
LIMit:DEFault
```

See Also

default shapes in this chapter.

Trigger

Softkey that activates the trigger menu for controlling the instrument sweep.

trnsfrm control

Softkey that controls the zoom transform operation if available.

Key Path

Press `Traces`, `trnsfrm control`.

TRx TOP|BOT

Softkey that positions traces on either the top or bottom screen of a split screen display.

Key Path

Press `Config`, `place trace`, `TRx TOP|BOT`.

See Also

place trace and *split:* in this chapter.

type:

Softkey that selects whether test limits are defined as a mask, an upper limit, or a lower limit.

Key Path

Press `Analyze`, `masks limits`, `define shapes`, `type:`.

Related Programming Command

```
LIMit:TYPE
```

UNIFORM

Softkey that is used when transforming a time domain trace to the frequency domain with `format:` and `xfrm to FRQ|OFF` softkeys located in the `Traces` menu.

Key Path

Press `Config`, `more 1 of 3`, `windows`, `format:`, `UNIFORM`.

UNIFORM

Softkey that is used when transforming a time domain trace to the frequency domain with `format:` and `xfrm to FRQ|OFF` softkeys located in the `Traces` menu.

Key Path

Press `Config`, `more 1 of 3`, `windows`, `math:`, `UNIFORM`.

update:

Softkey that allows you to modify when measurements update.

Selections for measurement update include the following: OFF, SINGLE, CONT, and AVERAGE. OFF turns off measurement update. SINGLE updates the current measurement data once each time it is pressed. CONTINUOUS updates the measurement on each sweep. AVERAGE updates a running average of the measurement values on each sweep. The averaging count is set by MEASURE AVERAGE. The line below the softkey shows the current update type.

Key Path

Press `Measure` , `update:` .

Related Programming Command

```
MEASure:TYPE
```

See Also

MEASURE AVERAGE in this chapter.

UPPER LIMIT

Softkey that turns on a line marker that can be positioned with keyboard or front-panel knob. It will be either on the X or Y axis depending on whether horizontal or vertical histograms are selected. Also, it can be used to set the upper bound for histogram calculations, including mean and standard deviation.

After acquiring histogram data on a trace, the display may show several places that satisfy the bounds of window markers 1 and 2. Use the `UPPER LIMIT` and `LOWER LIMIT` softkeys to determine the portion of the histogram results data that will be used for calculating the mean and standard deviation values.

Lower and upper limit bounds are not used until the `LIMIT → 0%-100%` softkey in the `histogm` menu is activated.

Key Path

Press `Analyze` , `histogm` , `other` , `UPPER LIMIT` .

Related Programming Command

```
HISTogram:PUL?
HISTogram:ULIMit
```

UPPER LIMIT

Softkey that specifies the displayed lines act as upper testing limits.

Key Path

Press `Analyze` , `masks limits` , `define shapes` , `type` , `UPPER LIMIT` .

Related Programming Command

```
LIMit:TYPE
```

UPPER THRSHLD

Softkey that defines the amplitude level that determines an edge for the automatic measurement functions, when the `USR|STD` softkey is set to user mode.

Key Path

Press `Measure`, `define`, `UPPER THRSHLD`.

Related Programming Command

```
MEASure:UPPer
```

use as:

Softkey that determines the function of the internal or external pulse generator and the pulse operating mode of the HP 70820A.

Key Path

Press `Pulsgen`, `use as:`.

Related Programming Command

```
MODulator:COUPle
```

user corr

Softkey that accesses menus used to create user correction data for CH1 and CH2.

Key Path

Press `Calib`, `user corr`.

use SRQ ON|OFF

Softkey used when the RF synthesizer is shared between the microwave transition analyzer and an HP 8510 network analyzer. Because SRQ is not passed from the synthesizer through the HP 8510, set the `use SRQ ON|OFF` softkey to `OFF`.

See Also

HP-IB options in this chapter.

Key Path

Press `Config`, `RF source`, `HP-IB options`, `use SRQ ON|OFF`.

Related Programming Command

```
SOURce:CONFigure:HANDshake
```

US|EURO

Softkey that changes the format of the displayed clock.

Key Path

Press `Config`, `more 1 of 3`, `clock`, `US|EURO`.

Related Programming Command

```
DISPlay:DATE:FORMat
```

usr cor ON|OFF

Softkey that turns the user corrections for the currently selected channel on or off.

Key Path

Press `Calib`, `user corr`, `usr cor ON|OFF`.

Related Programming Command

```
CALibrate:USER:STATe
```

USR|STD

Softkey that changes the definition of an edge for the automatic measurement routines. The STD is 10% to 90%. The USR is defined by `UPPER THRSHLD` and `LOWER THRSHLD`.

Key Path

Press `Measure`, `define`, `USR|STD`.

Related Programming Command

```
MEASure:MODE
```

VEC|FMT

Softkey that selects the type of trace data to be stored.

Vector data (VEC) is the actual complex trace data. This trace data has not been formatted. Formatted data (FMT) is data which has been converted to magnitude, log magnitude, phase, or real only data.

Key Path

Press `Traces`, `STORE TRACE`, `VEC|FMT`.

Press `States`, `more 1 of 2`, `mass storage`, `save`, `save trace`, `VEC|FMT`.

Related Programming Command

```
STORe
```

VECTOR AVERAGE

Softkey that turns averaging on for vector data.

Key Path

Press `Traces` , `avg hld` , `VECTOR AVERAGE` .

Related Programming Command

```
ACQuire:TYPE
ACQuire:COUNt
CHANx:TYPE
CHANx:COUNt
FUNCx:TYPE
FUNCx:COUNt
WAVeform:TYPE
```

VECTOR NETWORK

Softkey that configures the instrument for performing vector network analysis.

Key Path

Press `States` , `VECTOR NETWORK` .

See Also

"Predefined Measurement States" in Chapter 5 of this manual for information about the default settings for the various measurement states.

VECTOR VOLTAGE

Softkey that configures the instrument for vector voltmeter type operation.

Key Path

Press `States` , `VECTOR VOLTAGE` .

See Also

"Predefined Measurement States" in Chapter 5 of this manual for information about the default settings for the various measurement states.

VERTICL HISTOGM

Softkey that sets the histogram type to vertical.

The histogram is generated along the display's vertical axis. It shows the horizontal distribution of all data samples having values between the two vertical window markers.

Key Path

Press `Analyze` , `histogm` , `histog:` , `VERTICL HISTOGM` .

+WIDTH

Softkey that automatically measures the pulse width of a trace.

The measurement is performed on the trace defined by the `Msr Trc:`. The measurement updates the display as defined by the `update:` key.

Key Path

Press `Measure`, `more 1 of 3`, `+WIDTH`.

Related Programming Command

```
MEASure:PWIDth
```

−WIDTH

Softkey that automatically measures the negative pulse width of a trace.

The measurement is performed on the trace defined by the `Msr Trc:`. The measurement updates the display as defined by the `update:` key.

Key Path

Press `Measure`, `more 1 of 3`, `−WIDTH`.

Related Programming Command

