

Model 2000 Multimeter

Quick Reference Guide

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Model 2000 Multimeter

Quick Reference Guide

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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  screw is present, connect it to safety earth ground using the wire recommended in the user documentation.

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

The  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.

Introduction

This quick reference guide includes summary information on front panel and remote operation for the Model 2000 Multimeter. For detailed operating information, consult the Model 2000 User's Manual.

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Front Panel Operation Summary

Power-on defaults

Power-on defaults are those settings the instrument assumes when it is turned on. The Model 2000 offers two choices for the settings: user or factory. With user, the instrument will power-on to the last configuration that you saved. With factory, the instrument will power on to the factory default settings.

To store a user configuration in memory:

1. Configure the instrument as desired for USER default.
2. Press SHIFT and then SAVE.
3. Use the ▲ and ▼ keys to select YES or NO.
Note: Select NO if you do not wish to change the last configuration that you saved.
4. Press ENTER.

To restore factory or user settings:

1. Press SHIFT and then SETUP.
2. Use the ▲ and ▼ keys to select FACTORY or USER.
3. Press ENTER.

NOTE: Factory default settings are listed in Table 2.

Instrument connections

Basic connections for Model 2000 measurements are shown in Figure 1. These drawings show connections to the front panel terminals (INPUTS switch in the FRONT position). If using the rear panel terminals, place the

INPUTS switch in the REAR position. Note that current (DCI and ACI) measurements cannot be made from the rear panel terminals.

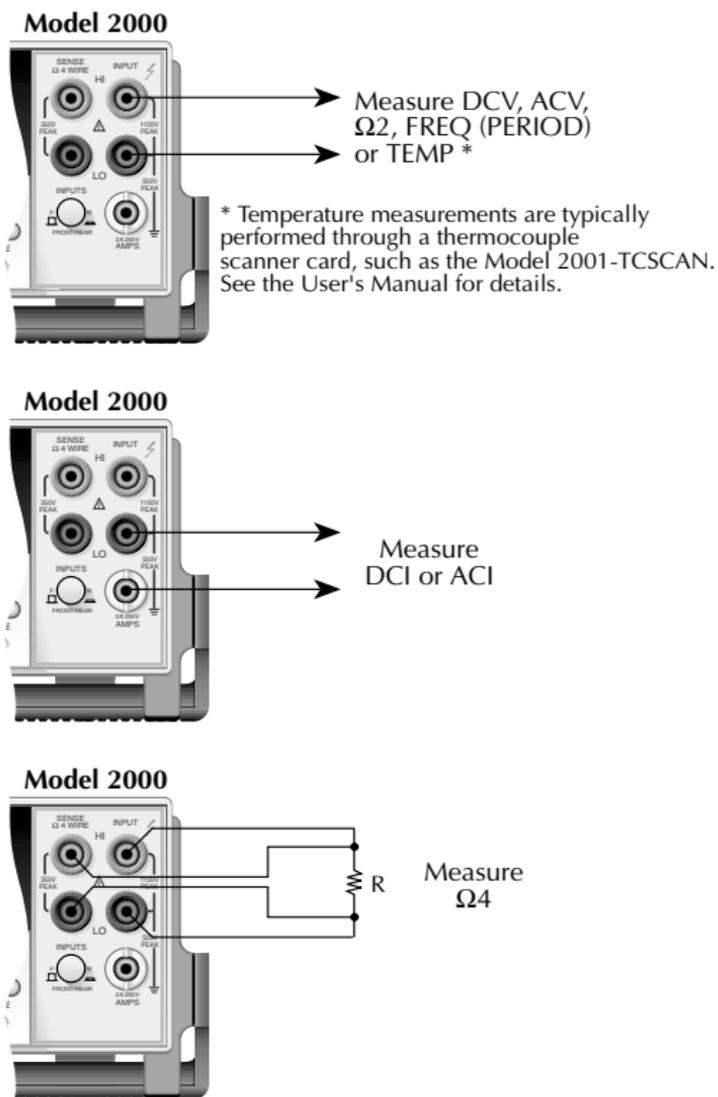


Figure 1. Basic measurement connections

For resistance measurements ($\Omega 2$ and $\Omega 4$) greater than $100k\Omega$, more stable readings can be achieved by using shielding. Place the resistance in a shielded enclosure and connect the shield to INPUT LO. Shielded cable should be used such that the shield (INPUT LO) encircles the other cable conductor(s).

