Model 2001 Multimeter

Quick Reference Guide

KEITHLEY

Model 2001 Multimeter
Quick Reference Guide

Table of Contents

Safety Precautions

The following safety precautions should be observed before using this product and any associated instrumentation. Although some instruments and accessories would normally be used with non-hazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read the operating information carefully before using the product.

The types of product users are:

Responsible body is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the manual. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, and perform safe installations and repairs of products. Only properly trained service personnel may perform installation and service procedures.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI)

states that a shock hazard exists when voltage levels greater than 30V RMS, 42.4V peak, or 60VDC are present. **A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.**

Users of this product must be protected from electric shock at all times. The responsible body must ensure that users are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product users in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, **no conductive part of the circuit may be exposed.**

As described in the International Electrotechnical Commission (IEC) Standard IEC 664, digital multimeter measuring circuits (e.g., Keithley Models 175A, 199, 2000, 2001, 2002, and 2010) are Installation Category II. All other instruments' signal terminals are Installation Category I and must not be connected to mains.

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Before operating an instrument, make sure the line cord is connected to a properly grounded power receptacle. Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

The instrument and accessories must be used in accordance with its specifications and operating instructions or the safety of the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.

When fuses are used in a product, replace with same type and rating for continued protection against fire hazard.

Chassis connections must only be used as shield connections for measuring circuits, NOT as safety earth ground connections.

If you are using a test fixture, keep the lid closed while power is applied to the device under test. Safe operation requires the use of a lid interlock.

If a $\left(\frac{\perp}{=}\right)$ screw is present, connect it to safety earth ground using the wire recommended in the user documentation.

The $\triangle$ symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

The $\triangle$ symbol on an instrument shows that it can source or measure 1000 volts or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.

The **WARNING** heading in a manual explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The **CAUTION** heading in a manual explains hazards that could damage the instrument. Such damage may invalidate the warranty.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits, including the power transformer, test leads, and input jacks, must be purchased from Keithley Instruments. Standard fuses, with applicable national safety approvals, may be used if the rating and type are the same. Other components that are not safety related may be purchased from other suppliers as long as they are equivalent to the original component. (Note that selected parts should be purchased only through Keithley Instruments to maintain accuracy and functionality of the product.) If you are unsure about the applicability of a replacement component, call a Keithley Instruments office for information.

To clean an instrument, use a damp cloth or mild, water based cleaner. Clean the exterior of the instrument only. Do not apply cleaner directly to the instrument or allow liquids to enter or spill on the instrument. Products that consist of a circuit board with no case or chassis (e.g., data acquisition board for installation into a computer) should never require cleaning if handled according to instructions. If the board becomes contaminated and operation is affected, the board should be returned to the factory for proper cleaning/servicing.

2/99

Introduction

This quick reference guide includes summary information on front panel and IEEE-488 operation for the Model 2001 Multimeter. For detailed information, consult the Model 2001 Operator's Manual, the Model 2001 Calibration Manual, and the Model 2001-SCAN Scanner Card Instruction Manual.

Operation Summary

Default Configuration

The Model 2001 can save from one to ten user setups in memory, depending on the installed memory option. You can select one of the user setups as the power-on default, or have the instrument power up to either of the two factory defaults (optimized for "BENCH" or "GPIB" operation). Reset the instrument to "BENCH" defaults from the front panel by performing the following steps:

1. Press the MENU key to display the main menu:

   MAIN MENU
   SAVESETUP GPIB CALIBRATION ▶
   ◀ TEST LIMITS STATUS-MSG GENERAL

2. If the SAVESETUP option is not blinking, press the ◀ key until it is blinking and then press ENTER to view the setup menu:

   SETUP MENU
   SAVE RESTORE POWERON RESET

3. Select the RESET option and press ENTER to view the reset menu:

   RESET ORIGINAL DFLTS
   BENCH GPIB

4. Select the BENCH option and press ENTER. The following message is displayed:

   RESETTING INSTRUMENT
   ENTER to confirm; EXIT to abort

5. Press ENTER to confirm. The display will show DC voltage readings with autorange enabled.

Assuming the Model 2001 is set to primary address 16, the instrument can be reset and the reading displayed on the computer CRT from the IEEE-488 bus with the following code fragment:

```
100   OUTPUT 716;":syst:pres"
110   OUTPUT 716;":fetc?"
120   ENTER 716;A$
130   PRINT A$
```

Instrument Connections

Each measurement function has an appropriate connection scheme. Connections for all functions can be found in Section 3 of the Model 2001 Operator's Manual. The following steps summarize making DC voltage measurements with the Model 2001:

1. Select the front input jacks with the INPUTS button (outer position for front jacks, inner position for rear).

2. Using the set of supplied test leads, connect the Model 2001 to a DC voltage source (e.g., a battery) as shown in Figure 1.

3. Use the RANGE keys to select autoranging or a manual range. Pressing the AUTO range key toggles autoranging. You can select a different range with the ▲ RANGE and ▼ RANGE keys. The following code statement enables autoranging on the DCV function:

```
100   OUTPUT 716;":volt:dc:rang:auto  on"
```

Model 2001
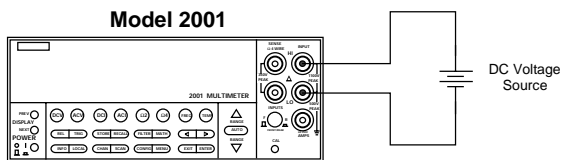
Input Resistance = 10MΩ on 1000V and 200V ranges ;
> 10GΩ on 20V, 2V and 200mV ranges.
= 1MΩ on DCV peak spikes measurement.

Caution : Maximum Input = 1100V peak

Figure 1. Typical DC voltage connections

Changing the Configuration

Each measurement function and operation has the default settings that are listed in Table 18. For example, the default settings for DC voltage are as follows:

- Measurement speed (integration time) — Normal, 1 power line cycle.

- Digital filter — Advanced, 10 readings, 1% noise tolerance, moving average.

- Display resolution — 6.5 digits.

If these settings are not sufficient for your application, they can be changed through configuration menus. For example, to configure the DC voltage function to store high speed measurements, follow these steps:

1. Press CONFIG key and then the DCV key to view

8

the DCV configuration menu:

CONFIGURE DCV
SPEED   FILTER   RESOLUTION

2. Select SPEED from the menu, then press ENTER. The multimeter displays the following menu:

DCV MEASUREMENT SPEED
NORMAL   FAST   MEDIUM   HIACCURACY ▶
◀ SET-SPEED-EXACTLY   SET-BY-RESLN

3. Using the cursor keys, select the FAST option, then press ENTER. Since the resolution is set to AUTO, where it defaults to a value appropriate for the speed, it will be set to 4.5d automatically.

4. Press EXIT to return to the normal display.

To store readings in the instrument's data storage buffer, perform the following:

1. Press the STORE key. The following message is displayed:

STORE 00100 READINGS
Use ◀ , ▶ , ▲ , ▼ , ENTER, EXIT, or INFO

2. Use the cursor and RANGE keys to change the number of readings stored, or just press ENTER to start storing readings.

To recall the stored readings, perform the following:

1. Press RECALL to view the readings. The following message is displayed with the cursor on the least significant digit of the reading number:

```
+000.0000 mVDC
Rdg#+00000 @Time =+000.000000 sec
```

2. Use the RANGE keys to increment and decrement the reading number and scroll through the buffer.

3. The NEXT and PREV DISPLAY keys can be used while recalling readings to access additional buffer data, such as maximum and minimum readings.

The following code fragment configures the Model 2001 for high speed DC voltage readings, stores 100 readings, and sends the readings over the bus:

```
100  OUTPUT 716;":syst:pres"
110  OUTPUT 716;":volt:dc:nplc  0.01"
120  OUTPUT 716;":trac:clear"
130  OUTPUT 716;":trac:feed  calc"
140  OUTPUT 716;":trac:egr  full"
150  OUTPUT 716;":trac:poin  100"
160  OUTPUT 716;":trac:feed:cont  next"
170  OUTPUT 716;":trac:data?"
180  ENTER 716;A$
190  PRINT A$
```

Multiple Displays

Each measurement function has its own set of "multiple displays" shown on the bottom line of the front panel display. To scroll through the multiple displays available for the present function, repeatedly press and release the NEXT DISPLAY key. The same action with the PRE-Vious DISPLAY key does a reverse scroll through the displays. To return to the default reading display, just press and hold either key.

Table 1. Multiple displays by function

Function	Next display
All	Bar graph Zero-centered bar graph Maximum and minimum values Relative and actual values Calculated and actual values (see Note 1) Limits bar graph (see Note 1) Adjacent channel readings (see Note 2)
DC voltage	DC volts, AC ripple voltage and frequency Positive peak spikes and highest value Negative peak spikes and lowest value Positive and negative peak spikes
AC voltage	AC RMS voltage, frequency, and crest factor AC RMS, average, and peak voltages
DC current	(none specific to function)
AC current	AC RMS (or average) current and frequency AC RMS and average current
2-wire resistance	Source current Voltage drop across DUT
4-wire resistance	Source current Voltage drop across DUT Lead resistance
Frequency	Period calculation Trigger level

Table 1. Multiple displays by function (cont.)

Function	Next display
Temperature	Celsius, Fahrenheit, and Kelvin units RTD resistance (or thermocouple voltage) Reference junction (thermocouples only)
Data storage buffer	Maximum and minimum values Average and standard deviation

Notes:
1. Multiple displays for calculated values and limits bar graph are not available for the frequency function.
2. The multiple display for adjacent channel readings is not available for the DC and AC current functions.

Menu Structures

The desired menu is displayed by pressing the appropriate key or sequence:

- CONFIG and then DCV (or ACV, DCI, ACI, Ω2, Ω4, FREQ, TEMP) — Shows the configuration menu for each measurement function.

- CONFIG and then NEXT DISPLAY (or PREV DISPLAY, REL, TRIG, STORE, FILTER, MATH, CHAN, SCAN) — Shows the configuration menu for the multiple displays and each measurement operation.

- MENU — The main menu accesses items for which there are not dedicated keys.

Once in a menu structure, place the cursor (◀ and ▶ keys) on the desired selection and press ENTER. Use the cursor keys, RANGE ▲ and RANGE ▼ keys to enter parameters. Use the EXIT key to back out of a menu structure and disable a menu.

Table 2. CONFIGURE DCV menu structure

Menu item	Description
SPEED	Measurement speed (integration time) menu:
NORMAL	Select 1 PLC (power line cycle, 16.67msec for 60Hz, 20msec for 50Hz and 400Hz).
FAST	Select 0.01 PLC.
MEDIUM	Select 0.1 PLC.
HIACCURACY	Select 10 PLC.
SET-SPEED-EXACTLY	Set integration time in PLC (0.01-10).
SET-BY-RSLN	Default to setting appropriate for resolution.
ANALOG-FILTER	Enable (ON) or disable (OFF) analog filter.

13

Table 2. CONFIGURE DCV menu structure (cont.)

Menu item	Description
FILTER	Digital filter menu:
AUTO	Default to filter appropriate for integration time.
AVERAGING	Program a simple average filter (1-100 readings).
ADVANCED	Program a simple average filter (1-100 readings) with a noise tolerance window (0-100% of range).
AVERAGING-MODE	Select moving average or repeating average mode.
RESOLUTION	Display resolution menu:
AUTO	Default to resolution appropriate for integration time.
3.5d, 4.5d, 5.5d, 6.5d, 7.5d	Select a specific resolution.

Table 3. CONFIGURE ACV menu structure

Menu item	Description
SPEED	Measurement speed (integration time) menu:
NORMAL	Select 1 PLC (power line cycle, 16.67msec for 60Hz, 20msec for 50Hz and 400Hz).
FAST	Select 0.01 PLC.
MEDIUM	Select 0.1 PLC.
HIACCURACY	Select 10 PLC.
SET-SPEED-EXACTLY	Set integration time in PLC (0.01-10).
SET-BY-RSLN	Default to setting appropriate for resolution.
FILTER	Digital filter menu:
AUTO	Default to filter appropriate for integration time.
AVERAGING	Program a simple average filter (1-100 readings).
ADVANCED	Program a simple average filter (1-100 readings) with a noise tolerance window (0-100% of range).
AVERAGING-MODE	Select moving average or repeating average mode.

Table 3. CONFIGURE ACV menu structure (cont.)

Menu item	Description

RESOLUTION
  AUTO
 	
  3.5d, 4.5d, 5.5d, 6.5d,
    7.5d
	Display resolution menu:
	  Default to resolution appropriate for
	    integration time.
	  Select a specific resolution.

UNITS
  VOLTS
  dB
 	
  dBm
	Display units menu:
	  Select volts.
	  Select dB and set voltage reference
	    level.
	  Select dBm and set reference imped-
	    ance.

COUPLING
  AC
  AC+DC
	Coupling menu:
	  Select AC coupled measurements.
	  Select DC coupled measurements.

AC-TYPE
  RMS
  AVERAGE
  PEAK
  LOW-FREQ-RMS
 	
  POSITIVE-PEAK
 	
  NEGATIVE-PEAK
	Type of ACV measurement menu:
	  Select true RMS ACV.
	  Select average ACV.
	  Select peak ACV.
	  Select low frequency (typically
	    <50Hz) true RMS ACV.
	  Select positive DCV peak spikes
	    measurements.
	  Select negative DCV peak spikes
	    measurements.