```
MEASure:NWIDth
```

WIDTH|DUT CYC

Softkey that selects the internal pulse modulator's WIDTH (pulse width) or DUT CYC (duty cycle) for changing.

Key Path

Press `Pulsgen`, `WIDTH|DUT CYC`.

Related Programming Command

```
MODulator:DUTY
MODulator:WIDth
```

windows

Softkey that selects the type of window used by the transform to frequency format and by the math transforms.

Key Path

Press `Config`, `more 1 of 3`, `windows`.

Related Programming Command

```
WINDow:MATH
WINDow:TYPE
WINDow:USER
```

WINDOW MARKER1

Softkey that displays two marker lines for defining sample data limits.

The two displayed markers are window marker 1 and window marker 2. The screen displays horizontal markers for horizontal histograms and vertical markers for vertical histograms. Valid histogram data samples fall between these two markers.

With window marker 1 activated, adjust the position of the lower horizontal marker (or left vertical marker for vertical histograms) using the front-panel knob or keys. To move window marker 2, press `histogm`, `WINDOW MARKER2`.

Key Path

Press `Analyze`, `histogm`, `other`, `WINDOW MARKER1`.

Related Programming Command

```
HISTogram:WINDow
```

WINDOW MARKER2

Softkey that displays two marker lines for defining sample data limits.

The two displayed markers are window marker 1 and window marker 2. The screen displays horizontal markers for horizontal histograms and vertical markers for vertical histograms. Valid histogram data samples fall between these two markers.

With window marker 2 activated, adjust the position of the upper horizontal marker (or right vertical marker for vertical histograms) using the front-panel knob or keys. To move window marker 1, press `histogm`, `WINDOW MARKER1`.

Key Path

Press `Analyze`, `histogm`, `other`, `WINDOW MARKER2`.

Related Programming Command

```
HISTogram:WINDow
```

xfrm ON|OFF

Softkey that turns the inverse FFT on or off, depending on the data type.

Key Path

Press `Traces`, `format:`, `xfrm ON|OFF`.

xfrm to FRQ|OFF

Softkey that transforms the time domain signal into the frequency domain, depending on the data type.

Key Path

Press `Traces`, `format:`, `xfrm to FRQ|OFF`.

Related Programming Command

```
WAVeform:DOMain
WAVeform:FINCrement
WINDow:TYPE
WINDow:USER
```

xfrm to TIM|OFF

Softkey that transforms the frequency domain signal into the time domain, depending on the data type.

Key Path

Press `Traces`, `format:`, `xfrm to TIM|OFF`.

YEAR

Softkey that is used to set the year value of the HP 70820A's system clock.

Key Path

Press `Config`, `more 1 of 3`, `clock`, `set clock`, `YEAR`.

See Also

set clock in this chapter.

zoom ON|OFF

Softkey that turns on the zoom transform that collects longer trace lengths in order to provide a narrower frequency resolution (improvement factor of up to 250). Small spans will slow down the update rate.

Key Path

Press `Traces`, `trnsfrm control`, `zoom ON|OFF`.

Related Programming Command