Maximum inputs for the Model 2000 are summarized in Table 1.

Table 1. Maximum inputs

| Function | Maximum input |
|---------------|--|
| DCV | 1000V peak |
| ACV | 750V rms, 1000V peak, $8 \times 10^7 V \cdot Hz$ |
| DCI | 3A dc, 250V |
| ACI | 3A rms, 250V |
| FREQ (PERIOD) | 1000V peak, $8 \times 10^7 V \cdot Hz$ |

Basic measurement procedure

1. Connect the instrument as explained in "Instrument connection".
2. From the function keys, select the desired measurement function.
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 ▲ and ▼ RANGE keys.
4. Take a reading from the display.

Storing readings (2 to 1024)

1. Set up the instrument for the desired configuration.
2. Press the STORE key.
3. Use the ◀, ▶, ▲ and ▼ keys to select the number of readings to store in the buffer.
4. Press ENTER to start the storage process. The asterisk (*) annunciator turns on to indicate a data storage operation. It turns off when the storage is finished.

Recalling readings

1. Press the RECALL key. The BUFFER annunciator indicates that stored readings are being displayed. The arrow annunciator indicates that more data can be viewed with the ◀, ▶, ▲ and ▼ keys.
2. Use the ◀, ▶, ▲ and ▼ keys to navigate through the reading numbers, reading values, and statistics. For any of the buffer statistics (maximum, minimum, average, standard deviation) the STAT annunciator is on.
3. Use the EXIT key to return to the normal display.

Changing speed, resolution and filter

RATE — Measurement speed (reading RATE) can be changed for any measurement function except frequency, period, continuity and diode test. Use the RATE key to select FAST, MEDium or SLOW. Use FAST (0.1 PLC) if speed is of primary importance (at the expense of increased noise and fewer usable digits of resolution). SLOW (10 PLC) provides better noise performance at the expense of speed. MEDium (1 PLC) provides a compromise between noise and speed.

DIGITS — Display resolution can be changed for any measurement function. Use the DIGITS key to select the desired number of digits (3½ to 6½).

FILTER — Filter state (on/off) and configuration can be changed for any measurement function, except frequency, period, continuity and diode test. The FILTER key toggles between filter on (FILT annunciator on) and filter off. After pressing FILTER to enable the filter, you can then enter the filter count (1 to 100), and select the filter type (moving or repeating). (If the FILT annunciator is already on, press FILTER twice before entering the filter count.)

Changing temperature measurement configuration

Press SHIFT and then TCOUPL. Three choices are available using the ▲ and ▼ keys:

- UNITS — C, K or F. Specify units.
- TYPE — J, K or T. Specify thermocouple type.
- JUNC — SIM or CH1. Simulate a reference junction temperature (for direct thermocouple connection to the INPUT), or use the reference junction (channel 1) provided on a switching card. In order to keep the reference calculations updated and accurate, Channel 1 needs to be read periodically.

To assign a value to a parameter, use the ▲ and ▼ keys to scroll to the desired parameter. Select the ► key, and use the ▲ and ▼ keys to scroll through and choose the preferred value. Select the ENTER key to save any changes.

Relative (rel)

Rel can be used to null offsets or subtract a baseline reading from present and future readings. When rel is enabled by pressing REL (REL annunciator on), the instrument uses the present reading as the relative value. Subsequent readings will be the difference between the actual input value and the rel value. You can define a rel value for each function. Pressing REL a second time disables rel.

Math

To enable and configure a math operation, press SHIFT and then the desired math key (MX+B, %, dBm or dB). Use the ◀, ▶, ▲ and ▼ keys to configure the math operation and press ENTER when done. Pressing SHIFT and then the related math key a second time disables the math operation.

MX+B

$$Y = mX + b$$

Where: X is the normal display reading.
m and b are the user entered constants.
Y is the displayed result.