Table 4. CONFIGURE DCI menu structure

Menu item	Description
SPEED	Measurement speed (integration time) menu:
NORMAL	Select 1 PLC (power line cycle, 16.67msec for 60Hz, 20msec for 50Hz and 400Hz).
FAST	Select 0.01 PLC.
MEDIUM	Select 0.1 PLC.
HIACCURACY	Select 10 PLC.
SET-SPEED-EXACTLY	Set integration time in PLC (0.01-10).
SET-BY-RSLN	Default to setting appropriate for resolution.
FILTER	Digital filter menu:
AUTO	Default to filter appropriate for integration time.
AVERAGING	Program a simple average filter (1-100 readings).
ADVANCED	Program a simple average filter (1-100 readings) with a noise tolerance window (0-100% of range).
AVERAGING-MODE	Select moving average or repeating average mode.
RESOLUTION	Display resolution menu:
AUTO	Default to resolution appropriate for integration time.
3.5d, 4.5d, 5.5d, 6.5d, 7.5d	Select a specific resolution.
MEASUREMENT-MODE	Measurement mode menu:
NORMAL	Select normal current measurement (use AMPS terminals).
IN-CIRCUIT	Select in-circuit current measurement (use INPUT and SENSE terminals).

Table 5. CONFIGURE ACI menu structure

Menu item	Description
SPEED	Measurement speed (integration time) menu:
NORMAL	Select 1 PLC (power line cycle, 16.67msec for 60Hz, 20msec for 50Hz and 400Hz).
FAST	Select 0.01 PLC.
MEDIUM	Select 0.1 PLC.
HIACCURACY	Select 10 PLC.
SET-SPEED-EXACTLY	Set integration time in PLC (0.01-10).
SET-BY-RSLN	Default to setting appropriate for resolution.
FILTER	Digital filter menu:
AUTO	Default to filter appropriate for integration time.
AVERAGING	Program a simple average filter (1-100 readings).
ADVANCED	Program a simple average filter (1-100 readings) with a noise tolerance window (0-100% of range).
AVERAGING-MODE	Select moving average or repeating average mode.
RESOLUTION	Display resolution menu:
AUTO	Default to resolution appropriate for integration time.
3.5d, 4.5d, 5.5d, 6.5d, 7.5d	Select a specific resolution.
COUPLING	Coupling menu:
AC	Select AC coupled measurements.
AC+DC	Select DC coupled measurements.
AC-TYPE	Type of ACI measurement menu:
RMS	Select true RMS ACI.
AVERAGE	Select average ACI.

Table 6. CONFIGURE OHMS-2W menu structure

Menu item	Description
SPEED	Measurement speed (integration time) menu:
NORMAL	Select 1 PLC (power line cycle, 16.67msec for 60Hz, 20msec for 50Hz and 400Hz).
FAST	Select 0.01 PLC.
MEDIUM	Select 0.1 PLC.
HIACCURACY	Select 10 PLC.
SET-SPEED-EXACTLY	Set integration time in PLC (0.01-10).
SET-BY-RSLN	Default to setting appropriate for resolution.
FILTER	Digital filter menu:
AUTO	Default to filter appropriate for integration time.
AVERAGING	Program a simple average filter (1-100 readings).
ADVANCED	Program a simple average filter (1-100 readings) with a noise tolerance window (0-100% of range).
AVERAGING-MODE	Select moving average or repeating average mode.
RESOLUTION	Display resolution menu:
AUTO	Default to resolution appropriate for integration time.
3.5d, 4.5d, 5.5d, 6.5d, 7.5d	Select a specific resolution.
OFFSETCOMP	Enable/disable offset compensation (20Ω-20kΩ ranges).
MAXAUTORANGE	Set upper limit for autoranging of 2-wire resistance.
1GΩ, 200MΩ, 20MΩ, 2MΩ, 200kΩ, 20kΩ	Select a specific range.

18

Table 7. CONFIGURE OHMS-4W menu structure

Menu item	Description
SPEED	Measurement speed (integration time) menu:
NORMAL	Select 1 PLC (power line cycle, 16.67msec for 60Hz, 20msec for 50Hz and 400Hz).
FAST	Select 0.01 PLC.
MEDIUM	Select 0.1 PLC.
HIACCURACY	Select 10 PLC.
SET-SPEED-EXACTLY	Set integration time in PLC (0.01-10).
SET-BY-RSLN	Default to setting appropriate for resolution.
FILTER	Digital filter menu:
AUTO	Default to filter appropriate for integration time.
AVERAGING	Program a simple average filter (1-100 readings).
ADVANCED	Program a simple average filter (1-100 readings) with a noise tolerance window (0-100% of range).
AVERAGING-MODE	Select moving average or repeating average mode.
RESOLUTION	Display resolution menu:
AUTO	Default to resolution appropriate for integration time.
3.5d, 4.5d, 5.5d, 6.5d, 7.5d	Select a specific resolution.
OFFSETCOMP	Enable/disable offset compensation (20Ω-20kΩ ranges).
MAXAUTORANGE	Set upper limit for autoranging of 4-wire resistance.
200kΩ, 20kΩ, 2kΩ	Select a specific range.

Table 8. CONFIGURE FREQUENCY menu structure

Menu item	Description
MAX-SIGNAL-LEVEL	Display maximum signal level menu:
1V, 10V, 100V, 1000V, TTL	Select maximum voltage level for voltage inputs.
1mA, 10mA, 100mA, 1A	Select maximum current level for current inputs.
RESOLUTION 4-DIGITS, 5-DIGITS	Display resolution menu: Select a specific resolution.
INPUT-TERMINALS	Input terminals for frequency measurements menu:
VOLTAGE	Select INPUT HI and INPUT LO terminals.
CURRENT	Select AMPS and INPUT LO terminals.
COUPLING AC	Coupling menu: Select AC coupled measurements.
AC+DC	Select DC coupled measurements.

Note: The maximum signal level menu is coupled to the input terminals menu, i.e., voltage levels are shown if voltage is the selected input.

Table 9. CONFIG TEMPERATURE menu structure

Menu item	Description
SENSOR	Sensor type menu:
4-WIRE-RTD	4-wire RTD type menu:
PT385	Select a PT385 type.
PT3916	Select a PT3916 type.
USER-RTD	Select desired R-zero, alpha, beta, and delta.
RTD	2-wire RTD type menu:
PT385	Select a PT385 type.
PT3916	Select a PT3916 type.
USER-RTD	Select desired R-zero, alpha, beta, and delta.
SENSOR	
THERMOCOUPLE	Thermocouple setup menu:
THERMOCOUPLE-TYPE	Select desired thermocouple type (J, K, T, E, R, S, B).
REF-JUNCTIONS	Configure reference junction menu (JN1 thru JN5):
CONFIGURE	Configure simulated or real junction.
ACQUIRE-REF-TEMP	Acquire reference temperature.
UNITS	Temperature units menu:
DEG-C, DEG-F, K	Select desired temperature units.
SPEED	Measurement speed (integration time) menu:
NORMAL	Select 1 PLC (power line cycle, 16.67msec for 60Hz, 20msec for 50Hz and 400Hz).
FAST	Select 0.01 PLC.
MEDIUM	Select 0.1 PLC.
HIACCURACY	Select 10 PLC.
SET-SPEED-EXACTLY	Set integration time in PLC (0.01-10).
SET-BY-RSLN	Default to setting appropriate for resolution.

Table 9. CONFIG TEMPERATURE menu structure (cont.)

Menu item	Description

FILTER
  AUTO
 	
  AVERAGING
 	
  AVERAGING-MODE
	Digital filter menu:
	  Default to filter appropriate for
	    integration time.
	  Select simple average filter
	    (1-100 readings).
	  Select moving average or
	    repeating average mode.

RESLN
  AUTO
 	
  1°, 0.1°, 0.01°, 0.001°
	Display resolution menu:
	  Default to resolution appropri-
	    ate for sensor.
	  Select a specific resolution.

Table 10. CONFIGURE TRIGGER menu structure

Menu item	Description
MEASURE	Measure layer menu:
SOURCE	Select measure source:
IMMEDIATE	Use to make measurements immediately.
EXTERNAL	Use external triggers to control measuring.
MANUAL	Use TRIG key to control measuring.
GPIB	Use bus triggers to control measuring.
TRIGLINK	Use Trigger Link triggers to control measuring. Enter Trigger Link mode and lines.
TIMER	Use a timer to control measuring and enter interval between triggers (0.001-999999.999sec).
HOLD	Use to hold up the measurement in the measure layer.
DELAY	Use to delay measurement in the measure layer (0.001-999999.999sec).
COUNT	Define number of measurements to make:
INFINITE	Repeat measuring indefinitely.
ENTER-CHAN-COUNT	Count = use defined value (1-99999).
CONTROL	Select trigger control mode:
SOURCE	Enable Source Bypass.
ACCEPTOR	Disable Source Bypass.

Table 10. CONFIGURE TRIGGER menu structure (cont.)

Menu item	Description
SCAN	Scan layer menu:
SOURCE	Select scan source:
IMMEDIATE	Use to pass operation immediately into the measure layer.
EXTERNAL	Use external triggers to control scanning.
MANUAL	Use TRIG key to control scanning.
GPIB	Use bus triggers to control scanning.
TRIGLINK	Use Trigger Link triggers to control scanning. Enter Trigger Link lines.
TIMER	Use a timer to control scanning and enter interval between scans (0.001-999999.999sec).
HOLD	Use to hold up the measurement in the scan layer.
DELAY	Use to delay scan in the scan layer (0.001-999999.999sec).
COUNT	Define number of scans to be performed:
INFINITE	Repeat scanning indefinitely.
ENTER-SCAN-COUNT	Count = user defined value (1-99999).
CONTROL	Select trigger control mode:
SOURCE	Enable Source Bypass.
ACCEPTOR	Disable Source Bypass.

Table 10. CONFIGURE TRIGGER menu structure (cont.)

Menu item	Description
ARM	Arm layer menu:
SOURCE	Select arm source:
IMMEDIATE	Use to arm meter immediately and pass operation into the scan layer.
EXTERNAL	Use external triggers to arm meter.
MANUAL	Use TRIG key to arm meter.
GPIB	Use bus triggers to arm meter.
TRIGLINK	Use Trigger Link triggers to arm meter. Enter Trigger Link lines.
HOLD	Use to hold up the measurement in the arm layer.
COUNT	Define number of times to arm meter:
INFINITE	Continuously re-arm meter.
ENTER-ARM-COUNT	User defined count value (1-99999).
CONTROL	Select trigger control mode:
SOURCE	Enable Source Bypass.
ACCEPTOR	Disable Source Bypass.
HALT	Use to halt triggers. Press TRIG key to resume triggering.

Table 11. CONFIG DATA STORE menu structure

Menu item	Description
BURST-MODE	Acquire 4.5-digit readings at 2000 readings/sec and store in buffer.
DATA-GROUP	Select data types to store in buffer.
FULL	Store reading, units, channel#, reading#, time-stamp, and status (overflow).
COMPACT	Store reading, units, reading#, and status (overflow).
CONTROL	Select type of buffer control.
FILL-AND-STOP	Fill buffer with readings and stop.
PRETRIGGER	Wait for pretrigger event; store before and after readings.
PERCENTAGE	Enter percentage of stored readings before trigger.
READING-COUNT	Enter count of stored readings before trigger.
EVENT	Select source for pretrigger event.
CONTINUOUS	Store readings in buffer continuously.
NEVER	Readings are not stored.
CLEAR-ALL	Clear all stored readings and buffer statistics.
COUNT	Select buffer size.
ENTER-COUNT	Enter number of readings to store.
USE-TRIGGER-MODEL	Use (finite) measure count from trigger model.
FEED	Select type of reading to store.
AFTER-CALC	Store readings after percent or mX+b calculation.
BEFORE-CALC	Store readings before percent or mX+b calculation.

Table 12. CONFIG FILTER menu structure

Menu item	Description
AUTO	Default to filter appropriate for measurement function and type.
AVERAGING	Program simple average filter (1-100 readings).
ADVANCED	Program simple average filter (1-100 readings), with a noise tolerance window (0-100% of range).
AVERAGING-MODE	Select moving average or repeating average mode.

Table 13. CONFIGURE MATH menu structure

Menu item	Description
NONE	Select no calculation when MATH key is pressed.
mX+b	Select mX+b calculation and enter constants.
PERCENT	Select percent calculation and enter target (reference) value.

Table 14. CHANNEL SELECTION menu structure

Menu item	Description
CLOSE-CHANNEL ENTER CHAN#01 (1-10)	Close channel menu: Use cursor, range, and ENTER keys.
OPEN-ALL-CHANNELS	Press ENTER to open closed channel(s).

Table 15. CONFIGURE CHANNELS menu structure

Menu item	Description

INTERNAL-CHANS
  SET INTERNAL CHANS
    1=DCV 2=DCV 3=DCV
    4=DCV 5=DCV
	Defines internal functions:
	  Use range and cursor keys
	    to select channels and
	    functions.

EXTERNAL INPUTS
 	
  # EXTERNAL INPUTS=80
 	
    DEFAULT
 	
  CHOOSE-FUNCTIONS
 	
    SELECT CHAN=01
 	
      CHANNEL #01 FUNCTION
	Sets number of external
	  channels and functions:
	  # of external channels (1-
	    80).
	    Selects default function
	      for all external chan-
	      nels.
	  Use to select channel
	    functions.
	    Select channel using
	      range and cursor
	      keys.
	      Select function using
	        cursor keys.