```
CHANx:ZOOM:STATe
FUNCx:ZOOM:STATe
SWEep:TIME:ZOOM:STATe
```

4

Error Messages

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

Program Command Errors (−100 to −199)

The microwave transition analyzer reports −1XX errors when it cannot decipher a remote programming message.

−100

`command error`

This is the generic syntax error for devices that cannot detect more specific errors. This code indicates only that a "command error" as defined in IEEE 488.2 (11.5.1.1.4) has occurred.

−101

`invalid char`

A syntactic element contains a character which is invalid for that type; for example, a header containing an ampersand, SETUP&. This error might be used in place of errors −114, −121, −141, and perhaps some others.

−102

`syntax error`

An unrecognized command or data type was encountered; for example, a string was received when the device does not accept strings.

−103

`invalid separator`

The parser was expecting a separator and encountered an illegal character; for example, the semicolon was omitted after a program message unit, `*EMC 1:CH1:VOLTS 5`.

−104

`data type error`

The parser recognized a data element different than one allowed; for example, numeric or string data was expected but block data was encountered.

−105

`GET not allowed`

A Group Execute Trigger was received within a program message (see IEEE 488.2, 7.7)

–108

`parameter not allowed`

More parameters were received than expected for the header; for example, the *EMC common command only accepts one parameter, so receiving `*EMC 0,1` is not allowed.

–109

`missing parameter`

Fewer parameters were received than required for the header; for example, the *EMC common command requires one parameter, so receiving `*EMC` is not allowed.

–110

`command header`

An error was detected in the header. This error message should be used when the device cannot detect the more specific errors described for errors –111 through –119.

–111

`header separator`

A character which is not a legal header separator was encountered while parsing the header; for example, no white space followed the header, thus *GMC"MACRO" is an error.

–112

`program mnemonic too long`

The header contains more than twelve characters (see IEEE 488.2, 7.6.1.4.1).

–113

`undefined header`

The header is syntactically correct, but it is undefined for this specific device; for example, *XYZ is not defined for any device.

–120

`numeric data error`

This error, as well as errors –121 through –129, are generated when parsing a data element which appears to be numeric, including the nondecimal numeric types. This particular error message should be used if the device cannot detect a more specific error.

−121

`invalid char in number`

An invalid character for the data type being parsed was encountered; for example, an alpha in a decimal numeric or a “9” in octal data.

−123

`numeric overflow`

The magnitude of the exponent was larger than 32000 (see IEEE 488.2, 7.7.2.4.1).

−124

`too many digits`

The mantissa of a decimal numeric data element contained more than 255 digits excluding leading zeros (see IEEE 488.2, 7.7.2.4.1).

−128

`numeric data not allowed`

A legal numeric data element was received, but the device does not accept one in this position for the header.

−130

`suffix error`

This error, as well as errors −131 through −139, are generated when parsing a suffix. This particular error message should be used if the device cannot detect a more specific error.

−131

`invalid suffix`

The suffix does not follow the syntax described in IEEE 488.2 (7.7.3.2) or the suffix is in appropriate for this device.

−134

`suffix too long`

The suffix contains more than 12 characters. See IEEE 488.2, 7.7.3.4.

−138

`suffix not allowed`

A suffix was encountered after a numeric element which does not allow suffixes.

–140

`char data error`

This error, as well as errors –141 through –149, are generated when parsing a character data element. This particular error message should be used if the device cannot detect a more specific error.

–141

`invalid char data`

Either the character data element contains an invalid character of the particular element received is not valid for the header.

–144

`char data too long`

The character data element contains more than 12 characters. See IEEE 488.2, 7.7.1.4.

–148

`char data not allowed`

A legal character data element was encountered where prohibited by the device.

–150

`string data error`

This error, as well as errors –151 through –159, are generated when parsing a string data element. This particular error message should be used if the device cannot detect a more specific error.

–151

`invalid string data`

A string data element was expected, but was invalid for some reason (see IEEE 488.2, 7.7.5.2); for example, an END message was received before the terminal quote character.

–158

`string data not allowed`

A string data element was encountered but was not allowed by the device at this point in parsing.

−160

`block data error`

This error, as well as errors −161 through −169, are generated when parsing a block data element. This particular error message should be used if the device cannot detect a more specific error.

−161

`invalid block data`

A block data element was expected, but was invalid for some reason (see IEEE 488.2, 7.7.6.2); for example, an END message was received before the length was satisfied.

−168

`block data not allowed`

A legal block data element was encountered but was not allowed by the device at this point in parsing.

−170

`expression error`

This error, as well as errors −171 through −179, are generated when parsing an expression data element. This particular error message should be used if the device cannot detect a more specific error.

−171

`invalid expression`

The expression data element was invalid (see IEEE 488.2, 7.7.7.2); for example, unmatched parentheses or an illegal character.

−174

`expression too long/complex`

The expression data element contains too many characters or involves too many operations.

−178

`expression data not allowed`

A legal expression data was encountered but was not allowed by the device at this point in parsing.

–180

`macro error`

This error, as well as errors –181 through –189, are generated when defining a macro or executing a macro. This particular error message should be used if the device cannot detect a more specific error.

–181

`invalid outside macro`

Indicates that a macro parameter placeholder ($<number) was encountered outside of a macro definition.

–183

`invalid inside macro`

Indicates that the program message unit sequence, sent with *DDT or *DMC command, is syntactically invalid. See IEEE 488.2, 10.7.6.3.

–184

`macro parameter error`

Indicates that a command inside the macro definition had the wrong number or type of parameters.

Program Performance Errors (−200 to −299)

The microwave transition analyzer reports −2XX errors when it is unable to perform a valid programming command.

−200

`execution error`

This is the generic syntax error for devices that cannot detect more specific errors. This code indicates only that an Execution Error as defined in IEEE 488.2, 11.5.1.1.5 has occurred.

−201

`remote only`

Indicates that a command is not executable while the device is in local due to a hard local control (see IEEE 488.2, 5.6.1.5); for example, a device with a rotary switch receives a message which would change the switches state, but the device is in local so the message cannot be executed.

−202

`settings lost`

Indicates that a setting associated with a hard local control (see IEEE 488.2, 5.6.1.5) was lost when the device changed to LOCS from REMS or to LWLS from RWLS.

−210

`trigger error`

−211

`trigger ignored`