Percent (%)

$$\text{Percent} = \frac{\text{Input} - \text{Reference}}{\text{Input}} \times 100\%$$

Where: Input is the normal display reading.
Reference is the user entered constant.
Percent is the displayed result.

dBm

$$\text{dBm} = 10 \log \frac{\left(V_{\text{IN}}^2 / Z_{\text{REF}} \right)}{1\text{mW}}$$

Where: V_{IN} is the DC or AC input signal.
 Z_{REF} is the specified reference impedance.

dB

$$\text{dB} = 20 \log \frac{|V_{\text{IN}}|}{|V_{\text{REF}}|}$$

Where: V_{IN} is the DC or AC input signal.
 V_{REF} is the specified voltage reference impedance.

Measuring continuity

With this feature, the instrument alerts you with a beep when a resistance reading is below the set level. To measure continuity, press SHIFT and then CONT. Use the ◀, ▶, ▲ and ▼ keys to set the resistance threshold level, and press ENTER. Connect the test leads to INPUT HI and LO.

Testing diodes

With this feature, the instrument measures the forward voltage drop of general-purpose diodes and the zener voltage of zener diodes. To test diodes, press SHIFT and then (→). Use the ▲ and ▼ keys to select the test current.

Limit operations

With this feature, you can check to see if readings are within (“IN” displayed), below (“LO” displayed) or above (“HI” displayed) specified low and high reading limits. You can also set the instrument to beep when readings are inside or outside of the limit range.

Setting limits — To set limits (absolute values), press SHIFT and then LIMITS to display the high limit. Use the ◀, ▶, ▲ and ▼ keys to enter the desired value, and press ENTER. Enter the low limit value and again press ENTER.

Enabling limits — Press SHIFT and then ON/OFF to display the beeper status. Use the ▲ and ▼ keys to change the beeper status (NEVER, OUTSIDE or INSIDE) and press ENTER to enable limits. Pressing SHIFT and then ON/OFF a second time disables limit operations.

Reading hold

With this feature, an audible beep is sounded when a valid, settled reading is acquired. A valid reading is determined by the specified window and count.

1. Press SHIFT and then HOLD. Select a window percentage and enter a count.
2. Apply the test probes to the signal and wait for the beeper to sound to indicate a valid reading.
3. Remove the hold condition by lifting the probes.

Pressing SHIFT and then HOLD a second time disables Hold.

Triggers

Factory defaults place the instrument in a continuous (immediate) measurement mode. The instrument can be placed in an external trigger mode where a programmed event is required to cause a measurement (device action).

The instrument is placed in the external trigger mode by pressing the EXT TRIG key. In this mode, a device action (measurement) will occur when the TRIG key is pressed, a bus trigger (*TRG or GET) is received, or an input trigger via the TRIGGER LINK connector is received. After the device action (measurement), an output trigger occurs and is available at the TRIGGER LINK connector. Refer to the User's Manual for details on using the trigger link. Pressing EXT TRIG a second time returns the instrument to continuous operation.

Delay — A programmable delay before the device action (measurement) occurs is available. It can be set manually or an auto delay can be used. To set a delay, press SHIFT and then DELAY. Use the ▲ and ▼ keys to select AUTO or MANUal. If MANUal is chosen, enter the duration of the delay and press ENTER. The AUTO delay times are listed in Table 3-2 of the User's Manual.

Scan operations

The Model 2000 can be used with an internal scanner card (Model 2000 SCAN or 2001-TCSCAN), or with external scanner cards installed in a switching main-frame (i.e. Model 7001 and 7002).

Step/Scan configuration — A “walk-through” menu is provided to configure stepping or scanning. The main menu is accessed by pressing SHIFT and then CONFIG. Use the ◀, ▶, ▲, ▼ and ENTER keys to select scan type (INTernal or EXTernal), first channel in the scan (MINimum CHANnel), last channel in the scan (MAXimum CHANnel), time between scans, and reading count (RDG CNT).

◀ and ▶ keys — These keys can be used to manually scan through channels on the internal scanner card. Press ▶ to manually increment channels or ◀ to manually decrement channels. Hold down either key to scan continuously.