SAVE-ALT-FCN	Stores present function as alternate.
RESTORE-ALT-FUNCTION	Restores saved alternate function.

Table 16. SCAN OPERATION menu structure

Menu item	Description
INTERNAL	Enables internal scanning.
EXTERNAL	Enables external scanning.

RATIO
  MEASURE
  REFERENCE
  FUNCTION
	Enables ratio mode (internal).
	  Selects measure channel.
	  Selects reference channel.
	  Selects ratio function.

DELTA
  MEASURE
  REFERENCE
  FUNCTION
	Enables delta mode (internal).
	  Selects measure channel.
	  Selects reference channel.
	  Selects delta function.

Table 17. Main menu structure

Menu item	Description
SAVESETUP	Setup menu:
SAVE	Save setup at a memory location (up to 1, 5, or 10).
RESTORE	Return 2001 to setup stored at a memory location (up to 1, 5, or 10).
POWERON	Power-on Menu:
BENCH	Power on to bench default setup conditions.
GPIB	Power on to GPIB default setup conditions.
USER-SETUP-NUMBER	Power on to setup stored at a memory location (up to 1, 5, or 10).
RESET	Reset Menu:
BENCH	Return 2001 to bench default setup.
GPIB	Return 2001 to GPIB default setup.

Table 17. Main menu structure (cont.)

Menu item	Description

GPIB
  ADDRESSABLE
	GPIB/Printer Setup menu:
	  Check/change IEEE-488 bus
	    address (0-30).

TALK-ONLY	GPIB/Printer Talk-only mode menu:

FEED
      AFTER-CALC
	GPIB Output Feed menu:
	    Specify reading after math
	      operation.

BEFORE-CALC	Specify reading before math operation.

NONE
    INTERFACE
      IEEE-488
      CENTRONICS
	Specify no readings.
	Select printer interface.
	    Specify IEEE-488 printer.
	    Specify Centronics parallel
	      printer.

INTERVAL	Specify printing interval (every reading to 1 out of 9999).

FORMFEED
      CONTROL
      SET-PAGE-SETUP
	Formfeeds menu:
	    Enable/disable page breaks.
	    Set number line between
	      form feeds (1-255).

ELEMENTS	Select GPIB data elements (read-
	    ing, units, reading number,
	    channel number, timestamp,
	    status).

STATUS	Display IEEE-488 bus status byte.

CALIBRATION
  COMPREHENSIVE
  AC-ONLY-CAL
	Calibration menu:
	  Perform DC and AC calibration.
	  Perform AC calibration only
	    (open-circuit).

CALIBRATION-DATES	Check/change calibration date.

TEST
  BUILT-IN-TEST
    AUTOMATIC
    MANUAL
  DIAGNOSTICS
  FRONT-PANEL-TESTS
    KEYS
	Self-test menu:
	  Test analog and digital boards.
	    Run all tests automatically.
	    Select tests to run.
	  Factory diagnostic tests.
	  Test display board.
	    Verify operation of front panel
	      keys.

DISPLAY-PATTERNS	Verify operation of display.

Table 17. Main menu structure (cont.)

Menu item	Description
LIMITS	Limits menu:
LIMIT-SET-1	Limit-Set-1 menu:
CONTROL	Enable/disable limit set #1.
LOLIM1	Set value of low limit #1.
HILIM1	Set value of high limit #1.
LIMIT-SET-2	Limit-Set-2 menu:
CONTROL	Enable/disable limit set #2.
LOLIM2	Set value of low limit #2.
HILIM2	Set value of high limit #2.
STROBE-CONTROL	Enable/disable limit strobe signal of digital output #4 when trigger occurs.
PASS-PATTERN	Specify patterns on digital outputs to signify limits pass.
STATUS-MSG	Enable/disable status message mode.
GENERAL	General menu:
DIGITAL-I/O	Digital I/O menu:
OUTPUT-STATE	Check/change states of digital output lines.
OUTPUT-SENSE	Check/change sense of digital output lines.
INPUT	Read digital input line.
SERIAL#	Display serial number, memory option, SCPI version, and firmware revisions.
AUTOZERO	Disable or enable normal (after every reading) or synchronous (every 200ms) autozero mode.
GENERAL	
LINE-SYNC	Enable/disable line synchronization of measurements.
DECIMAL	Select period or comma for display of decimal point.

Default Conditions

Table 18. Factory default conditions

Function or operation	Bench default	GPIB default
AC current:		
AC-type	RMS	RMS
Coupling	AC	AC
Filter	Off	Off
Auto	On	Off
Averaging	Off	Off
Readings	10	10
Advanced	On	On
Readings	10	10
Noise tolerance level	5%	5%
Filter mode	Moving	Repeat
Range	Auto	Auto
Relative	Off	Off
Value	0.0	0.0
Resolution	Auto (5.5d)	Auto (5.5d)
Speed	Normal (1 PLC)	Normal (1 PLC)
AC voltage:		
AC-type	RMS	RMS
Peak spikes window	0.1sec	0.1sec
Coupling	AC	AC
Filter	Off	Off
Auto	On	Off
Averaging	Off	Off
Readings	10	10
Advanced	On	On
Readings	10	10
Noise tolerance level	5%	5%
Filter mode	Moving	Repeat
Range	Auto	Auto
Relative	Off	Off
Value	0.0	0.0
Resolution	Auto (5.5d)	Auto (5.5d)
Speed	Normal (1 PLC)	Normal (1 PLC)
Units	Volts	Volts
dB reference	1V	1V
dBm reference	75Ω	75Ω
Autozero	On (Normal)	On (Normal)

Table 18. Factory default conditions (cont.)

Function or operation	Bench default	GPIB default
Buffer:		
Burst mode	No effect	No effect
Control	No effect	No effect
Count	No effect	No effect
Data group	No effect	No effect
Feed	No effect	No effect
DC current:		
Filter	On	Off
Auto	On	Off
Averaging	Off	Off
Readings	10	10
Advanced	On	On
Readings	10	10
Noise tolerance level	1%	1%
Filter mode	Moving	Repeat
Measurement mode	Normal	Normal
Range	Auto	Auto
Relative	Off	Off
Value	0.0	0.0
Resolution	Auto (6.5d)	Auto (6.5d)
Speed	Normal (1 PLC)	Normal (1 PLC)
DC voltage:		
Filter	On	Off
Auto	On	Off
Averaging	Off	Off
Readings	10	10
Advanced	On	On
Readings	10	10
Noise tolerance level	1%	1%
Filter mode	Moving	Repeat
Range	Auto	Auto
Relative	Off	Off
Value	0.0	0.0
Resolution	Auto (6.5d)	Auto (6.5d)
Speed	Normal (1 PLC)	Normal (1 PLC)
Digital I/O:		
Output states	No effect	No effect
Output sense	No effect	No effect
Frequency:		
Coupling	AC	AC
Maximum signal level:		
Function	Voltage	Voltage
Voltage level	10V	10V
Current level	1mA	1mA

Table 18. Factory default conditions (cont.)

Function or operation	Bench default	GPIB default
Frequency:		
Relative	Off	Off
Value	0.0	0.0
Resolution	Auto (5d)	Auto (5d)
Terminals	Voltage	Voltage
Trigger level	0.0	0.0
Function	DCV	DCV
Limits:		
Limit set #1	Off	Off
Low limit #1	-1.0	-1.0
Low limit #1 action	0	0
High limit #1	1.0	1.0
High limit #1 action	0	0
Limit set #2	Off	Off
Low limit #2	-1.0	-1.0
Low limit #2 action	0	0
High limit #2	1.0	1.0
High limit #2 action	0	0
Strobe control	Off	Off
Pass pattern	0	0
Line synchronization	Off	Off
Math	Off	Off
Function	Percent	Percent
Reference for percent	1.0	1.0
Scale factor for mX+b	1.0	1.0
Offset for mX+b	0.0	0.0
Resistance (2-wire):		
Filter	On	Off
Auto	On	Off
Averaging	Off	Off
Readings	10	10
Advanced	On	On
Readings	10	10
Noise tolerance level	1%	1%
Filter mode	Moving	Repeat
Offset compensation	Off	Off
Range	Auto	Auto
Maximum autorange	1GΩ	1GΩ
Relative	Off	Off
Value	0.0	0.0
Resolution	Auto (6.5d)	Auto (6.5d)
Speed	Normal (1 PLC)	Normal (1 PLC)

Table 18. Factory default conditions (cont.)

Function or operation	Bench default	GPIB default
Resistance (4-wire):		
Filter	On	Off
Auto	On	Off
Averaging	Off	Off
Readings	10	10
Advanced	On	On
Readings	10	10
Noise tolerance level	1%	1%
Filter mode	Moving	Repeat
Offset compensation	Off	Off
Range	Auto	Auto
Maximum autorange	200kΩ	200kΩ
Relative	Off	Off
Value	0.0	0.0
Resolution	Auto (6.5d)	Auto (6.5d)
Speed	Normal (1 PLC)	Normal (1 PLC)
Scanning:		
Channels	No effect	No effect
Scan list:		
Internal list	No channels	No channels
External list	No channels	No channels
Function	DC voltage	DC voltage
Scan operation	None	None
Ratio:		
Reference channel	5	5
Measure channel	10	10
Function	DC voltage	DC voltage
Delta:		
Reference channel	5	5
Measure channel	10	10
Function	DC voltage	DC voltage

Table 18. Factory default conditions (cont.)

Function or operation	Bench default	GPIB default
Temperature:		
Filter	On	Off
Auto	On	Off
Averaging	On	On
Readings	10	10
Filter mode	Moving	Repeat
Relative	Off	Off
Value	0.0	0.0
Resolution	Auto (0.01°C)	Auto (0.01°C)
RTDs:		
Type	PT385	PT385
Resistance at 0°C	100Ω	100Ω
Alpha	0.00385	0.00385
Beta	0.111	0.111
Delta	1.507	1.507
Temperature:		
Sensor	4-wire RTD	4-wire RTD
Speed	Normal (1 PLC)	Normal (1 PLC)
Thermocouples:		
Type	J	J
Reference junction	Simulated	Simulated
Default temperature	23°C	23°C
Real junction temp. coefficient	10mV/°C	10mV/°C
Offset	0mV @ 0°C	0mV @ 0°C
Units	°C	°C

Table 18. Factory default conditions (cont.)

Function or operation	Bench default	GPIB default
Triggers:	Armed	Idled
Arm layer:		
Source	Immediate	Immediate
Triglink input	Line 2	Line 2
Triglink output	Line 1	Line 1
Count	1	1
Control	Acceptor	Acceptor
Scan layer:		
Source	Immediate	Immediate
Triglink input	Line 2	Line 2
Triglink output	Line 1	Line 1
Delay	0	0
Count	Infinite	1
Control	Acceptor	Acceptor
Measure layer:		
Source	Immediate	Immediate
Triglink mode	Asynchronous	Asynchronous
Triglink input	Line 2	Line 2
Triglink output	Line 1	Line 1
Timer	0.1sec	0.1sec
Delay	0	0
Count	Infinite	1
Control	Acceptor	Acceptor

Table 19. *RST and :SYSTem:PRESet

Command	*RST	:SYSTem:PRESet
IEEE 488.2 common commands		
All commands	[unaffected]	[unaffected]
SCPI signal oriented commands		
:CONFigure	"VOLT:DC"	"VOLT:DC"
Calculate 1 subsystem		
:CALCulate1		
:STATe	0 (OFF)	0 (OFF)
:FORMat	PERCent	PERCent
:MMFactor	1.0	1.0
:MBFactor	0.0	0.0
:PERCent	1.0	1.0
Calculate 2 subsystem		
:CALCulate2		
:STATe	0 (OFF)	0 (OFF)
:FORMat	NONE	NONE
Calculate 3 subsystem		
:CALCulate3		
:LIM1		
:STATe	0 (OFF)	0 (OFF)
:UPPer		
:DATA	1.0	1.0
:SOURce	0	0
:LOWer		
:DATA	-1.0	-1.0
:SOURce	0	0
:CLEar		
:AUTO	1 (ON)	1 (ON)
:LIM2		
:STATe	0 (OFF)	0 (OFF)
:UPPer		
:DATA	1.0	1.0
:SOURce	0	0
:LOWer		
:DATA	-1.0	-1.0
:SOURce	0	0
:CLEar		
:AUTO	1 (ON)	1 (ON)

Table 19. *RST and :SYSTem:PRESet (cont.)

Command	*RST	:SYSTem:PRESet
:CALCulate3		
:BSTRobe		
:STATe	0 (OFF)	0 (OFF)
:PASS		
:SOURce	0	0
Calibration subsystem		
All commands	[unaffected]	[unaffected]
Display subsystem		
:DISPlay		
:SMESsage	0 (OFF)	0 (OFF)
:WINDow1		
:TEXT		
:STATe	[unaffected]	[unaffected]
:DATA	[unaffected]	[unaffected]
:WINDow2		
:TEXT		
:STATe	[unaffected]	[unaffected]
:DATA	[unaffected]	[unaffected]
:ENABle	[unaffected]	[unaffected]
Format subsystem		
:FORMat		
:DATA	ASCII	ASCII
:BORDer	SWAPped	SWAPped
:ELEMents	READing	all
Output commands		
All commands	[unaffected]	[unaffected]
Route subsystem		
:ROUTe		
:CLOSe	[unaffected]	[unaffected]
:OPEN	[unaffected]	[unaffected]
:SCAN		
:INTernal	empty	empty
:FUNCtion	all "VOLT:DC"	all "VOLT:DC"
:EXTernal	empty	empty
:FUNCtion	all "VOLT:DC"	all "VOLT:DC"

Table 19. *RST and :SYSTem:PRESet (cont.)