Indicates that a GET, *TRG, or triggering signal was received and recognized by the device but was ignored because of device timing considerations; for example, the device was not ready to respond.

Note A DT0 device always ignores GET and treats *TRG as a command error.

−220

`parameter error`

Indicates that a program data element related error occurred. This error message should be used when the device cannot detect the more specific errors described for errors −221 through −229.

–221

`settings conflict`

Indicates that a legal program data element was parsed but could not be executed due to the current device state. See IEEE 488.2, 6.4.5.3 and 11.5.1.1.5.

–222

`data out of range`

Indicates that a legal program data element was parsed but could not be executed because the interpreted value was outside the legal range as defined by the device. See IEEE 488.2, 11.5.1.1.5.

–223

`too much data`

Indicates that a legal program data element of block, expression, or string type was received that contained more data than the device could handle due to memory or related device-specific requirements.

–230

`data corrupt`

Possibly invalid data; new reading started but not completed since last access.

–231

`data questionable`

Indicates that measurement accuracy is suspect.

–270

`macro error`

Indicates that a macro-related execution error occurred. This error message should be used when the device cannot detect the more specific errors described for errors –271 through –279.

–271

`macro syntax error`

Indicates that a syntactically legal macro program data sequence, according to IEEE 488.2, 10.7.2, could not be executed due to a syntax error within the macro definition. See IEEE 488.2, 10.7.6.3.

−272

`macro execute error`

Indicates that a syntactically legal macro program data sequence could not be executed due to some error in the macro definition. See IEEE 488.2, 10.7.6.3.

−273

`illegal macro label`

Indicates that the macro label defined in the *DMC command was a legal string syntax, but could not be accepted by the device (see IEEE 488.2, 10.7.3 and 10.7.6.2); for example, the label was too long, the same as a common command header, or contained invalid header syntax.

−274

`macro parameter error`

Indicates that the macro definition improperly used a macro parameter placeholder. See IEEE 488.2, 10.7.3.

−275

`macro definition too long`

Indicates that a syntactically legal macro program data sequence could not be executed because the string or block contents were too long for the device to handle. See IEEE 488.2, 10.7.6.1.

−276

`macro recursion error`

Indicates that a syntactically legal macro program data sequence could not be executed because the device found it to be recursive. See IEEE 488.2, 10.7.6.6.

−277

`macro redefinition`

Indicates that a syntactically legal macro label in the *DMC command could not be executed because the macro label was already defined. See IEEE 488.2, 10.7.6.4.

−278

`macro header not found`

Indicates that a syntactically legal macro label in the *GMC? query could not be executed because the header was not previously defined.

−280

`Program error`

Indicates that a downloaded program-related execution error occurred.

−281

`Cannot create program`

Indicates that an attempt to create a program was unsuccessful. A reason for the failure might include not enough memory.

−282

`Illegal program name`

The name used to reference a program was invalid. For example, redefining an existing program, deleting a nonexistent program, or in general, referencing a nonexistent program.

−283

`Illegal variable name`

An attempt was made to reference a nonexistent variable in a program.

−284

`Program currently running`

Certain operations dealing with programs may be illegal while the program is running; for example, deleting a running program is not possible.

−285

`Program syntax error`

Indicates that a syntax error appears in a downloaded program.

−286

`Program runtime error`

PON and Self-Test Hardware Errors (−300 to −399)

The microwave transition analyzer reports −3XX errors when a problem with the hardware is detected during the PON and SELF TEST routines.

−300

`generic execute`

This is the generic device-dependent error for devices that cannot detect more specific errors. This code indicates only that a device-dependent error as defined in IEEE 488.2, 11.5.1.1.6 has occurred.

−310

`system error`

Indicates that some error, termed “system error” by the device, has occurred. This code is device-dependent.

−311

`memory error`

Indicates that an error was detected in the device’s memory. The scope of this error is device-dependent.

−312

`PUD memory lost`

Indicates that the protected user data saved by the *PUD command has been lost.

−313

`calibration memory lost`

Indicates that nonvolatile calibration data used by the *CAL? command has been lost.

−314

`save/recall memory lost`

Indicates that the nonvolatile data saved by the *SAV? command has been lost.

–315

`configuration memory lost`

Indicates that nonvolatile configuration data saved by the device has been lost. The meaning of this error is device-specific.

–330

`self test failed`

Indicates that the self-test routine has fail.

–350

`too many errors`

A specific code entered into the queue in lieu of the code that caused the error. This code indicates that there is no room in the queue and an error occurred but was not recorded.

Program Query/ Response Errors (−400 to −499)

The microwave transition analyzer reports −4XX errors during remote programming. These errors result from a violation of query/response syntax.

−400

`query error`

This is the generic query error for devices that cannot detect more specific errors. This code indicates only that a query error as defined in IEEE 488.2, 11.5.1.1.7 and 6.3 has occurred.

−410

`query intr`

Indicates that a condition causing an INTERRUPTED query error occurred (see IEEE 488.2, 6.3.2.3); for example, a query followed by DAB or GET before a response was completely sent.

−420

`query unterm`

Indicates that a condition causing an UNTERMINATED query error occurred (see IEEE 488.2, 6.3.2.2); for example, the device was addressed to talk and an incomplete program message was received.

−430

`query deadlock`

Indicates that a condition causing a DEADLOCKED query error occurred (see IEEE 488.2, 6.3.1.7); for example, both input buffer and output buffer are full and the device cannot continue.

Hardware and Operation Errors (6000 to 7999)

6100

`Option not installed`

Indicates that a command or query was used to access a capability related to an uninstalled option.

6200

`chan skew too large`

This error indicates that the channel skew value is too large to perform a measurement. Increase the time span or refer to the appropriate application note.

6201

`zoom span too small`

This error indicates that the zoom processing used requires more data than can be acquired. Refer to the appropriate application note.

6202

`time span too small`

This error indicates that the time span selected was too small for a valid measurement. Check the time span.

6203

`no instrument present`

This error indicates that the microwave transition analyzer cannot find the external synthesizer on the private HP-IB or HP-MSIB system bus. Check the configuration of your instrument set up and the cable connections first. Otherwise, the problem could be with the A8 microprocessor.

6204

`instrument does not match config`

This error indicates that the external synthesizer on the private HP-IB or HP-MSIB system bus does not match the synthesizer selected in the Config menu. Check the configuration of your instrument set up.

6205

`not active controller`