OPEN and CLOSE keys — Use these keys to open and close channels on the internal scanner card. After pressing CLOSE, use the ◀, ▶, ▲ and ▼ keys to display the desired channel (1 to 10) and press ENTER. Selecting a different channel will cause the previously closed channel to open. For the Ω4 function, CLOSE will close the selected channel and the paired channel. Paired channels for the Model 2000 SCAN are 1&6, 2&7, 3&8, 4&9, and 5&10. Channel pairs are similar for the Model 2001-TCSCAN except that channels 1&6 are not paired.

STEP key — Pressing this key starts a stepping operation of consecutive channels, where output triggers are sent after every channel closure.

SCAN key — Pressing this key starts a scanning operation of consecutive channels, where an output trigger is sent at the end of the scan list.

HALT — Pressing SHIFT and then HALT stops stepping or scanning.

Factory default conditions

Table 2. Factory defaults

| Setting | Factory default |
|----------------------|-------------------|
| Autozero | On |
| Buffer | No effect |
| Continuity | |
| Beeper | On |
| Digits | 4½ |
| Rate | Fast (0.1 PLC) |
| Threshold | 10Ω |
| Current (AC and DC) | |
| Digits (AC) | 5½ |
| Digits (DC) | 6½ |
| Filter | On |
| Count | 10 |
| Mode | Moving average |
| Range | Auto |
| Relative | Off |
| Value | 0.0 |
| Rate (AC) | Medium* |
| Rate (DC) | Medium (1 PLC) |
| Diode test | |
| Digits | 6½ |
| Range | 1mA |
| Rate | Medium (1 PLC) |
| Frequency and Period | |
| Digits | 6½ |
| Range | 10V |
| Relative | Off |
| Value | 0.0 |
| Rate | Slow (1 sec) |
| Function | DCV |
| GPIB | No effect |
| Address | (16 at factory) |
| Language | (SCPI at factory) |
| Limits | Off |
| Beeper | Never |
| High limit | +1 |
| Low limit | -1 |
| mX+b | Off |
| Scale factor | 1.0 |
| Offset | 0.0 |
| Percent | Off |
| References | 1.0 |

Table 2. Factory defaults (cont.)

| Setting | Factory default |
|--------------------------------|-----------------|
| Resistance (2-wire and 4-wire) | |
| Digits | 6½ |
| Filter | On |
| Count | 10 |
| Mode | Moving average |
| Range | Auto |
| Relative | Off |
| Value | 0.0 |
| Rate | Medium (1 PLC) |
| RS-232 | Off |
| Baud | No effect |
| Flow | No effect |
| Tx term | No effect |
| Scanning | Off |
| Channels | 1-10 |
| Mode | Internal |
| Temperature | |
| Digits | 5½ |
| Filter | On |
| Count | 10 |
| Mode | Moving average |
| Junction | Simulated |
| Temperature | 23°C |
| Relative | Off |
| Value | 0.0 |
| Rate | Medium (1 PLC) |
| Thermocouple | J |
| Units | °C |
| Triggers | |
| Continuous | On |
| Delay | Auto |
| Source | Immediate |
| Voltage (AC and DC) | |
| dB reference | No effect |
| dBm reference | 75Ω |
| Digits (AC) | 5½ |
| Digits (DC) | 6½ |
| Filter | On |
| Count | 10 |
| Mode | Moving average |
| Range | Auto |
| Relative | Off |
| Value | 0.0 |
| Rate (AC) | Medium* |
| Rate (DC) | Medium (1 PLC) |