Command	*RST	:SYSTem:PRESet
:ROUTe		
:SCAN		
:RATio		
:RCHannel	5	5
:MCHannel	10	10
:FUNCtion	"VOLT:DC"	"VOLT:DC"
:DELTa		
:RCHannel	5	5
:MCHannel	10	10
:FUNCtion	"VOLT:DC"	"VOLT:DC"
:LSELect	NONE	NONE
Sense commands		
:SENSe1		
:FUNCtion	"VOLT:DC"	"VOLT:DC"
AC current commands		
:SENSe1		
:CURRent		
:AC		
:APERture	1/LineFreq	1/LineFreq
:AUTO	0 (OFF)	0 (OFF)
:NPLCycles	1	1
:AUTO	0 (OFF)	0 (OFF)
:COUPling	AC	AC
:RANGe		
:UPPer	2.1	2.1
:AUTO	1 (ON)	1 (ON)
:ULIMit	2.1	2.1
:LLIMit	2.0E-4	2.0E-4
:REFerence	0.0	0.0
:STATe	0 (OFF)	0 (OFF)
:DIGits	6	6
:AUTO	1 (ON)	1 (ON)
:AVERage		
:STATe	0 (OFF)	0 (OFF)
:AUTO	0 (OFF)	1 (ON)
:COUNt	10	10
:TCONtrol	REPeat	MOVing
:ADVanced		
:STATe	1 (ON)	1 (ON)
:NTOLerance	5	5
:DETector		
:FUNCtion	RMS	RMS

*Table 19. *RST and :SYSTem:PRESet (cont.)*

Command	*RST	:SYSTem:PRESet
DC current commands		
:SENSe1		
:CURRent		
:DC		
:APERture	1/LineFreq	1/LineFreq
:AUTO	0 (OFF)	0 (OFF)
:NPLCycles	1	1
:AUTO	0 (OFF)	0 (OFF)
:RANGe		
:UPPer	2.1	2.1
:AUTO	1 (ON)	1 (ON)
:ULIMit	2.1	2.1
:LLIMit	2.0E-4	2.0E-4
:REFerence	0.0	0.0
:STATe	0 (OFF)	0 (OFF)
:DIGits	7	7
:AUTO	1 (ON)	1 (ON)
:AVERage		
:STATe	0 (OFF)	1 (ON)
:AUTO	0 (OFF)	1 (ON)
:COUNt	10	10
:TCONtrol	REPeat	MOV
:ADVanced		
:STATe	1 (ON)	1 (ON)
:NTOLerance	1	1
:METHod	NORMal	NORMal
AC voltage commands		
:SENSe1		
:VOLTage		
:AC		
:APERture	1/LineFreq	1/LineFreq
:AUTO	0 (OFF)	0 (OFF)
:NPLCycles	1	1
:AUTO	0 (OFF)	0 (OFF)
:COUPling	AC	AC
:RANGe		
:UPPer	775	775
:AUTO	1 (ON)	1 (ON)
:ULIMit	775	775
:LLIMit	.2	.2
:REFerence	0.0	0.0
:STATe	0 (OFF)	0 (OFF)

Table 19. *RST and :SYSTem:PRESet (cont.)

Command	*RST	:SYSTem:PRESet
:SENSe1		
:VOLTage		
:AC		
:DIGits	6	6
:AUTO	1 (ON)	1 (ON)
:AVERage		
:STATe	0 (OFF)	0 (OFF)
:AUTO	0 (OFF)	1 (ON)
:COUNt	10	10
:TCONtrol	REPeat	MOVing
:ADVanced		
:STATe	1 (ON)	1 (ON)
:NTOLerance	5	5
:DETector	RMS	RMS
:FUNCtion	0.1	0.1
DC voltage commands		
:SENSe1:		
:VOLTage		
:DC		
:APERture	1/LineFreq	1/LineFreq
:NPLCycle	1	1
:AUTO	0 (OFF)	0 (OFF)
:RANGe		
:UPPer	1100	1100
:AUTO	1 (ON)	1 (ON)
:ULIMit	1100	1100
:LLIMit	.2	.2
:REFerence	0.0	0.0
:STATe	0 (OFF)	0 (OFF)
:DIGits	7	7
:AUTO	1 (ON)	1 (ON)
:AVERage		
:STATe	0 (OFF)	1 (ON)
:AUTO	0 (OFF)	1 (ON)
:COUNt	10	10
:TCONtrol	REPeat	MOVing
:ADVanced		
:STATe	1 (ON)	0 (OFF)
:NTOLerance	1	1

*Table 19. *RST and :SYSTem:PRESet (cont.)*

Command	*RST	:SYSTem:PRESet
Frequency commands		
:SENSe1		
:FREQuency		
:COUPling	AC	AC
:REFerence	0.0	0.0
:STATe	0 (OFF)	0 (OFF)
:DIGits	5	5
:THReshold		
:VOLTage		
:LEVel	0	0
:RANGe	10	10
:CURRent		
:LEVel	0	0
:RANGe	1.0E-3	1.0E-3
:SOURce	VOLTage	VOLTage
2-wire resistance commands		
:SENSe1		
:RESistance		
:APERture	1/LineFreq	1/LineFreq
:AUTO	0 (OFF)	0 (OFF)
:NPLCycles	1	1
:AUTO	0 (OFF)	0 (OFF)
:RANGe		
:UPPer	1.1E+9	1.1E+9
:AUTO	1 (ON)	1 (ON)
:ULIMit	1.1E+9	1.1E+9
:LLIMit	20	20
:REFerence	0.0	0.0
:STATe	0 (OFF)	0 (OFF)
:DIGits	7	7
:AUTO	1 (ON)	1 (ON)
:OCOMpensated	0 (OFF)	0 (OFF)
:AVERage		
:STATe	0 (OFF)	1 (ON)
:AUTO	0 (OFF)	1 (ON)
:COUNt	10	10
:TCONtrol	REPeat	MOVing
:ADVanced		
:STATe	1 (ON)	1 (ON)
:NTOLerance	1	1

Table 19. *RST and :SYSTem:PRESet (cont.)

Command	*RST	:SYSTem:PRESet
4-wire resistance commands		
:SENSe1		
:FRESistance		
:APERture	1/LineFreq	1/LineFreq
:AUTO	0 (OFF)	0 (OFF)
:NPLCycles	1	1
:AUTO	0 (OFF)	0 (OFF)
:RANGe		
:UPPer	2.1E+5	2.1E+5
:AUTO	1 (ON)	1 (ON)
:ULIMit	2.1E+5	2.1E+5
:LLIMit	20	20
:REFerence	0.0	0.0
:STATe	0 (OFF)	0 (OFF)
:DIGits	7	7
:AUTO	1 (ON)	1 (ON)
:OCOMpensated	0 (OFF)	0 (OFF)
:AVERage		
:STATe	0 (OFF)	1 (ON)
:AUTO	0 (OFF)	1 (ON)
:COUNt	10	10
:TCONtrol	REPeat	MOVing
:ADVanced		
:STATe	1 (ON)	1 (ON)
:NTOLerance	1	1
Temperature commands		
:SENSe1		
:TEMPerature		
:APERture	1/LineFreq	1/LineFreq
:AUTO	0 (OFF)	0 (OFF)
:NPLCycles	1	1
:AUTO	0 (OFF)	0 (OFF)
:REFerence	0.0	0.0
:STATe	0 (OFF)	0 (OFF)
:DIGits	6	6
:AUTO	1 (ON)	1 (ON)
:AVERage		
:STATe	0 (OFF)	1 (ON)
:AUTO	0 (OFF)	1 (ON)
:COUNt	10	10
:TCONtrol	REPeat	MOVing
:RJUNction1		
:RSELect	SIMulated	SIMulated

Table 19. *RST and :SYSTem:PRESet (cont.)

Command	*RST	:SYSTem:PRESet
:SENSe1		
:TEMPerature		
:RJUNction1		
:SIMulated	23(˚C)	23(˚C)
:REAL		
:TCOefficient	0.01	0.01
:OFFSet	0.01	0.01
:RJUNction2		
:RSELect	SIMulated	SIMulated
:SIMulated	23(˚C)	23(˚C)
:REAL		
:TCOefficient	0.01	0.01
:OFFSet	0.01	0.01
:RJUNction3		
:RSELect	SIMulated	SIMulated
:SIMulated	23(˚C)	23(˚C)
:REAL		
:TCOefficient	0.01	0.01
:OFFSet	0.01	0.01
:RJUNction4		
:RSELect	SIMulated	SIMulated
:SIMulated	23(˚C)	23(˚C)
:REAL		
:TCOefficient	0.01	0.01
:OFFSet	0.01	0.01
:RJUNction5		
:RSELect	SIMulated	SIMulated
:SIMulated	23(˚C)	23(˚C)
:REAL		
:TCOefficient	0.01	0.01
:OFFSet	0.01	0.01
:TRANsducer	FRTD	FRTD
:RTD		
:TYPE	PT385	PT385
:ALPHa	0.00385	0.00385
:BETA	0.111	0.111
:DELTa	1.507	1.507
:RZERo	100.0	100.0
:TCouple		
:TYPE	J	J
Source subsystem		
All commands	[unaffected]	[unaffected]

Table 19. *RST and :SYSTem:PRESet (cont.)

Command	*RST	:SYSTem:PRESet
System subsystem		
:SYSTem		
:KEY	[unaffected]	[unaffected]
:AZERo		
:STATe	1 (ON)	1 (ON)
:TYPE	NORMal	NORMal
:LSYNc		
:STATe	0 (OFF)	0 (OFF)
:POSetup	[unaffected]	[unaffected]
:AMEThod	NORMal	NORMal
:FETCh		
:FORMat	[unaffected]	[unaffected]
Trigger subsystem		
:INITiate		
:CONTinuous	0 (OFF)	1 (ON)
:ARM:SEQuence1		
:LAYer1		
:COUNt	1	1
:SOURce	IMMediate	IMMediate
:TCONfigure		
:DIRection	ACCeptor	ACCeptor
:ASYNchronous		
:ILINe	2	2
:OLINe	1	1
:LAYer2		
:COUNt	1	INF
:DELay	0	0
:SOURce	IMMediate	IMMediate
:TIMer	0.1	0.1
:TCONfigure		
:DIRection	ACCeptor	ACCeptor
:ASYNchronous		
:ILINe	2	2
:OLINe	1	1
:TRIGger		
:SEQuence1		
:COUNt	1	INF
:DELay	0	0
:SOURce	IMMediate	IMMediate
:TIMer	0.1	0.1
:TCONfigure		
:PROTcol	ASYNchronous	ASYNchronous
:DIRection	ACCeptor	ACCeptor

*Table 19. *RST and :SYSTem:PRESet (cont.)*

Command	*RST	:SYSTem:PRESet

:TRIGger
  :SEQuence1
    :TCONfigure
      :ASYNchronous
        :ILINe
        :OLINe
      :SSYNchronous
        :LINE
	2
	1
	
	1
		2
		1
		
		1

Status subsystem		
All commands	[unaffected]	[unaffected]
Trace subsystem		
All commands	[unaffected]	[unaffected]
Unit commands		

:UNIT
  :TEMPerature
  :VOLTage
    :AC
      :DB
        :REFerence
      :DBM
        :IMPedance
	C
	
	V
	
	1
	
	75
		C
		
		V
		
		1
		
		75

Error and Status Messages

Table 20. Error and status messages

Number	Description	Event
+900	"Internal System Error"	EE
+611	"Questionable Temperature"	SE
+610	"Questionable Calibration"	SE
+515	"Calibration dates lost"	EE
+514	"DC calibration data lost"	EE
+513	"AC calibration data lost"	EE
+512	"Power-on state lost"	EE
+511	"GPIB address lost"	EE
+510	"Reading buffer data lost"	EE
+444 to +350	Calibration Errors (see Calibration Manual)	EE
+312	"Buffer Pretriggered"	SE
+310	"Buffer full"	SE
+309	"Buffer half full"	SE
+308	"Buffer Available"	SE
+306	"Reading Available"	SE
+305	"High limit 2 event"	SE
+304	"Low limit 2 event"	SE
+303	"High limit 1 event"	SE
+302	"Low limit 1 event"	SE
+301	"Reading overflow"	SE
+174	"Re-entering the idle layer"	SE
+173	"Waiting in arm layer 2"	SE
+172	"Waiting in arm layer 1"	SE
+171	"Waiting in trigger layer"	SE
+161	"Program running"	SE
+126	"Device calculating"	SE
+125	"Device measuring"	SE
+124	"Device sweeping"	SE
+123	"Device ranging"	SE
+122	"Device settling"	SE
+121	"Device calibrating"	SE
+101	"Operation Complete"	SE
+000	"No Error"	SE

Table 20. Error and status messages (cont.)