This error indicates that the HP 70820A is not the active controller. Therefore, either control needs to be passed to the HP 70820A or the system control switch needs to be changed.

6206

`edges required for meas. not found`

This error indicates that the measurement routine could not find one or more edges needed for the requested operation with the current threshold definition.

6207

`"fuzzy" adjustment limits exceeded`

This error indicates that the desired measurement cannot be correctly set up without exceeding the adjustment limits for either the synthesizer frequency, trace length, or time range.

6208

`carrier frequency mixed to poor i.f.`

This error indicates that the carrier frequency is such that its aliased position in the I.F. will probably compromise the measurement.

6209

`oven cold during measurement`

This error indicates that the oven is cold.

6210

`math overrange`

This error indicates that one of the internal DSP chips has limited a data value. this may be caused by an overrange input that has gone undetected.

6211

`channel 1 hardware overrange`

This error indicates that the input signal to channel 1 is too large. Reduce the signal, increase the voltage range, or turn on autoranging.

6212

`channel 2 hardware overrange`

This error indicates that the input signal to channel 2 is too large. Reduce the signal, increase the voltage range, or turn on autoranging.

6213

`delay too large`

Indicates the measurement delay is too large for the hardware.

6214

`too many files open`

This error indicates that too many files are opened for the internal processing to keep track of.

6215

`Illegal or undefined mass storage device`

This error indicates an attempt was made to perform a mass storage operation without a valid mass storage device.

6216

`could not acquire storage link`

This error indicates an attempt to establish a storage link (usually on the HP-MSIB) failed.

6217

`file open failed`

This error indicates a file could not be opened.

6218

`catalog open failed`

This error indicates a catalog could not be performed on mass storage device.

6219

`unexpected end of file`

This error indicates that the file ended before the logical end was reached.

6220

`record size too large or small`

This error indicates the size of the data indicates that the file is either corrupt or the wrong type. For example, this error occurs when loading a recall state into a trace.

6221

`write to file failed`

This error indicates data could not be written to the file.

6222

`purge of file failed`

This error indicates file could not be erased.

6223

`format failed`

This error indicates mass storage device could not be formatted for data.

6224

`illegal filename`

This error indicates file name is too long.

6225

`file load failed`

This error indicates file could not be recalled.

6226

`wrong type of file`

This error indicates the file header is not the expected value for the type of operation in progress. For example, loading a recall state into a trace.

6227

`unrecognized file header`

This error indicates the file header does not match any of the types recognized. For example, an attempt was made to load HP 70900B amplitude corrections into the HP 70820A.

6327

`time ram:1`

This error indicates that the time RAM did not pass the one's test. The one's test fills RAM with logic ones and then reads the memory and detects any errors. This error probably results from a failure on the A11 address.

6328

`time ram:0`

Indicates that the time RAM did not pass the zero's test. The zero's test fills RAM with logic zeros and then reads the memory and detects any errors. This error probably results from a failure on the A11 address.

6239

`time cntr,ram`

This error indicates that the time counter or RAM is not working properly. The time RAM counters were reset, and then allowed to run for one second. The time is read and compared to an expected value. This error probably results from a failure on the A11 address.

6330

`add1`

This error indicates that the add1 line is not working. This error probably results from a failure on the A11 address board.

6331

`1st time ram num`

This error indicates a failure on the A11 address.

6332

`tm rm post trig n 0`

This error indicates a failure on the A11 address.

6333

`tm rm time bet trigs wrng`

This error indicates a failure on the A11 address.

6334

`too many trigs`

This error indicates a failure on the A11 address.

6349

`mem addr hi bits`

This error indicates that memory addressing is not linear, high order bits. There is probably a failure on the A9 or A10 converter or the A11 address.

6350

`adc bit stuck low: bit`

This error indicates a failure on the A9 or A10 converter. Check the clock input to channel 1 and channel 2 first.

6351

`adc bit stuck high: bit`

This error indicates a failure on the A9 or A10 converter. Check the clock input to channel 1 and channel 2.

6352

`adc missing code num`

This error probably results from a failure on the A9 or A10 converters.

6353

`mem addr lo bits`

This error indicates that the memory addressing is not linear, high order bits. Check the A9 or A10 converter or A11 address.

6359

`gain=3 not working`

This error indicates a failure on the A9 or A10 converter.

6360

`gain=1 not working`

This error indicates a failure on the A9 or A10 converter.

6363

`pos slope hyst`

This error indicates a failure on the A9 or A10 converter. The offset DAC is used as a signal source to test this function.

6364

`pos slope trig`

This error indicates a failure on the A9 or A10 converter. The offset DAC is used as a signal source to test this function.

6365

`neg slope hyst`

This error indicates a failure on the A9 or A10 converter. The offset DAC is used as a signal source to test this function.

6366

`neg slope trig`

This error indicates a failure on the A9 or A10 converter. The offset DAC is used as a signal source to test this function.

6367

`abv lvl trig n reset`

This error indicates a failure on the A9 or A10 converter. The offset DAC is used as a signal source to test this function.

6368

`abv lvl trig n set`

This error indicates a failure on the A9 or A10 converter. The offset DAC is used as a signal source to test this function.

6370

`bel lvl trig n reset`

This error indicates a failure on the A9 or A10 converter. The offset DAC is used as a signal source to test this function.

6371

`bel lvl trig n set`

This error indicates a failure on the A9 or A10 converter. The offset DAC is used as a signal source to test this function.

6384

`chx miss/broke`

This error indicates a failure on the A9 or A10 converter as indicated by chx.

6385

`RTC set/broke`

This error indicates that the Real Time Clock may not be correctly set or is broken. Check the A8A1 control.

6391

`wait state ROM,RAM,MSIB,HPIB,SW,CLK,DSPA,DSP`

This error indicates that the wait state generator on the A8 microprocessor is generating the incorrect number of wait states. Check the A8A1 control or the A8A2 ROM/RAM.

6392

`Frac N unlock`

This error indicates that the A15 fractional N is not locked within the expected time after measurement setup. Check the A15 fractional N or the A4 LO. Refer also to error code description 7391.

6393

`illegal sample rate`

This error code indicates that the user tried to set an illegal sample rate. Reset the sample rate.

6394

`390 Mhz loop unlocked`

This error indicates a failure on the A4 LO or a problem with the A12 crystal reference.

6395

`Frac N Sweep not finished`

This error indicates an internal synthesizer error. Check the A15 fractional N.

6396

`no external ref`

This error indicates that the external reference is selected and the reference loops are unlocked. Normally this means that the external reference is not connected. If the external reference is present at the A4 LO, the failure is on the A4 LO.