*DETECTOR: BANDwidth 30

Error and status messages

Table 3. Error and status messages

| Number | Description | Event |
|--------|--|-------|
| -440 | Query unterminated after indefinite response | EE |
| -430 | Query deadlocked | EE |
| -420 | Query unterminated | EE |
| -410 | Query interrupted | EE |
| -363 | Input buffer overrun | SYS |
| -350 | Queue overflow | SYS |
| -330 | Self-test failed | EE |
| -314 | Save/recall memory lost | EE |
| -315 | Configuration memory lost | EE |
| -285 | Program syntax error | EE |
| -284 | Program currently running | EE |
| -282 | Illegal program name | EE |
| -281 | Cannot create program | EE |
| -260 | Expression error | EE |
| -241 | Hardware missing | EE |
| -230 | Data corrupt or stale | EE |
| -225 | Out of memory | EE |
| -224 | Illegal parameter value | EE |
| -223 | Too much data | EE |
| -222 | Parameter data out of range | EE |
| -221 | Settings conflict | EE |
| -220 | Parameter error | EE |
| -215 | Arm deadlock | EE |
| -214 | Trigger deadlock | EE |
| -213 | Init ignored | EE |
| -212 | Arm ignored | EE |
| -211 | Trigger ignored | EE |
| -210 | Trigger error | EE |
| -202 | Settings lost due to rtl | EE |
| -201 | Invalid while in local | EE |
| -200 | Execution error | EE |
| -178 | Expression data not allowed | EE |
| -171 | Invalid expression | EE |
| -170 | Expression error | EE |
| -168 | Block data not allowed | EE |
| -161 | Invalid block data | EE |
| -160 | Block data error | EE |
| -158 | String data not allowed | EE |
| -154 | String too long | EE |
| -151 | Invalid string data | EE |
| -150 | String data error | EE |
| -148 | Character data not allowed | EE |

Table 3. Error and status messages (cont.)

| Number | Description | Event |
|---------------|-----------------------------|--------------|
| -144 | Character data too long | EE |
| -141 | Invalid character data | EE |
| -140 | Character data error | EE |
| -128 | Numeric data not allowed | EE |
| -124 | Too many digits | EE |
| -123 | Exponent too large | EE |
| -121 | Invalid character in number | EE |
| -120 | Numeric data error | EE |
| -114 | Header suffix out of range | EE |
| -113 | Undefined header | EE |
| -112 | Program mnemonic too long | EE |
| -111 | Header separator error | EE |
| -110 | Command header error | EE |
| -109 | Missing parameter | EE |
| -108 | Parameter not allowed | EE |
| -105 | GET not allowed | EE |
| -104 | Data type error | EE |
| -103 | Invalid separator | EE |
| -102 | Syntax error | EE |
| -101 | Invalid character | EE |
| -100 | Command error | EE |
| +000 | No error | SE |
| +101 | Operation complete | SE |
| +121 | Device calibrating | SE |
| +122 | Device settling | SE |
| +123 | Device ranging | SE |
| +124 | Device sweeping | SE |
| +125 | Device measuring | SE |
| +126 | Device calculating | SE |
| +161 | Program running | SE |
| +171 | Waiting in trigger layer | SE |
| +174 | Re-entering the idle layer | SE |
| +301 | Reading overflow | SE |
| +302 | Low limit 1 event | SE |
| +303 | High limit 1 event | SE |
| +304 | Low limit 2 event | SE |
| +305 | High limit 2 event | SE |
| +306 | Reading available | SE |
| +307 | Voltmeter complete | SE |
| +308 | Buffer available | SE |
| +309 | Buffer half full | SE |
| +310 | Buffer full | SE |
| +311 | Buffer overflow | SE |

Table 3. Error and status messages (cont.)