Number	Description	Event
SE = Status event		
EE = Error event		
-100	"Command Error"	EE
-101	"Invalid Character"	EE
-102	"Syntax Error"	EE
-103	"Invalid Separator"	EE
-104	"Data Type Error"	EE
-105	"GET not allowed"	EE
-108	"Parameter not allowed"	EE
-109	"Missing Parameter"	EE
-110	"Command Header Error"	EE
-111	"Command Header Separator Error"	EE
-112	"Program mnemonic too long"	EE
-113	"Undefined header"	EE
-114	"Header suffix out of range"	EE
-120	"Numeric data error"	EE
-121	"Invalid character in number"	EE
-123	"Exponent too large"	EE
-124	"Too many digits in number"	EE
-128	"Numeric data not allowed"	EE
-140	"Character data error"	EE
-141	"Invalid character data"	EE
-144	"Character data too long"	EE
-148	"Character data not allowed"	EE
-150	"String data error"	EE
-151	"Invalid string data"	EE
-154	"String too long"	EE
-158	"String data not allowed"	EE
-160	"Block data error"	EE
-161	"Invalid block data"	EE
-168	"Block data not allowed"	EE
-170	"Expression error"	EE
-171	"Invalid expression"	EE
-178	"Expression data not allowed"	EE
-200	"Execution error"	EE
-201	"Invalid while in local"	EE
-202	"Settings lost due to rtl" (return to local)	EE

SE = Status event
EE = Error event

Table 20. Error and status messages (cont.)

| Number	Description	Event
-210	"Trigger error"	EE
-211	"Trigger ignored"	EE
-212	"Arm ignored"	EE
-213	"Init ignored"	EE
-214	"Trigger deadlock"	EE
-215	"Arm deadlock"	EE
-220	"Parameter Error"	EE
-221	"Settings conflict"	EE
-222	"Parameter data out of range"	EE
-223	"Too much data"	EE
-224	"Illegal parameter value"	EE
-230	"Data corrupt or stale"	EE
-241	"Hardware missing"	EE
-260	"Expression Error"	EE
-314	"Save/recall memory lost"	EE
-330	"Self Test failed"	EE
-350	"Queue overflow"	EE
-410	"Query interrupted"	EE
-420	"Query unterminated"	EE
-430	"Query deadlocked"	EE
-440	"Query unterminated after indefinite response"	EE

SE = Status event
EE = Error event
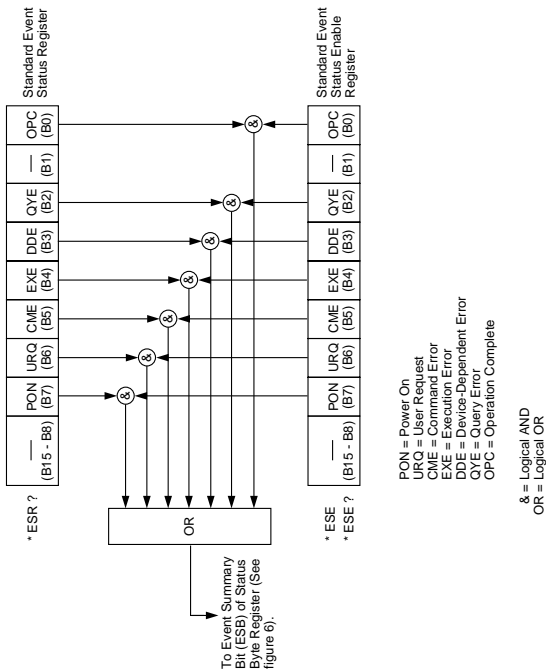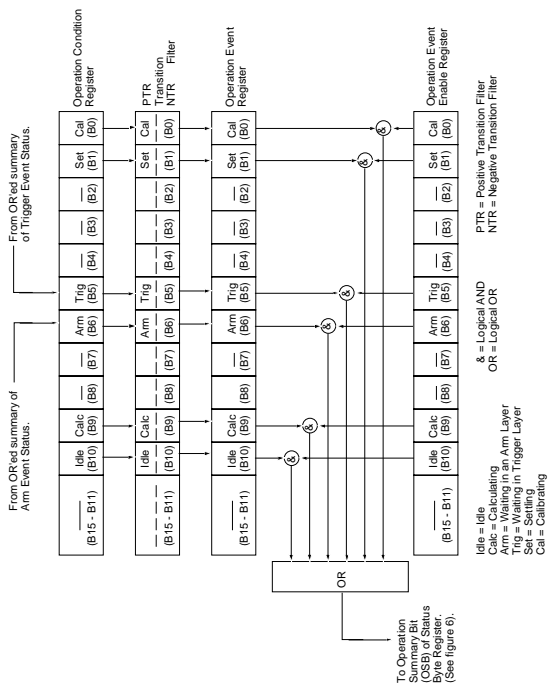
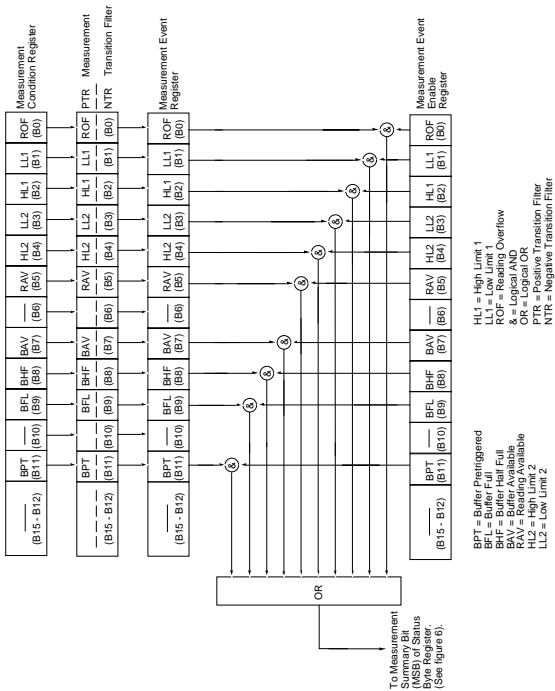*Figure 2. Standard event status*

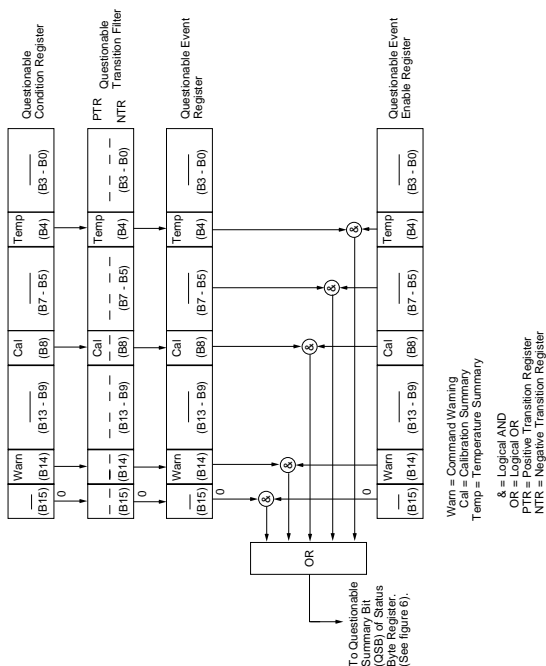*Figure 3. Operation event status*

Figure 4. Measurement event status

53

Figure 5. Questionable event status

54
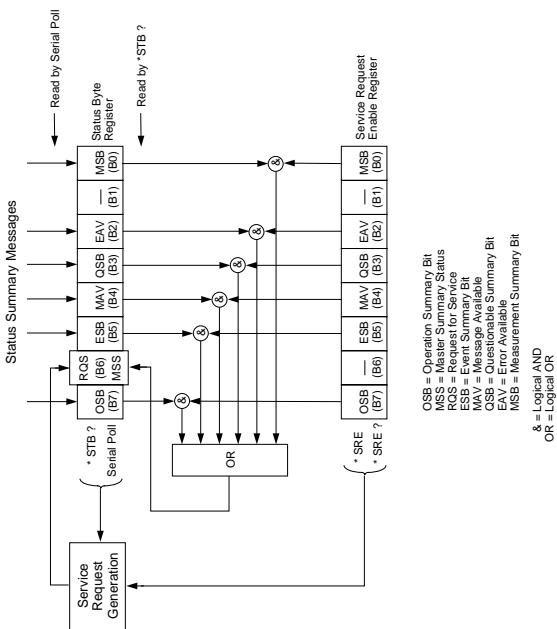
Figure 6. Status byte and service request (SRQ)

OSB = Operation Summary Bit
MSS = Master Summary Status
RQS = Request for Service
ESB = Event Summary Bit
MAV = Message Available
QSB = Questionable Summary Bit
EAV = Error Available
MSB = Measurement Summary Bit

& = Logical AND
OR = Logical OR

IEEE-488.2 Common Commands and Queries

Table 21. IEEE-488.2 common commands and queries

Mnemonic	Name	Description
*CLS	Clear status	Clears all event registers, and Error Queue.
*ESE <NRf>	Event Enable command	Sets Standard Event Enable Register.
*ESE?	Event Enable query	Reads Standard Event Enable Register.
*ESR?	Event status register query	Reads Standard Event Status Register and clears it.
*IDN?	Identification query	Reads ID information of instrument.
*OPC	Operation complete command	Sets the OPC bit in the Standard Event Status Register after all pending commands have been executed.
*OPC?	Operation complete query	Places an ASCII "1" into the output queue when all pending selected device operations have been completed.
*OPT?	Option identification query	Reads ID code of options present (memory, scanner).
*RCL <NRf>	Recall command	Returns the 2001 to the setup configuration stored in the designated memory location.
*RST	Reset command	Returns the 2001 to the *RST default conditions.
*SAV <NRf>	Save command	Saves the current setup configuration to the designated memory location.
*SRE <NRf>	Service request enable command	Sets Service Request Enable Register.

*Table 21. IEEE-488.2 common commands and queries
(cont.)*

Mnemonic	Name	Description
*SRE?	Service request enable query	Reads Service Request Enable Register.
*STB?	Read status byte query	Reads Status Byte Register.
*TRG	Trigger command	Issues a bus trigger.
*TST?	Self-test query	Performs a checksum test on ROM and return the results.
*WAI	Wait-to-continue command	Wait until all previous commands are executed.

SCPI Command Subsystems

Notes:

1. Brackets ([ ]) are used to denote optional character sets. These optional characters do not have to be included in the program message. Do not use brackets ([ ]) in the program message.

2. Angle brackets (< >) are used to indicate parameter type. Do not use angle brackets (< >) in the program message.

3. Upper case characters indicate the short-form version for each command word.

Table 22. Signal oriented measurement commands

Command	Description
:FETCh?	Requests the latest reading (SCPI) or a fresh reading (FRESh).
:CONFigure:<function>	Places the 2001 in a "one-shot" measurement mode for the specified function.
:READ?	Performs an :ABORt, :INITiate, and a FETCh?.
:MEASure[:<function>]?	Performs an :ABORt, :CONFigure :<function>, and a :READ?.

Table 23. Calculate command summary

Command	Description

:CALCulate[1]
  :FORMat <name>
	Subsystem to control CALC 1:
	    Select math format: MXB, PERCent, NONE.

:FORMat?
  :KMATh
    :MMFactor <NRf>
	Query math format.
	    Path to configure math calculations:
	      Specify "m" for mX+b
	      (-9.999999e20 to
	      +9.999999e20).

:MMFactor?
    :MBFactor <NRf>
	Query "m" factor.
	      Specify "b" for mX+b
	      (-9.999999e30 to
	      +9.999999e30).

Table 23. Calculate command summary (cont.)

Command	Description
:CALCulate[1]	
:KMATh	
:MBFactor?	Query "b" factor.
:PERCent <NRf>	Set PERCENT value (-9.999999e35 to +9.999999e35).
:PERCent?	Query PERCENT.
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) calculation.
:STATe?	Query state of math function.
:DATA?	Read math result of CALC 1.
:IMMediate	Recalculate input data.
:CALCulate2	Subsystem to control CALC 2:
:FORMat <name>	Select math format: MEAN, SDEViation, MAXimum, MINimum, PKPK, NONE.
:FORMat?	Query math format.
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) calculation.
:STATe?	Query state of math function.
:IMMediate	Recalculate raw input data in buffer.
:DATA?	Read math result of CALC 2.
:CALCulate3	Subsystem to control CALC 3 (limit tests):
:LIMit[1]	Path to control LIMIT 1 test:
:UPPer	Path to configure upper limit:
[:DATA] <n>	Specify upper limit (-9.999999e35 to +9.999999e35).
[:DATA]?	Query upper limit.
:SOURce <NRf>	Specify digital output (0 to 15).
:SOURce?	Query source.
:LOWer	Path to configure lower limit:
[:DATA] <n>	Specify lower limit (-9.999999e35 to +9.999999e35).
[:DATA]?	Query lower limit.
:SOURce <NRf>	Specify digital output (0 to 15).
:SOURce?	Query source.
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) limit test.
:STATe?	Query state of limit test.
:FAIL?	Query test result (1 = pass, 0 = fail).
:CLEAR	Path to clear failed test:

Table 23. Calculate command summary (cont.)