6397

`frac N μCode load failure`

Indicates that the processor was unable to load and verify the microcode in the fractional N sub-assembly.

6600

`Illegal Cal Signal`

This error indicates that the internal calibration signal is not within expected limits. Normally this means that it is not connected. If the internal calibration signal is not present at the calibrator output, this error indicates a failure on the A4 LO or a related assembly problem. If the signal is present, the failure may be the A5 IF, the A9 or A10 converter, or the connecting cables.

6601

`bad factory cal`

This error indicates invalid factory calibration data. The EEROM data is corrupted past recovery. Check the A8A1 control.

6602

`bad drive flat cal`

This error indicates invalid LO drive calibration data. Calibrate the appropriate channel.

6603

`bad IF flat cal`

This error indicates invalid calibration data. Calibrate the appropriate channel.

6604

`bad insert loss cal`

This error indicates invalid insertion loss calibration data. Calibrate the appropriate channel.

6605

`correction data clipped`

This error indicates internal correction data overflow. Minor adjustment of seconds/division, trace length, or recalibration may be required.

6606

`cal numeric ovrflw`

This error indicates that the computation in calibration data overflowed. Calibrate both channels.

6607

`adc gain cal`

This error indicates that the gain calibration failed for internal ADC. Check the A9 or A10 converter.

6608

`adc trig cal`

This error indicates that the trigger calibration failed for internal ADC. Check the A9 or A10 converter.

6609

`bad adc cal data`

This error indicates that the ADC calibration data is invalid. Calibrate the appropriate channel.

6610

`bad user cal data`

This error indicates invalid USER calibration data.

6611

`questionable cal data (ch1)`

This error indicates invalid calibration data for channel 1. Calibrate channel 1.

6612

`Questionable cal data (ch2)`

This error indicates invalid calibration data for channel 2. Calibrate channel 2.

6613

`empty recall reg`

This error indicates that the user attempted to recall data from an empty state register.

6614

`invalid trace`

This error indicates that an operation involving a trace without valid data has been performed.

6615

`signal not found`

This error indicates that `Find Signals` did not find any signals.

6616

`busy`

This error indicates that the microwave transition analyzer is too busy to handle the remote programming request.

6621

`rf carrier adj`

This error indicates that the RF carrier adjustment for subsync/profile failed.

6622

`low i.f.`

This error indicates that the signal mixed too low in the IF, generally a result of too narrow a time span. Change the time span.

6623

`user cal resol`

This error indicates a bad match between the user calibration resolution and the time range. Change the time range.

6624

`no histogram data`

This error indicates that an operation was requested using histogram data when none was available. Check the input.

6625

`bad zero cal data`

This error indicates invalid ZERO calibration data. Calibrate appropriate channel.

6626

`chan align cal error`

This error indicates that the two channels are not close enough in time skew. Calibrate channel 1 or channel 2.

6627

`unable to separate signals`

This error indicates that the table mode setup failed because the signal or harmonic is nearly identical to another signal or harmonic.

6628

`EEROM read waring (recovered)`

This error indicates that the EEROM had one or more recoverable 1-bit read errors.

6629

`Questionable frequency list`

This error indicates that the signal frequency found by the microwave transition analyzer is questionable. Verify the signal frequency.

6630

`freq domain format required`

This error indicates that the last operation invoked requires the source trace to be formatted in the frequency domain.

6631

`freq domain data required`

This error indicates that the last operation invoked requires the source trace to be frequency domain data (for example, a frequency sweep).

6632

`cannot perform operation`

This error indicates that a marker operation cannot be performed (usually marker to center).

6633

`invalid source`

This error indicates that the source trace is invalid for the requested operation (usually marker to center or marker is off).

6634

`no trace data stored`

Indicates that no trace data was stored into the user correction array. This is usually caused by storing a trace that only has negative frequencies.

7301

`uP bus, wr addr: bit`

This error indicates that the A8 microprocessor tried to load and then read back the write address counter. This process failed at 'bit'. The sampler clocks from the A4 LO must be ECL (referenced to +5 volts). If they are not, this is an A4 LO. If correct, this is an A11 address failure. The A16 motherboard connections to the A9 or A10 converters may also be suspect.

7302

`rd addr, inh rd: bit`

This error indicates that the A8 microprocessor tried to set the read/write address so that inhibit read would be set. This process failed with read address at 'bit'. This error probably results from an A11 address failure.

7303

`shld addr, inh wr: bit`

This error indicates that the A8 microprocessor tried to set the shield address so that inhibit write would be set. This process failed with read address at 'bit'. This error probably results from an A11 address failure.

7304

`seg size short: bit`

This error indicates that the A8 microprocessor tried to set the segment size counters. This error probably results from an A11 address failure.

7305

`seg size long: bit`

This error indicates that the A8 microprocessor tried to set the segment size counters. This error probably results from an A11 address failure.

7306

`inh rd n reset`

This error indicates that the A8 microprocessor could not reset the inhibit read. This error probably results from an A11 address failure.

7307

`inh wr n reset`

This error indicates that the A8 microprocessor could not reset the inhibit write. This error probably results from an A11 address failure.

7308

`wr addr n count`

This error indicates that the write address counters are not counting or not reaching terminal count. This error probably results from an A11 address failure or an A9 or A10 converter failure.

7309

`cps cntr early`

This error indicates that the clock per sample counters timed out too soon, probably resulting from an A11 address board failure. Another possible cause is a bad clock frequency from the A8A1 control or the A4 LO.

7310

`cps cntr late`

This error indicates that the clock per sample counters timed out too late. This error probably results from an A11 address failure. Another possible cause is a bad clock frequency from the A8A1 control or the A4 LO.

7311

`trig n reset @ uP`

This error indicates that the trigger signal did not reset at the A8 microprocessor. It can be caused by a trigger signal or an A8 microprocessor read ckt. This error probably results from an A11 address failure or an A8A1 control failure.

7312

`trig n set @ uP`

This error indicates that the trigger signal did not reset at the A8 microprocessor. It can be caused by a trigger signal or an A8 microprocessor read ckt. This error probably results from an A11 address failure or an A8A1 control failure.

7313

`WAT timeout early`

This error indicates that the writes after trigger counter timed out early. This error probably results from an A11 address failure. This can also be caused by the A10 converter or by the convertor boards being switched. See chapter 8 for major assembly locations.