| Number | Description | Event |
|--------|----------------------------------|-------|
| | Calibration messages: | |
| +400 | 10 vdc zero error | EE |
| +401 | 100 vdc zero error | EE |
| +402 | 10 vdc full scale error | EE |
| +403 | -10 vdc full scale error | EE |
| +404 | 100 vdc full scale error | EE |
| +405 | -100 vdc full scale error | EE |
| +406 | 1k 2-w zero error | EE |
| +407 | 10k 2-w zero error | EE |
| +408 | 100k 2-w zero error | EE |
| +409 | 10M 2-w zero error | EE |
| +410 | 10M 2-w full scale error | EE |
| +411 | 10M 2-w open error | EE |
| +412 | 1k 4-w zero error | EE |
| +413 | 10k 4-w zero error | EE |
| +414 | 100k 4-w zero error | EE |
| +415 | 10M 4-w sense lo zero error | EE |
| +416 | 1k 4-w full scale error | EE |
| +417 | 10k 4-w full scale error | EE |
| +418 | 100k 4-w full scale error | EE |
| +419 | 1M 4-w full scale error | EE |
| +420 | 10M 4-w full scale error | EE |
| +421 | 10m adc zero error | EE |
| +422 | 100m adc zero error | EE |
| +423 | 10m adc full scale error | EE |
| +424 | 100m adc full scale error | EE |
| +425 | 1 adc full scale error | EE |
| +438 | Date of calibration not set | EE |
| +439 | Next date of calibration not set | EE |
| +450 | 100m vac dac error | EE |
| +451 | 1 vac dac error | EE |
| +452 | 10 vac dac error | EE |
| +453 | 100 vac dac error | EE |
| +454 | 100m vac zero error | EE |
| +455 | 100m vac full scale error | EE |
| +456 | 1 vac zero error | EE |
| +457 | 1 vac full scale error | EE |
| +458 | 1 vac noise error | EE |
| +459 | 10 vac zero error | EE |
| +460 | 10 vac full scale error | EE |
| +461 | 10 vac noise error | EE |
| +462 | 100 vac zero error | EE |
| +463 | 100 vac full scale error | EE |
| +464 | 750 vac zero error | EE |
| +465 | 750 vac full scale error | EE |
| +466 | 750 vac noise error | EE |

Table 3. Error and status messages (cont.)

| Number | Description | Event |
|---------------|---------------------------------------|--------------|
| +467 | Post filter offset error | EE |
| +468 | 1 aac zero error | EE |
| +469 | 1 aac full scale error | EE |
| +470 | 3 aac zero error | EE |
| +471 | 3 aac full scale error | EE |
| +472 | Input time constant error | EE |
| +473 | Frequency gain error | EE |
| +500 | Calibration data invalid | EE |
| +510 | Reading buffer data lost | EE |
| +511 | GPIB address lost | EE |
| +512 | Power-on state lost | EE |
| +513 | AC calibration data lost | EE |
| +514 | DC calibration data lost | EE |
| +515 | Calibration dates lost | EE |
| +522 | GPIB communication language lost | EE |
| +610 | Questionable Calibration | SE |
| +611 | Questionable Temperature | SE |
| +800 | RS-232 Framing Error detected | EE |
| +802 | RS-232 Overrun detected | EE |
| +803 | RS-232 Break detected | EE |
| +805 | Invalid system communication | EE |
| +806 | RS-232 Settings Lost | EE |
| +807 | RS-232 OFLO: Characters Lost | EE |
| +808 | ASCII only with RS-232 | EE |
| +900 | Internal System Error | EE |
| | DDC Status Model: | |
| +950 | DDC Trigger Overrun Error | EE |
| +951 | DDC Interval Overrun Error | EE |
| +952 | DDC Big String Error | EE |
| +953 | DDC Uncalibrated Error | EE |
| +954 | DDC No Scanner Error | EE |
| +955 | DDC Maximum Channel is 4 | EE |
| +956 | DDC Maximum Channel is 8 | EE |
| +957 | DDC Calibration Locked | EE |
| +958 | DDC Conflict Error | EE |
| +959 | DDC No Remote Error | EE |
| +960 | DDC Mode IDDC Error | EE |
| +961 | DDC Mode IDDCO Error | EE |
| | Keithley 199 Serial Poll Byte Events: | |
| +962 | DDC Ready | SE |
| +963 | DDC Reading Done | SE |
| +964 | DDC Buffer Half Full | SE |
| +965 | DDC Buffer Full | SE |
| +966 | DDC Reading overflow | SE |

Table 3. Error and status messages (cont.)

| Number | Description | Event |
|---------------|-------------------------------------|--------------|
| +970 | Fluke 8842 serial poll byte events: | |
| +970 | Fluke Error | SE |
| +971 | Data Available | SE |
| +972 | Overrange | SE |

EE = error event

SE = status event

SYS = system error event

Remote Operation Summary

At the factory, the instrument is set for GPIB bus operation at primary address 16 using the SCPI programming language.