Command	Description
:CALCulate3	
:LIMit[1]	
:CLEAR	
[:IMMediate]	Clear failed test indication.
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto clear.
:AUTO?	Query auto clear.
:LIMit2	Path to control LIMIT 2 test:
:UPPer	Path to configure upper limit:
[:DATA] <n>	Specify upper limit (-9.999999e35 to +9.999999e35).
[:DATA]?	Query upper limit.
:SOURce <NRf>	Specify digital output (0 to 15).
:SOURce?	Query source (digital output value).
:LOWer	Path to configure lower limit:
[:DATA] <n>	Specify lower limit (-9.999999e35 to +9.999999e35).
[:DATA]?	Query lower limit.
:SOURce <NRf>	Specify digital output (0 to 15).
:SOURce?	Query source (digital output value).
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) limit test.
:STATe?	Query state of limit test.
:FAIL?	Query test result (1 = pass, 0 = fail).
:CLEAR	Path to clear failed test:
[:IMMediate]	Clear failed test indication.
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto clear.
:AUTO?	Query auto clear.
:PASS	Path to define "pass" digital output pattern.
:SOURce <NRf>	Specify digital output (0 to 15).
:CLIMits	Command path for composite limits:
:FAIL?	Query composite result of LIMIT 1 and LIMIT 2 tests (1 = pass, 0 = fail).
:BSTRobe	Path to control limit binning strobe:
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) strobe.
:STATe?	Query state of binning strobe.
:IMMediate	Re-perform limit tests.

60

Table 24. CALibrate command summary

Command	Description
:CALibration	Calibration root command.
:PROTected	All commands in this subsystem are protected by the CAL switch.
:LOCK	Lock out calibration (opposite of enabling cal with CAL switch).
:SWITch?	Request comprehensive CAL switch state. (0 = locked; 1 = unlocked)
:SAVE	Save cal constants to EEPROM.
:DATA?	Download cal constants from 2001.
:DATE "<string>"	Send cal date to 2001.
:DATE?	Request cal date from 2001.
:NDUE "<string>"	Send next due cal date to 2001.
:NDUE?	Request next due cal date from 2001.
:LLEVel	Low-level calibration subsystem.
:SWITch?	Request low-level CAL switch state. (0 = locked; 1 = unlocked)
:STEP <Step #>	
1	20V AC at 1kHz step.
2	20V AC at 30kHz step.
3	200V AC at 1kHz step.
4	200V AC at 30kHz step.
5	1.5V AC at 1kHz step.
6	0.2V AC at 1kHz step.
7	5mV AC at 100kHz step.
8	0.5mV AC at 1kHz step.
9	+2V DC step.
10	-2V DC step.
11	0V DC step.
12	20mA AC at 1kHz step.
13	+0.2A DC step.
14	+2A DC step.
15	2V AC at 1Hz step.
:STEP?	Request the current calibration step.
:CALCulate	Calculate low-level cal constants.

61

Table 24. CALibrate command summary (cont.)

Command	Description
:CALibration	
:PROTected	
:DC	User calibration subsystem.
:ZERO	Low-thermal short calibration step.
:LOW <NRf>	+2V DC calibration step.
:HIGH <NRf>	+20V DC calibration step.
:LOHM <NRf>	20kΩ calibration step.
:HOHM <NRf>	1MΩ calibration step.
:OPEN	Open circuit calibration step.
:CALCulate	Calculate DC cal constants.
:UNPRotected	All commands in this subsystem are not protected by CAL switch.
:ACCompensation	Perform user AC calibration (disconnect all cables).

Table 25. DISPlay command summary

Command	Description
:DISPlay	
[:WINDow[1]]	Path to locate message to top display.
:TEXT	Path to control user text messages.
:DATA <a>	Define ASCII message "a" using up to 20 characters.
:DATA?	Query text message.
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) message mode.
:STATe?	Query text message mode (0 or 1).
:DATA?	Query data on top portion of display.
:WINDow2	Path to locate message to bottom display.
:TEXT	Path to control user text messages.
:DATA <a>	Define ASCII message "a" using up to 32 characters.
:DATA?	Query text message.
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) message mode.
:STATe?	Query text message mode (0 or 1).
:DATA?	Query data on bottom portion of display.

Table 25. DISPlay command summary (cont.)

Command	Description
:DISPlay	
:CNDisplay	Clear NEXT (or PREV) display messages and cancel associated operations.
:SMESsage <b>	Enable (1 or ON) or disable (0 or OFF) status message mode.
:SMESsage?	Query status message mode (0 or 1).
:ENABle <b>	Turn on (1 or ON) or turn off (0 or OFF) the front panel display.
:ENABle?	Query state of the display (0 or 1).

Table 26. FORMat command summary

Command	Description
:FORMat	
[:DATA] <type>[,<length>]	Select data format: ASCii REAL, 32 REAL, 64 SREal DREal
[:DATA]?	Query data format.
:ELEMents <item list>	Specify data elements: READing, CHANnel, RNUMber, UNITs, TIMEstamp and STATus.
:ELEMents?	Query data elements.
:BORDer <name>	Select binary byte order: NORMal, SWAPped.
:BORDer?	Query byte order.

Table 27. OUTPut command summary

Command	Description
:OUTPut	
:TTL[1]	Path to set polarity of digital output line 1:
:LSENse <name>	Select polarity; active (AHIGH) or active (ALOW).
:LSENse?	Query polarity of line 1.
:TTL2	Path to set polarity of digital output line 2:
:LSENse <name>	Select polarity; active (AHIGH) or active (ALOW).
:LSENse?	Query polarity of line 2.
:TTL3	Path to set polarity of digital output line 3:
:LSENse <name>	Select polarity; active (AHIGH) or active (ALOW).
:LSENse?	Query polarity of line 3.
:TTL4	Path to set polarity of digital output line 4:
:LSENse <name>	Select polarity; active (AHIGH) or active (ALOW).
:LSENse?	Query polarity of line 4.

Table 28. ROUTe command summary

Command	Description
:ROUTe	
:CLOSe <list>	Path and command to close specified channel:
:STATe?	Query closed channel.
:CLOSe? <list>	Query specified channels (1 = closed, 0 = open).
:OPEN <list>	Open specified channel or all channels.
:OPEN:ALL	Open all channels.
:OPEN? <list>	Query specified channels (1 = open, 0 = closed).
:SCAN	Command path to configure and control scan operations:
[:INTernal] <list>	Specify an internal scan list (2 to 10 channels).

Table 28. ROUTe command summary (cont.)

Command	Description
:ROUTe	
:SCAN	
[:INTernal]?	Query the internal scan list.
:FUNCtion <list>, <name>	Assign measurement function to specified channels.
:FUNCtion? <list>	Query function for each specified channel.
:EXTernal <list>	Specify an external scan list (2 to 80 channels).
:EXTernal?	Query the external scan list.
:FUNCtion <list>, <name>	Assign measurement function to specified channels.
:FUNCtion? <list>	Query function for each specified channel.
:RATio	Command path to configure ratio calculation:
:FUNCtion <name>	Specify function for Ratio ('VOLTage:DC', 'RESistance' or 'FRESistance').
:FUNCtion?	Query Ratio function.
:RCHannel <list>	Specify reference channel (1 to 10).
:RCHannel?	Query reference channel.
:MCHannel <list>	Specify measure channel (1 to 10).
:MCHannel?	Query measure channel.
:DELTa	Command path to configure delta calculation:
:FUNCtion <name>	Specify function for Delta ('VOLTage:DC', 'RESistance' or 'FRESistance').
:FUNCtion?	Query Delta function.
:RCHannel <list>	Specify reference channel (1 to 10).
:RCHannel?	Query reference channel.
:MCHannel <list>	Specify measure channel (1 to 10).
:MCHannel?	Query measure channel.
:LSELect <name>	Select scan operation: INTernal, EXTernal, RATio, DELTa, NONE.
:LSELect?	Query scan operation.

Table 29. Sense command summary

Command	Description
[:SENSe[1]]	
:ALTernate[1]	Path to control an Alternate setup.
:SAVE	Save current setup as Alternate setup.
:RECall	Return instrument to Alternate setup.
:FUNCtion <name>	Select measurement function: 'VOLTage:AC', 'VOLTage: DC','RESistance', 'FRESis- tance','CURRent:AC', 'CUR- Rent:DC','FREQuency', 'TEMPerature'
:FUNCtion?	Query function.
:DATA	Path to select reading type:
[:LATest]?	Query the latest reading.
:FRESh?	Query a fresh reading.

Table 29. Sense command summary (cont.)

Command	Description
:CURRent:AC	Path to configure AC current.
:APERture <n>	Specify integration rate in seconds (166.67e-6 to 200e-3).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto aperture.
:AUTO ONCE	Enable and then disable auto aperture.
:AUTO?	Query auto aperture (0 or 1).
:APERture?	Query aperture (integration rate).
:NPLCycles <n>	Specify integration rate (number of line cycles; 0.01 to 10).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto NPLC.
:AUTO ONCE	Enable and then disable auto NPLC.
:AUTO?	Query auto line cycle integration (0 or 1).
:NPLCycles?	Query line cycle integration rate.
:COUPling AC|DC	Specify input coupling.
:COUPling?	Query input coupling.
:RANGe	Path to configure measurement range:
[:UPPer] <n>	Select range (0 to +2.1).
[:UPPer]?	Query range.
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto range.

Table 29. Sense command summary (cont.)

Command	Description
:CURRent:AC	
:RANGe	
:AUTO ONCE	Set range based on present input signal.
:ULIMit <n>	Specify upper limit for auto range (0 to +2.1).
:ULIMit?	Query upper limit.
:LLIMit <n>	Specify lower limit for auto range (0 to +2.1).
:LLIMit?	Query lower limit.
:AUTO?	Query auto range.
:REFerence <n>	Specify reference (REL) value (-2.1 to +2.1).
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) REL.
:STATe?	Query state of REL (0 or 1).
:ACQuire	Use input signal as reference.
:REFerence?	Query reference (REL) value.
:DIGits <n>	Specify measurement resolution (4 to 8).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto resolution.
:AUTO ONCE	Enable and then disable auto resolution.
:AUTO?	Query auto resolution (0 or 1).
:DIGits?	Query resolution.
:AVERage	Path to configure and control the filter.
:TCONtrol <name>	Select filter type: MOVing, REPeat.
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:ADVanced	Path to configure and control advanced filter.
:NTOLerance <n>	Specify noise tolerance level (0 to 100 percent).
:NTOLerance?	Query noise tolerance level.
[:STATe] <b>	Enable (1 or ON) or disable (0 or OFF) advanced filter.

68

Table 29. Sense command summary (cont.)

Command	Description
:CURRent:AC	
:AVERage	
:ADVanced	
[:STATe]?	Query state of advanced filter.
[:STATe] \<b\>	Enable (1 or ON) or disable (0 or OFF) filter.
[:STATe]?	Query state of digital filter.
:AUTO \<b\>	Enable (1 or ON) or disable (0 or OFF) auto filter.
:AUTO ONCE	Enable and then disable auto filter.
:AUTO?	Query auto filter.
:DETector	Path to select function:
[:FUNCtion] \<name\>	Select type of AC measurement: RMS, AVERage.
[:FUNCtion]?	Query detector function.
:CURRent:DC	Path to configure DC current.
:APERture \<n\>	Specify integration rate in seconds ($166.67e-6$ to $200e-3$).
:AUTO \<b\>	Enable (1 or ON) or disable (0 or OFF) auto aperture.
:AUTO ONCE	Enable and then disable auto aperture.
:AUTO?	Query auto aperture (0 or 1).
:APERture?	Query aperture (integration rate).
:NPLCycles \<n\>	Specify integration rate (number of line cycles; 0.01 to 10).
:AUTO \<b\>	Enable (1 or ON) or disable (0 or OFF) auto NPLC.
:AUTO ONCE	Enable and then disable auto NPLC.
:AUTO?	Query auto line cycle integration (0 or 1).
:NPLCycles?	Query line cycle integration rate.
:RANGe	Path to configure measurement range:
[:UPPer] \<n\>	Select range (0 to 2.1).
[:UPPer]?	Query range.
:AUTO \<b\>	Enable (1 or ON) or disable (0 or OFF) auto range.

Table 29. Sense command summary (cont.)

Command	Description
:CURRent:DC	
:RANGe	
:AUTO ONCE	Set range based on present input signal.
:ULIMit \<n\>	Specify upper limit for auto range (0 to 2.1).
:ULIMit?	Query upper limit.
:LLIMit \<n\>	Specify lower limit for auto range (0 to 2.1).
:LLIMit?	Query lower limit.
:AUTO?	Query auto range.
:REFerence \<n\>	Specify reference (REL) value (-2.1 to +2.1).
:STATe \<b\>	Enable (1 or ON) or disable (0 or OFF) REL.
:STATe?	Query state of REL (0 or 1).
:ACQuire	Use input signal as reference.
:REFerence?	Query reference (REL) value.
:DIGits \<n\>	Specify measurement resolution (4 to 8).
:AUTO \<b\>	Enable (1 or ON) or disable (0 or OFF) auto resolution.
:AUTO ONCE	Enable and then disable auto resolution.
:AUTO?	Query auto resolution (0 or 1).
:DIGits?	Query resolution.
:AVERage	Path to configure and control the filter.
:TCONtrol \<name\>	Select filter type: MOVing, REPeat.
:TCONtrol?	Query filter type.
:COUNt \<n\>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:ADVanced	Path to configure and control advanced filter.
:NTOLerance \<n\>	Specify noise tolerance level (0 to 100 percent).
:NTOLerance?	Query noise tolerance level.
[:STATe] \<b\>	Enable (1 or ON) or disable (0 or OFF) advanced filter.