7314

`WAT timeout late`

This error indicates that the writes after trigger counter timed out late. This error probably results from an A11 address failure. This can also be caused by the A10 converter.

7315

`wr addr n stop @ EOS`

This error indicates that the write address counter did not stop counting at the end of the segment boundary. This error probably results from an A11 address failure.

7316

`WAT cntr n stop @ EOS`

This error indicates that the writes after trigger counter did not stop at the end of the segment boundary. This error probably results from an A11 address failure.

7317

`cps stuck @ 1`

This error indicates that the clock per sample counter stuck at divide by 1. This error probably results from an A11 address failure.

7318

`cps bad load`

This error indicates that the clocks per sample counter was not loaded correctly. This error probably results from an A11 address failure.

7319

`WAT n wait for trig`

This error indicates that the writes after trigger counter started counting before the trigger signal occurred. This error probably results from an A11 address failure.

7320

`WAT n strt by trig`

This error indicates that the writes after trigger counter was not counting after trigger occurred. This error probably results from an A11 address failure.

7321

`WAT n reload`

This error indicates that the writes after trigger counter did not reload. This error probably results from an A11 address failure.

7322

`wr addr, WAT lsbs`

This error indicates that there is an error in the least significant bits of the writes after trigger counter. This error probably results from an A11 address failure.

7323

`trace n wait for trig`

This error indicates that the trace started before trigger. This error probably results from an A11 address failure.

7324

`trace n strt by trig`

This error indicates that the trace did not start when the trigger occurred. This error probably results from an A11 address failure.

7325

`timebase switch-early`

This error indicates that the clocks per sample counter is loaded with the alternate value earlier than expected. This error probably results from an A11 address failure or an A10 converter failure.

7326

`timebase switch-late`

This error indicates that the clocks per sample counter is loaded with the alternate value later than expected. This error probably results from an A11 address failure or an A10 converter failure.

7382

`missing adc clock`

This error indicates that the microwave transition analyzer cannot detect a clock on the internal adc(s). The clock to the A9 and A10 converters should be ECL (referenced to +5 volts). If this is verified, check for an A9 or A10 converter failure. Otherwise, the problem was caused by an A4 LO failure.

7383

`slow adc clock`

This error indicates that the clock for the internal adc(s) is slow. The clock to the A9 and A10 converters should be ECL (referenced to +5 volts). If this is verified, this error is probably the result of an A9 or A10 converter failure. Otherwise, it is an A4 LO failure.

7386

`: Memory Overflow`

This error indicates that the internal heap is too small.

7389

`HP_MSIB error`

This error indicates that the power-on check for the MSIB failed. This can be caused by a connector problem or an A8A1 control failure.

7390

`via`

This error indicates an A8A1 control failure.

7391

`: Frac N is not responding`

This error indicates that the A8 microprocessor cannot talk to the A15 fractional N. This failure may be caused by a failure with the A15 fractional N or the A8A1 control.

7394

`trace lengths do not match`

This error indicates that the two traces are not the same size or are not completely overlapping.

7395

`operand mismatch`

This error indicates that the two traces are not the same type.

7396

`operand domain error`

This error indicates that this type of operation on this type of trace is invalid.

7397

`unsupport transform`

This error indicates that the current code does not support the requested trace transformation.

7398

`recursive function`

This error indicates that the recursive function is defined.

7400

`dsp chip(dspx overlay 0: up/dn load)`

This error indicates that the DSP chips on the A9 and A10 converter boards did not pass the self-test. This failure may be caused by the A9 or A10 converters, the A8A1 control, or connections through the A16 motherboard.

7401

`channel 1 I.F. path bad`

This error indicates that the signal path for channel 1 is not intact.

7402

`channel 2 I.F. path bad`

This error indicates that the signal path for channel 2 is not intact.

7403

`I.F. cables reversed`

This error indicates that the cables for channel 1 and channel 2 signal paths are backwards.

7617

`Data(Battery) failure`

This error indicates that some or all of the data in the battery backed-up RAM has been lost. To replace the battery, refer to the *HP 71500 Series Service Guide*.

7618

`RAM address buss`

This error indicates an A8A1 control failure or an A8A2 ROM/RAM failure.

7619

`RAM data Error`

This error indicates either an A8A1 control failure or an A8A2 ROM/RAM failure.

7620

`ROM checksum Error`

This error indicates an A8A2 ROM/RAM failure.

7621

`Internal GND`

This error indicates that an internal ground is not at zero volts. This error may be caused by incorrect calibration data or by an A5 IF failure.

7622

`Write to EEROM failed`

This error indicates an A8A1 control failure.

7624

`EEROM read failure`

This error indicates an A8A1 control failure.

Floating Point Errors (8000 to 8999)

The microwave transition analyzer generates the following floating point math errors.

8000

`zero div`

Indicates that an attempt to divide by zero was made (usually an internal firmware failure).

8001

`real ovflw/undflw`

Indicates that the result of a floating point operation exceeds the legal range for the data format.

8002

`log(0)`

Indicates that an attempt to compute log(0) was made (usually an internal firmware failure.

8003

`log(-x)`

Indicates that an attempt to compute log(x) was made, where x<0.

8004

`int ovflw`

Indicates that math operation results exceed the range for a 32-bit integer (that is, integer math overrange).

8005

`sqrt err`

Indicates that an attempt to compute sqrt(x) was made, where x<0.

8006

`x mod 0`

Indicates that an attempt to modulo by zero was made.

8007

`acs(x), abs(x) > 1`

Indicates that an attempt to compute arccos(x) was made, where abs(x)>1.

8999

`real undrflw`

Indicates that the result of a floating point operation exceeds the legal range for the data format.

Hardware Errors (9000 to 9999)

Series 9000 Errors

9101

`Protocol`

This error indicates that an illegal MSIB protocol command was received. Review the command given.

9380

`Stack Overflow`

This error indicates that an internal stack overflowed its allocated size. The probable cause for this problem is a firmware failure.

9381

`Internal`

This error indicates a generic internal firmware error.

9387

`use of non-acq resource`

This error indicates an internal firmware error.

9388

`parser error` This error indicates an internal firmware error.

9390

`illegal DSP instr`

This error indicates that the DSP overlay does not contain instruction.

9391

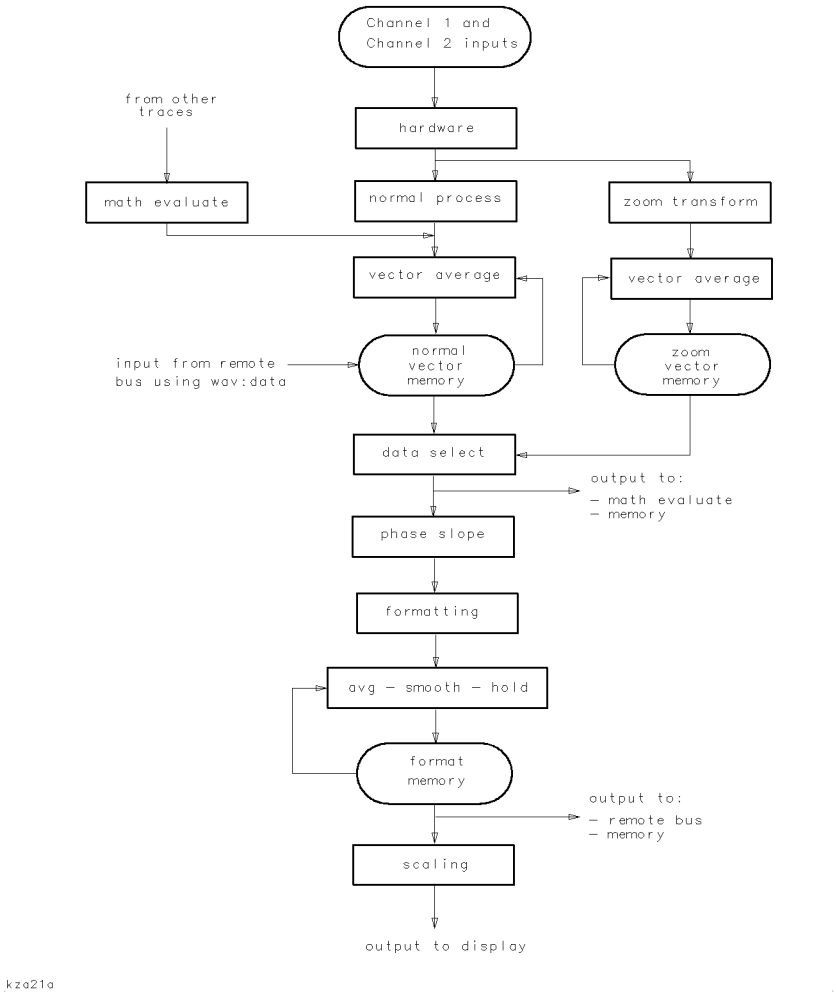
`instr shell error`

This error indicates an internal SHELL firmware error.

5

Tables and Charts

Data Processing Flow Chart



Predefined Measurement States

There are six predefined measurement states that can be accessed in the `States` menu:

- Frequency & Power
- Vector Voltage
- Vector Network
- Scalar Network
- Time & FFT
- Pulsed Time

The section shows the default settings for each of the measurement states.

Frequency & Power

trace length ..... 800 points

Main Menu

`sig trk ON|OFF`

source configured ..... OFF

source not configured ..... ON

`sweep labels` ..... `#CYCLE DELAY`

#CYCLE 2

Table Menu

`input:` ..... `CH1`

`# OF HARMNCS` ..... 1 (harmonics displayed)

`INCLUDE HARMNCS` ..... OFF (include harmonics)

`show MAG|PHA` ..... MAG (show phase)

AMPL ..... ON (show amplitude)

	TR1 (Trace 1)	**TR2 (Trace 2)**	**TR3 (Trace 3)**	**TR4 (Trace 4)**
Trace Definition	CH1	CH2	CH1/CH2	CH1/CH2
`format`	`REAL (scope)`	`REAL (scope)`	`REAL (scope)`	`REAL (scope)`
`input:`	`CH1`	`CH2`	`CH1/CH2`	`CH1/CH2`
`display ON|OFF`	OFF	OFF	OFF	OFF
Amplitude Scale	auto	auto	auto	auto
Reference Level	0 V	0 V	0 V	0 V

Vector Voltage

trace length ..... 800 points
Main Menu
`sig trk ON|OFF`
source configured ..... OFF
source not configured ..... ON
`sweep labels` ..... `#CYCLE DELAY`
#CYCLE 2
Table Menu
`input:` ..... `CH1/CH2`
`# OF HARMNCS` ..... 1 (number of harmonics displayed)
`INCLUDE HARMNCS` ..... OFF (include harmonics)
`show MAG|PHA` ..... PHA (show phase) AMPL: ON (show amplitude)

	TR1 (Trace 1)	**TR2 (Trace 2)**	**TR3 (Trace 3)**	**TR4 (Trace 4)**
Trace Definition	CH1	CH2	CH1/CH2	CH1/CH2
`format`	`REAL (scope)`	`REAL (scope)`	`REAL (scope)`	`REAL (scope)`
`input:`	`CH1`	`CH2`	`CH1/CH2`	`CH1/CH2`
`display ON|OFF`	OFF	OFF	OFF	OFF
Amplitude Scale	auto	auto	auto	auto
Reference Level	0 V	0 V	0 V	0 V

Vector Network

trace length ..... 101 points
Main Menu
`sig trk ON|OFF` ..... OFF
Sweep ..... CONT (continuous sweep)
TYPE ..... FREQ (frequency sweep)
Table Menu
`input:` ..... `OFF`

	TR1 (Trace 1)	TR2 (Trace 2)	TR3 (Trace 3)	TR4 (Trace 4)
Trace Definition	CH1/CH2	(CH1/CH2)/MEM1	equa 1	equa 2
`format`	`LOGMAG`	`LOGMAG`	`LOGMAG`	`LOGMAG`
`input:`	`CH1/CH2`	transmn	Refl_Mag	Refl_Pha
`display ON|OFF`	ON	OFF	OFF	OFF
Amplitude Scale	10 dB/	10 dB/	10 dB/	90 deg/
Reference Level	20 dBm	20 dBm	20 dBm	0 deg

Equation 1

(2*MAGN(CH1/CH2))/(MAGN(MEM2) +MAGN(MEM3))) [open short avg]

Equation 2

(−CH1/CH2)/MEM3 [norm to short]

Scalar Network

trace length ..... 101 points
Main Menu
`sig trk ON|OFF` ..... OFF
Sweep ..... CONT (continuous sweep)
TYPE ..... FREQ (frequency sweep)
Table Menu
`input:` ..... `OFF`

	TR1 (Trace 1)	TR2 (Trace 2)	TR3 (Trace 3)	TR4 (Trace 4)
Trace Definition	CH1	CH2	CH1/MEM1	equa 1
`format`	`LOGMAG`	`LOGMAG`	`LOGMAG`	`LOGMAG`
`input:`	`CH1`	`CH2`	Transmn	Reflctn
`display ON|OFF`	ON	ON	OFF	OFF
Amplitude Scale	20 dB/	20 dB/	20 dB/	20 dB/
Reference Level	20 dBm	20 dBm	20 dBm	20 dBm

Equation 1

(2*MAGN(CH1/CH2))/(MAGN(MEM2) +MAGN(MEM3))) [open short avg]

Time & FFT

trace length ..... 800 points
Main Menu
  defaults ..... displays 2 cycles
Trigger Menu
  `trg is:` ..... `PHASE` (phase trigger)
  `input:` ..... `CH1`
Table Menu
  `input:` ..... `OFF`

	TR1 (Trace 1)	**TR2 (Trace 2)**	**TR3 (Trace 3)**	**TR4 (Trace 4)**
Trace Definition	CH1	CH1	CH1/CH2	CH1/CH2
`format`	`REAL (scope)`	`LOGMAG (lg am)`	`LOGMAG (lg am)`	`LOGMAG (lg am)`
`input:`	`CH1`	`CH2`	`CH1/CH2`	`CH1/CH2`
`display ON|OFF`	ON	ON	OFF	OFF
Amplitude Scale	50 mV/	20 dB/	20 dB/	20 dB/
Reference Level	0 V	−10 dBm	−10 dBm	−10 dBm

Pulsed Time

trace length ..... 400 points
Main Menu
  defaults ..... displays 2 cycles
Trigger Menu
  `trg is:` ..... `PULS RF`
  `LEVEL` ..... −5 dB (56%)
  `src rel ON|OFF` ..... ON
Table Menu
  `input:` ..... `OFF`
Pulsgen Menu
  `gen is:` ..... `INT`
  `PRI|PRF` ..... PRF 10 kHz
  `WIDTH|DUT CYC` ..... WIDTH 1 us

	TR1 (Trace 1)	**TR2 (Trace 2)**	**TR3 (Trace 3)**	**TR4 (Trace 4)**
Trace Definition	CH1	CH2	CH1	CH1/CH2
`format`	`REAL (scope)`	`MAGN (am)`	`MAGN (am)`	`LOGMAG (lg am)`
`input:`	`CH1`	`CH2`	`CH1`	`CH1/CH2`
`display ON|OFF`	ON	OFF	ON	OFF
Amplitude Scale	50 mV/	50 mV/	50 mV/	20 dB/
Reference Level	0 V	0 V	0 V	−10 dBm

Volatile and Nonvolatile Internal Memory

The term "volatile internal memory" refers to parameters that are erased when power is removed from the analyzer. Conversely, "nonvolatile internal memory" refers to parameters that are not erased when power is removed.

Internal Memory (RAM)	
Volatile	**Nonvolatile**
Traces (unsaved)	RF Corrections
Current State	Traces (saved)
	States (saved)
	Calibration Data
	User Corrections

Supported Synthesizers and Drivers

Use of a synthesizer under HP-IB or HP-MSIB control and sharing a common 10 MHz time base, while not absolutely required, is highly recommended to simplify the use of the instrument. Drivers for synthesizers consist of HP-IB/HP-MSIB drivers in the HP 70820A to control the source frequency, power level, RF output on/off, and pulse modulation on/off from the HP 70820A. Custom drivers for other HP-IB synthesized sources, may be defined over IEEE-488.

RF sources generally have lower phase noise than microwave sources and are recommended for repetition rates < 1 GHz.

Synthesizers Supported with Drivers						
	Frequency Range (GHz)	**Frequency Resolution**	**Freq & Power Control**	**RF Out ON/OFF Control**	**Pulsed-RF Carr Freq Adjust**	**Pulse Mod ON/OFF Control**
HP 3325B[1,2]	1 μHz[2] to 21 MHz	1 μHz	Yes	No	Yes	No
HP 3335A[1,2]	200 Hz to 81 MHz	1 mHz	Yes	No	Yes	No
HP 8340	0.01 to 26.5	1 Hz	Yes	Yes	Yes	Yes
HP 8341	0.01 to 20	1 Hz	Yes	Yes	Yes	Yes
HP 83620A Opt. 008	0.01 to 20	1 Hz	Yes	Yes	Yes	Yes
HP 83622A Opt. 008	2 to 20	1 Hz	Yes	Yes	Yes	Yes
HP 83623A Opt. 008 (hi pwr.)	0.01 to 20	1 Hz	Yes	Yes	Yes	Yes
HP 83624A Opt. 008 (hi pwr.)	2 to 20	1 Hz	Yes	Yes	Yes	Yes
HP 83640A Opt. 008	0.01 to 40	1 Hz	Yes	Yes	Yes	Yes
HP 83642A Opt. 008	2 to 40	1 Hz	Yes	Yes	Yes	Yes
HP 836xx except Opt. 008		1 kHz	Yes	Yes	No[3]	Yes
HP 8644A[1]	0.000252 to 2.06	0.01 Hz	Yes	Yes	Yes	Yes
HP 8645A[1]	0.000252 to 2.06	0.01 Hz	Yes	Yes	Yes	Yes
HP 8657A	0.1 M to 1.04 G	1 Hz	Yes	Yes	Yes	No
HP 8657B	0.1 M to 2.06 G	1 Hz	Yes	Yes	Yes	No
HP 8665A[1]	0.000100 to 4.20	0.01 Hz	Yes	Yes	Yes	Yes
HP 8672A	2 to 18	1 to 3 kHz	Yes	Yes	No[3]	Yes
HP 8673B	2 to 26	1 to 4 kHz	Yes	Yes	No[3]	Yes
HP 8673C	0.05 to 18.6	1 to 4 kHz	Yes	Yes	No[3]	Yes
HP 8673D	0.05 to 26	1 to 4 kHz	Yes	Yes	No[3]	Yes
HP 8673E	2 to 18	1 to 3 kHz	Yes	Yes	No[3]	Yes
HP 8673G	2 to 26	1 to 4 kHz	Yes	Yes	No[3]	No
HP 8673H	2 to 12 or 5 to 28	1 to 3 kHz	Yes	Yes	No[3]	Yes
HP 8662A[1]	0.000100 to 1.28	0.1 Hz	Yes	No	Yes	Yes
HP 70320A	0.000252 to 2.06	0.01 Hz	Yes	Yes	Yes	Yes
HP 70322A	0.000100 to 4.20	0.01 Hz	Yes	Yes	Yes	Yes
HP 70325A	0.000252 to 2.06	0.01 Hz	Yes	Yes	Yes	Yes
HP 70340 Opt. 1E8	1 to 20	1 Hz	Yes	Yes	Yes	Yes
HP 70340 except Opt. 1E8	1 to 20	1 kHz	Yes	Yes	No	Yes
HP 70841	100 Mb/s to 3 Gb/s	—	No	No	No	No

Table Footnotes

[1]The HP 3325, HP 3335, HP 8662A, and HP 7032x synthesizers do not support a "signal settled" bit. To be safe, the user should include a dwell time sufficient to let the signal settle in frequency sweeps. The dwell time required depends on the noise filter BW used and accuracy desired.

[2]The HP 3325B and HP 3335A work well for frequency and power sweeps or any case where approximately one cycle is on screen. But these instruments have jitter that is inversely proportional to the repetition frequency. When observing fast events at low repetition frequencies, this jitter may make the HP 3325B and HP 3335A unsuitable for delta time measurements with the HP 70820A. HP recommends using the internal pulse generator (as a time base for low repetition frequencies) to trigger an external signal source reducing the jitter problem. The HP 3325B is supported only down to 0.1 Hz.

[3]For pulsed-RF component characterization, the HP 70820A may adjust the carrier frequency slightly from what was chosen to allow the AM/PM demodulation routines to work properly. Because of this adjustment, synthesizers with at least 1 Hz frequency resolution are recommended for pulsed-RF component characterization.

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