Table 29. Sense command summary (cont.)

Command	Description
:CURRent:DC	
:AVERage	
:ADVanced	
[:STATe]?	Query state of advanced filter.
[:STATe] <b>	Enable (1 or ON) or disable (0 or OFF) filter.
[:STATe]?	Query state of digital filter.
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto filter.
:AUTO ONCE	Enable and then disable auto filter.
:AUTO?	Query auto filter.
:METHod <name>	Select measurement technique: NORMal, ICIRcuit.
:METHod?	Query method.
:VOLTage:AC	Path to configure AC voltage.
:APERture <n>	Specify integration rate in seconds (166.67e-6 to 200e-3).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto aperture.
:AUTO ONCE	Enable and then disable auto aperture.
:AUTO?	Query auto aperture (0 or 1).
:APERture?	Query aperture (integration rate).
:NPLCycles <n>	Specify integration rate (number of line cycles; 0.01 to 10).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto NPLC.
:AUTO ONCE	Enable and then disable auto NPLC.
:AUTO?	Query auto line cycle integration (0 or 1).
:NPLCycles?	Query line cycle integration rate.
:COUPling AC|DC	Specify input coupling.
:COUPling?	Query input coupling.
:RANGe	Path to configure measurement range:
[:UPPer] <n>	Select range (0 to +775).
[:UPPer]?	Query range.

Table 29. Sense command summary (cont.)

Command	Description
:VOLTage:AC	
:RANGe	
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto range.
:AUTO ONCE	Set range based on present input signal.
:ULIMit <n>	Specify upper limit for auto range (0 to +775).
:ULIMit?	Query upper limit.
:LLIMit <n>	Specify lower limit for auto range (0 to +775).
:LLIMit?	Query lower limit.
:AUTO?	Query auto range.
:REFerence <n>	Specify reference (REL) value (-775 to +775).
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) REL.
:STATe?	Query state of REL (0 or 1).
:ACQuire	Use input signal as reference.
:REFerence?	Query reference (REL) value.
:DIGits <n>	Specify measurement resolution (4 to 8).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto resolution.
:AUTO ONCE	Enable and then disable auto resolution.
:AUTO?	Query auto resolution (0 or 1).
:DIGits?	Query resolution.
:AVERage	Path to configure and control the filter.
:TCONtrol <name>	Select filter type: MOVing, REPeat.
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:ADVanced	Path to configure and control advanced filter.
:NTOLerance <n>	Specify noise tolerance level (0 to 100 percent).
:NTOLerance?	Query noise tolerance level.

Table 29. Sense command summary (cont.)

Command	Description
:VOLTage:AC	
:AVERage	
:ADVanced	
[:STATe] <b>	Enable (1 or ON) or disable (0 or OFF) advanced filter.
[:STATe]?	Query state of advanced filter.
[:STATe] <b>	Enable (1 or ON) or disable (0 or OFF) filter.
[:STATe]?	Query state of digital filter.
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto filter.
:AUTO ONCE	Enable and then disable auto filter.
:AUTO?	Query auto filter.
:DETector	Path to select function:
[:FUNCtion] <name>	Select type of AC measurement: RMS, AVERage, PEAK, LFRMS, NPeak, PPeak.
[:FUNCtion]?	Query detector function.
:PWINdow <n>	Specify window in seconds (0.1 to 9.9).
:PWINdow?	Query peak spike detection window.
:VOLTage:DC	Path to configure DC voltage:
:APERture <n>	Specify integration rate in seconds (166.67e-6 to 200e-3).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto aperture.
:AUTO ONCE	Enable and then disable auto aperture.
:AUTO?	Query auto aperture (0 or 1).
:APERture?	Query aperture (integration rate).
:NPLCycles <n>	Specify integration rate (number of line cycles; (0.01 to 10).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto NPLC.
:AUTO ONCE	Enable and then disable auto NPLC.

Table 29. Sense command summary (cont.)

Command	Description
:VOLTage:DC	
:NPLCycles <n>	
:AUTO?	Query auto line cycle integration (0 or 1).
:NPLCycles?	Query line cycle integration rate.
:RANGe	Path to configure measurement range:
[:UPPer] <n>	Select range (0 to 1100).
[:UPPer]?	Query range.
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto range.
:AUTO ONCE	Set range based on present input signal.
:ULIMit <n>	Specify upper limit for auto range (0 to 1100).
:ULIMit?	Query upper limit.
:LLIMit <n>	Specify lower limit for auto range (0 to 1100).
:LLIMit?	Query lower limit.
:AUTO?	Query auto range.
:REFerence <n>	Specify reference (REL) value (-1100 to +1100).
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) REL.
:STATe?	Query state of REL (0 or 1).
:ACQuire	Use input signal as reference.
:REFerence?	Query reference (REL) value.
:DIGits <n>	Specify measurement resolution (4 to 8).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto resolution.
:AUTO ONCE	Enable and then disable auto resolution.
:AUTO?	Query auto resolution (0 or 1).
:DIGits?	Query resolution.
:AVERage	Path to configure and control the filter.
:TCONtrol <name>	Select filter type: MOVing, REPeat.
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.

Table 29. Sense command summary (cont.)

Command	Description
:VOLTage:DC	
:AVERage	
:ADVanced	Path to configure and control advanced filter.
:NTOLerance \<n\>	Specify noise tolerance level (0 to 100 percent).
:NTOLerance?	Query noise tolerance level.
[:STATe] \<b\>	Enable (1 or ON) or disable (0 or OFF) advanced filter.
[:STATe]?	Query state of advanced filter.
[:STATe] \<b\>	Enable (1 or ON) or disable (0 or OFF) filter.
[:STATe]?	Query state of digital filter.
:AUTO \<b\>	Enable (1 or ON) or disable (0 or OFF) auto filter.
:AUTO ONCE	Enable and then disable auto filter.
:AUTO?	Query auto filter.
:RESistance	Path to configure resistance:
:APERture \<n\>	Specify integration rate in seconds (166.67e-6 to 200e-3).
:AUTO \<b\>	Enable (1 or ON) or disable (0 or OFF) auto aperture.
:AUTO ONCE	Enable and then disable auto aperture.
:AUTO?	Query auto aperture (0 or 1).
:APERture?	Query aperture (integration rate).
:NPLCycles \<n\>	Specify integration rate in number of line cycles (0.01 to 10).
:AUTO \<b\>	Enable (1 or ON) or disable (0 or OFF) auto NPLC.
:AUTO ONCE	Enable and then disable auto NPLC.
:AUTO?	Query auto line cycle integration (0 or 1).
:NPLCycles?	Query line cycle integration rate.
:RANGe	Path to configure measurement range:

Table 29. Sense command summary (cont.)

Command	Description
:RESistance	
:RANGe	
[:UPPer] <n>	Select range (0 to 1.05e9).
[:UPPer]?	Query range.
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto range.
:AUTO ONCE	Set range based on present input signal.
:ULIMit <n>	Specify upper limit for auto range (0 to 1.05e9).
:ULIMit?	Query upper limit.
:LLIMit <n>	Specify lower limit for auto range (0 to 1.05e9).
:LLIMit?	Query lower limit.
:AUTO?	Query auto range.
:REFerence <n>	Specify reference (REL) value (-1.05e9 to +1.05e9).
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) REL.
:STATe?	Query state of REL (0 or 1).
:ACQuire	Use input signal as reference.
:REFerence?	Query reference (REL) value.
:DIGits <n>	Specify measurement resolution (4 to 8).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto resolution.
:AUTO ONCE	Enable and then disable auto resolution.
:AUTO?	Query auto resolution (0 or 1).
:DIGits?	Query resolution.
:AVERage	Path to configure and control the filter.
:TCONtrol <name>	Select filter type: MOVing, REPeat.
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:ADVanced	Path to configure and control advanced filter.
:NTOLerance <n>	Specify noise tolerance level (0 to 100 percent).

Table 29. Sense command summary (cont.)

Command	Description
:RESistance	
:AVERage	
:ADVanced	
:NTOLerance?	Query noise tolerance level.
[:STATe] <b>	Enable (1 or ON) or disable (0 or OFF) advanced filter.
[:STATe]?	Query state of advanced filter.
[:STATe] <b>	Enable (1 or ON) or disable (0 or OFF) filter.
[:STATe]?	Query state of digital filter.
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto filter.
:AUTO ONCE	Enable and then disable auto filter.
:AUTO?	Query auto filter.
:OCOMpensated <b>	Enable (1 or ON) or disable (0 or OFF) Offset Compensation.
:OCOMpensated?	Query Offset Compensation.
:FRESistance	Path to configure four-wire resistance:
:APERture <n>	Specify integration rate in seconds (166.67e-6 to 200e-3).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto aperture.
:AUTO ONCE	Enable and then disable auto aperture.
:AUTO?	Query auto aperture (0 or 1).
:APERture?	Query aperture (integration rate).
:NPLCycles <n>	Specify integration rate in number of line cycles (0.01 to 10).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto NPLC.
:AUTO ONCE	Enable and then disable auto NPLC.
:AUTO?	Query auto line cycle integration (0 or 1).
:NPLCycles?	Query line cycle integration rate.

Table 29. Sense command summary (cont.)

Command	Description
:FRESistance	
:RANGe	Path to configure measurement range:
[:UPPer] <n>	Select range (0 to 2.1e5).
[:UPPer]?	Query range.
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto range.
:AUTO ONCE	Set range based on present input signal.
:ULIMit <n>	Specify upper limit for auto range (0 to 2.1e5).
:ULIMit?	Query upper limit.
:LLIMit <n>	Specify lower limit for auto range (0 to 2.1e5).
:LLIMit?	Query lower limit.
:AUTO?	Query auto range.
:REFerence <n>	Specify reference (REL) value (-2.1e5 to +2.1e5).
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) REL.
:STATe?	Query state of REL (0 or 1).
:ACQuire	Use input signal as reference.
:REFerence?	Query reference (REL) value.
:DIGits <n>	Specify measurement resolution (4 to 8).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto resolution.
:AUTO ONCE	Enable and then disable auto resolution.
:AUTO?	Query auto resolution (0 or 1).
:DIGits?	Query resolution.
:AVERage	Path to configure and control the filter.
:TCONtrol <name>	Select filter type: MOVing, REPeat.
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:ADVanced	Path to configure and control advanced filter.
:NTOLerance <n>	Specify noise tolerance level (0 to 100 percent).

Table 29. Sense command summary (cont.)

Command	Description
:FRESistance	
:AVERage	
:ADVanced	
:NTOLerance?	Query noise tolerance level.
[:STATe] <b>	Enable (1 or ON) or disable (0 or OFF) advanced filter.
[:STATe]?	Query state of advanced filter.
[:STATe] <b>	Enable (1 or ON) or disable (0 or OFF) filter.
[:STATe]?	Query state of digital filter.
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto filter.
:AUTO ONCE	Enable and then disable auto filter.
:AUTO?	Query auto filter.
:OCOMpensated <b>	Enable (1 or ON) or disable (0 or OFF) Offset Compensation.
:OCOMpensated?	Query Offset Compensation.
:FREQuency	Path to configure frequency:
:COUPling AC|DC	Specify input coupling.
:COUPling?	Query input coupling.
:REFerence <n>	Specify reference (REL) value (0 to 15e6).
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) REL.
:STATe?	Query state of REL (0 or 1).
:ACQuire	Use input signal as reference.
:REFerence?	Query reference (REL) value.
:DIGits <n>	Specify measurement resolution (4 or 5).
:DIGits?	Query resolution.
:SOURce <name>	Select source: CURRent, VOLTage.
:SOURce?	Query source.
:THReshold	Path to configure threshold:
:CURRent	Path to set current threshold:
:RANGe <n>	Specify range (0 to 1).
:RANGe?	Query range.

79

Table 29. Sense command summary (cont.)

Command	Description
:FREQuency	
:THReshold	
:CURRent	
:LEVel <n>	Specify threshold level.
:LEVel?	Query threshold level.
:VOLTage	Path to set voltage threshold:
:RANGe <n>	Specify range (0 to 1000).
:RANGe?	Query range.
:LEVel <n>	Specify threshold level.
:LEVel?	Query threshold level.
:TTL	Set threshold to TTL level.
:TEMPerature	Path to configure four-wire resistance:
:APERture <n>	Specify integration rate in seconds (166.67e-6 to 200e-3).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto aperture.
:AUTO ONCE	Enable and then disable auto aperture.
:AUTO?	Query auto aperture (0 or 1).
:APERture?	Query aperture (integration rate).
:NPLCycles <n>	Specify integration rate in number of line cycles (0.01 to 10).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto NPLC.
:AUTO ONCE	Enable and then disable auto NPLC.
:AUTO?	Query auto line cycle integration (0 or 1).
:NPLCycles?	Query line cycle integration rate.
:REFerence <n>	Specify reference (REL) value.
:STATe <b>	Enable (1 or ON) or disable (0 or OFF) REL.
:STATe?	Query state of REL (0 or 1).
:ACQuire	Use input signal as reference.
:REFerence?	Query reference (REL) value.

Table 29. Sense command summary (cont.)

Command	Description
:TEMPerature	
:DIGits <n>	Specify measurement resolution (4 to 7).
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto resolution.
:AUTO ONCE	Enable and then disable auto resolution.
:AUTO?	Query auto resolution (0 or 1).
:DIGits?	Query resolution.
:AVERage	Path to configure and control the filter.
:TCONtrol <name>	Select filter type: MOVing, REPeat.
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
[:STATe] <b>	Enable (1 or ON) or disable (0 or OFF) filter.
[:STATe]?	Query state of digital filter.
:AUTO <b>	Enable (1 or ON) or disable (0 or OFF) auto filter.
:AUTO ONCE	Enable and then disable auto filter.
:AUTO?	Query auto filter.
:TRANsducer <name>	Select transducer: RTD, FRTD, TCouple.
:TRANsducer?	Query transducer.
:RTD	Path to configure RTD measurements:
:TYPE <name>	Select RTD parameters: PT385, PT3916, USER.
:TYPE?	Query RTD type.
:ALPHa <NRf>	Specify constant for USER type (0 to 0.01).
:ALPHa?	Query alpha.
:BETA <NRf>	Specify constant for USER type (0 to 1).
:BETA?	Query beta.
:DELTa <NRf>	Specify constant for USER type (0 to 5).
:DELTa?	Query delta.
:RZERo <NRf>	Specify constant for USER type (0 to 1000).
:RZERo?	Query rzero.

Table 29. Sense command summary (cont.)

Command	Description
:TEMPerature	
:TCouple	Path to configure TC measurements:
:TYPE <name>	Select thermocouple type: J, T, K, E, R, S, B.
:TYPE?	Query TC type.
:RJUNctionX	Path to configure reference junctions (Z = 1 to 5).
:RSELect <name>	Select reference type: SIMulated, REAL.
:RSELect?	Query reference type.
:SIMulated <n>	Specify simulated remperature.
:SIMulated?	Query simluated temperature.
:REAL	Command path to specify "real" reference junction.
:TCOefficient <n>	Specify TC.
:TCOefficient?	Query TC.
:OFFSet <n>	Specify voltage offset at 0°C.
:OFFSet?	Query voltage offset.
:ACQuire	Update reference temperature.
:SENSe2	
:TTL[1]	Path to read digital input port:
:DATA?	Query (read) the digital input port.

Table 30. SOURce command summary

Command	Description
:SOURce	
:TTL[1][:LEVel] <b>	Set digital output line #1 true (1 or ON) or false (0 or OFF).
:TTL[1][:LEVel]?	Query digital output line 1.
:TTL2[:LEVel] <b>	Set digital output line #2 true (1 or ON) or false (0 or OFF).
:TTL2[:LEVel]?	Query digital output line 2.
:TTL3[:LEVel] <b>	Set digital output line #3 true (1 or ON) or false (0 or OFF).
:TTL3[:LEVel]?	Query digital output line 3.
:TTL4[:LEVel] <b>	Set digital output line #4 true (1 or ON) or false (0 or OFF).
:TTL4[:LEVel]?	Query digital output line 4.

Table 31. STATus command summary

Commands	Description
:STATus	
:MEASurement	Path to control measurement event registers:
[:EVENt]?	Read the event register.
:ENABle <NRf>	Program the enable register.
:ENABle?	Read the enable register.
:PTRansition <NRf>	Program the positive transition register.
:PTRansition?	Read the positive transition register.
:NTRansition <NRf>	Program the negative transition register.
:NTRansition?	Read the negative transition register.
:CONDition?	Read the condition register.
:OPERation	Path to control operation event registers:
[:EVENt]?	Read the event register.
:ENABle <NRf>	Program the enable register.
:ENABle?	Read the enable register.
:PTRansition <NRf>	Program the positive transition register.
:PTRansition?	Read the positive transition register.

Table 31. STATus command summary (cont.)

Commands	Description
:STATus	
:OPERation	
:NTRansition <NRf>	Program the negative transition register.
:NTRansition?	Read the negative transition register.
:CONDition?	Read the condition register.
:ARM	Path to control arm event registers:
[:EVENt]?	Read the event register.
:ENABle <NRf>	Program the enable register.
:ENABle?	Read the enable register.
:PTRansition <NRf>	Program the positive transition register.
:PTRansition?	Read the positive transition register.
:NTRansition <NRf>	Program the negative transition register.
:NTRansition?	Read the negative transition register.
:CONDition?	Read the condition register.
:SEQuence	Path to control the sequence event registers:
[:EVENt]?	Read the event register.
:ENABle <NRf>	Program the enable register.
:ENABle?	Read the enable register.
:PTRansition <NRf>	Program the positive transition register.
:PTRansition?	Read the positive transition register.
:NTRansition <NRf>	Program the negative transition register.
:NTRansition?	Read the negative transition register.
:CONDition?	Read the condition register.
:TRIGger	Path to control trigger event registers:
[:EVENt]?	Read the event register.
:ENABle <NRf>	Program the enable register.

Table 31. STATus command summary (cont.)

Commands	Description
:STATus	
:OPERation	
:TRIGger	
:ENABle?	Read the enable register.
:PTRansition <NRf>	Program the positive transition register.
:PTRansition?	Read the positive transition register.
:NTRansition <NRf>	Program the negative transition register.
:NTRansition?	Read the negative transition register.
:CONDition?	Read the condition register.
:QUEStionable	Path to control questionable event registers:
[:EVENt]?	Read the event register.
:ENABle <NRf>	Program the enable register.
:ENABle?	Read the enable register.
:PTRansition <NRf>	Program the positive transition register.
:PTRansition?	Read the positive transition register.
:NTRansition <NRf>	Program the negative transition register.
:NTRansition?	Read the negative transition register.
:CONDition?	Read the condition register.
:PRESet	Return status registers to default states.
:QUEue	Path to access error queue:
[:NEXT]?	Read the most recent error message.
:ENABle <list>	Specify error and status messages for queue.
:ENABle?	Read the enabled messages.
:DISable <list>	Specify messages not to be placed in queue.
:DISable?	Read the disabled messages.
:CLEar	Clears all messages from Error Queue.

Table 32. SYSTem command summary

Command	Description
:SYSTem	
:PRESet	Return to :SYST:PRES defaults.
:POSetup \<name\>	Select power-on setup: RST, PRESet, SAV0-SAV9.
:POSetup?	Query power-on setup.
:FRSWitch?	Query INPUTS switch (0 = rear, 1 = front).
:VERSion?	Query revision level of SCPI standard.
:ERRor?	Query (read) Error Queue.
:AZERo	Path to set up auto-zero.
:TYPE \<name\>	Select auto-zero mode: NORMal, SYNChronous.
:TYPE?	Query auto-zero mode (0 or 1).
:STATe \<b\>	Enable (1 or ON) or disable (0 or OFF) auto-zero.
:STATe?	Query auto-zero (0 or 1).
:AMEThod \<name\>	Select reading acquisition method: BURSt, NORMal, ASTReam, SSTReam.
:AMEThod?	Query acquisition method.
:LSYNc	Path to control line synchronization of measurements.
:STATe \<b\>	Enable (1 or ON) or disable (0 or OFF) line sync.
:STATe?	Query line sync (0 or 1).
:KEY \<NRf\>	Simulate key-press (1 to 31).
:KEY?	Query the last "pressed" key.
:CLEar	Clears messages from the Error Queue.
:FETCh	Path to set fetch format.
:FORMat \<name\>	Select format for :FETCh? command; SCPI or FRESh.

Table 33. TRACe command summary

Command	Description
:TRACe|:DATA	Use :TRACe or :DATA as root command.
:CLEar [BUFFER,]	Clear readings from buffer.
:FREE? [BUFFER,]	Query bytes available and bytes in use.
:EGRoup [BUFFER,] <name>	Select element group: FULL, COMPact.
:EGRoup? [BUFFER,]	Query element group.
:POINts [BUFFER,] <n>	Specify size of buffer.
:AUTO [BUFFER,] <b>	Enable (1 or ON) or disable auto buffer sizing.
:AUTO? [BUFFER,]	Query state of auto buffer sizing.
:POINts? [BUFFER,]	Query buffer size.
:FEED [BUFFER,] <name>	Select source of readings: SENSe[1], CALCulate[1], NONE.
:PRETrigger	Path to configure pre-trigger storage mode.
:AMOunt	Path to specify number of pre-trigger readings.
[:PERCent] [BUFFER,] <n>	Specify as a % (0 to 100) of buffer.
[:PERCent]? [BUFFER,]	Query percentage.
:READings [BUFFER,] <n>	Specify as a number.
:READings? [BUFFER,]	Query number of readings.
:SOURce [BUFFER,] <name>	Select pre-trigger source event:EXTernal, TLINk, BUS, MANual.
:SOURce? [BUFFER,]	Query pre-trigger source event.
:CONTrol [BUFFER,] <name>	Select buffer control mode:NEVer, NEXT, ALWays, PRETrigger.
:CONTrol? [BUFFER,]	Query buffer control mode.
:FEED? [BUFFER,]	Query source of readings for buffer.
:DATA? [BUFFER,]	Read all readings in the buffer.

Table 34. Trigger command summary

Command	Description
:INITiate	Subsystem command path:
[:IMMediate]	Initiate one trigger cycle.
:CONTinuous \<b\>	Enable (1 or ON) or disable (0 or OFF) continuous initiation of trigger system.
:CONTinuous?	Query continuous initiation.
:ABORt	Reset trigger system.
:ARM[:SEQuence[1]]	Subsystem command path to configure arm layers:
[:LAYer[1]]	Path to program arm layer 1:
:IMMediate	Loop around control source.
:COUNt \<n\>	Program arm count (1 to 99999, or INF).
:COUNt?	Query arm count.
:SOURce \<name\>	Select control source: HOLD, IMMediate, MANual, BUS, TLINk, EXTernal.
:SOURce?	Query control source.
:SIGNal	Loop around control source.
:TCONfigure	Path to configure Triggers:
:DIRection \<name\>	Enable (SOUR) or disable (ACC) Bypass: SOURce, ACCeptor.
:DIRection?	Query direction.
:ASYNchronous	Path to configure asynchronous Trigger Link:
:ILINe \<NRf\>	Select input line (1 to 6).
:ILINe?	Query input line.
:OLINe \<NRf\>	Select output line (1 to 6).
:OLINe?	Query output line.
:LAYer2	Path to program arm layer 2:
:IMMediate	Loop around control source.
:COUNt \<n\>	Program scan count (1 to 99999 or INF).
:COUNt?	Query scan count.
:DELay \<n\>	Program delay (0 to 999999.999 sec).
:DELay?	Query delay.
:SOURce \<name\>	Select control source: HOLD, IMMediate, TIMer, MANual, BUS, TLINk, EXTernal.
:SOURce?	Query control source.
:TIMer \<n\>	Set timer interval (0 to 999999.999 sec).
:TIMer?	Query timer.
:SIGNal	Loop around control source.

Table 34. Trigger command summary (cont.)

Command	Description
:ARM[:SEQuence[1]]	
:LAYer2	
:TCONfigure	Path to configure Triggers:
:DIRection <name>	Enable (SOUR) or disable (ACC) Bypass: SOURce, ACCeptor.
:DIRection?	Query direction.
:ASYNchronous	Path to configure asynchronous Trigger Link:
:ILINe <NRf>	Select input line (1 to 6).
:ILINe?	Query input line.
:OLINe <NRf>	Select output line (1 to 6).
:OLINe?	Query output line.
:TRIGger[:SEQuence[1]]	Path to program trigger layer:
:IMMediate	Loop around control source.
:COUNt <n>	Program measure count (1 to 99999, or INF).
:COUNt?	Query measure count.
:DELay <n>	Program delay (0 to 999999.999 sec).
:DELay?	Query delay.
:SOURce <name>	Select control source: HOLD, IMMediate, TIMer, MANual, BUS, TLINk, EXTernal.
:SOURce?	Query control source.
:TIMer <n>	Set timer interval (0 to 999999.999 sec).
:TIMer?	Request the programmed timer interval.
:SIGNal	Loop around control source.
:TCONfigure	Path to configure Triggers:
:PROTocol <name>	Select protocol: ASYNchronous, SSYNchronous.
:PROTocol?	Query protocol.
:DIRection <name>	Enable (SOUR) or disable (ACC) Bypass: SOURce, ACCeptor.
:DIRection?	Query direction.
:ASYNchronous	Path to configure asynchronous Trigger Link:
:ILINe <NRf>	Select input line (1 to 6).
:ILINe?	Query input line.
:OLINe <NRf>	Select output line (1 to 6).
:OLINe?	Query output line.

Table 34. Trigger command summary (cont.)

Command	Description
:TRIGger[:SEQuence[1]]	
:TCONfigure	
:SSYNchronous	Path to configure semi-syn-chronous Trigger Link:
:LINE <NRf>	Select trigger line (1 to 6).
:LINE?	Query trigger line.

Table 35. UNIT command summary

Command	Description
:UNIT	
:TEMPerature <name>	Select temperature measurement units: C, CEL, F, FAR, K.
:TEMPerature?	Query temperature units.
:VOLTage	Path to configure ACV units.
:AC <name>	Select ACV measurement units: V, DB, DBM.
:DB	Path to set DB reference volt-age.
:REFerence <n>	Specify reference in volts.
:REFerence?	Query DB reference.
:DBM	Path to set DBM reference impedance.
:IMPedance <n>	Specify reference imped-ance.
:IMPedance?	Query DBM reference impedance.
:AC?	Query ACV units.