GPIB bus — Use the GPIB bus configuration menu to enable or disable GPIB bus operation (ON or OFF), and to check and/or change the primary address (0 to 30) and language (SCPI, 199, or 8842). The configuration menu is accessed by pressing SHIFT and then GPIB. Commands for the SCPI language are provided in Tables 4 through 15. The DDC commands for the 199 and 8842 languages are provided in Tables 16 and 17.

RS-232 interface — Use the RS-232 interface menu to enable or disable RS-232 interface operation (ON or OFF), and to check and/or change the baud rate (300 to 19.2k), flow control (NONE or XonXoff) and terminator (LF, CR or LFCR). Note that only the SCPI language commands can be used over the RS-232 interface.

Status structure

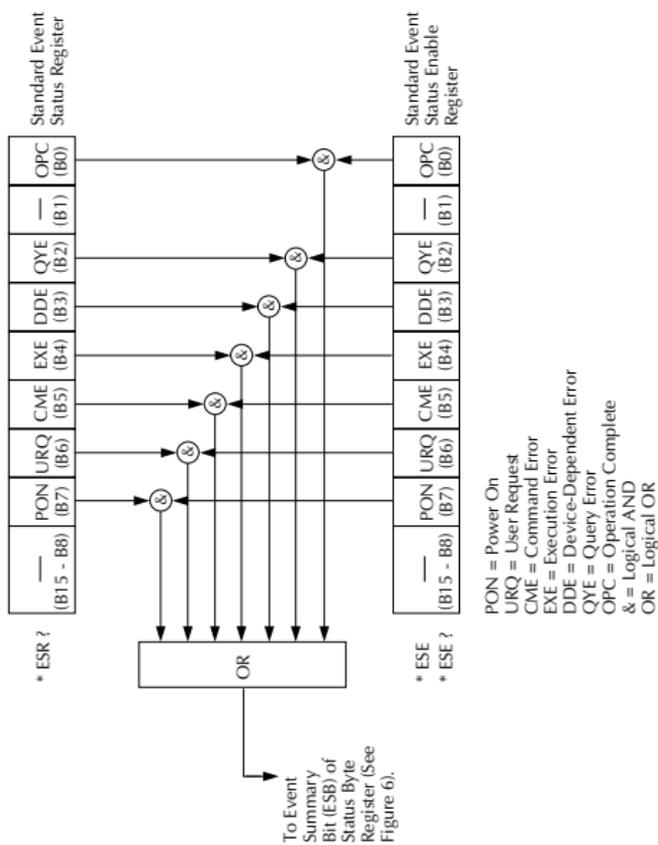


Figure 2. Standard event status

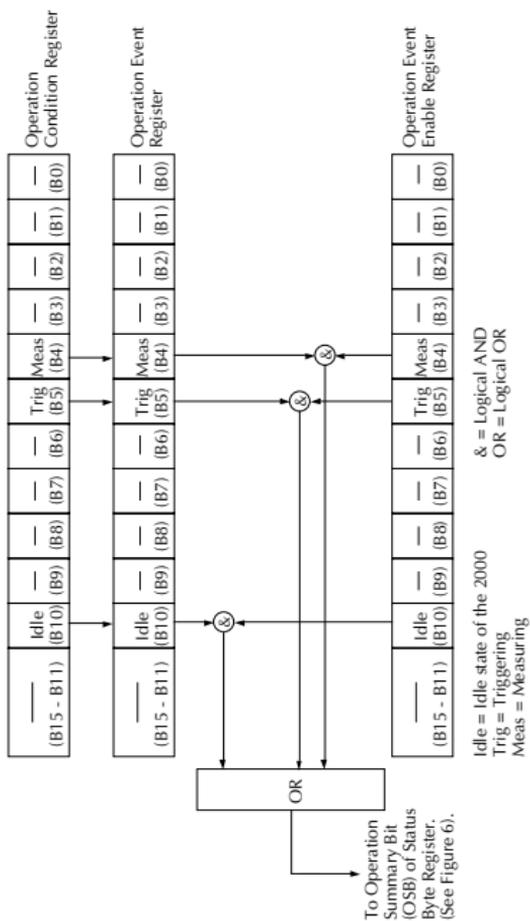


Figure 3. Operation event status

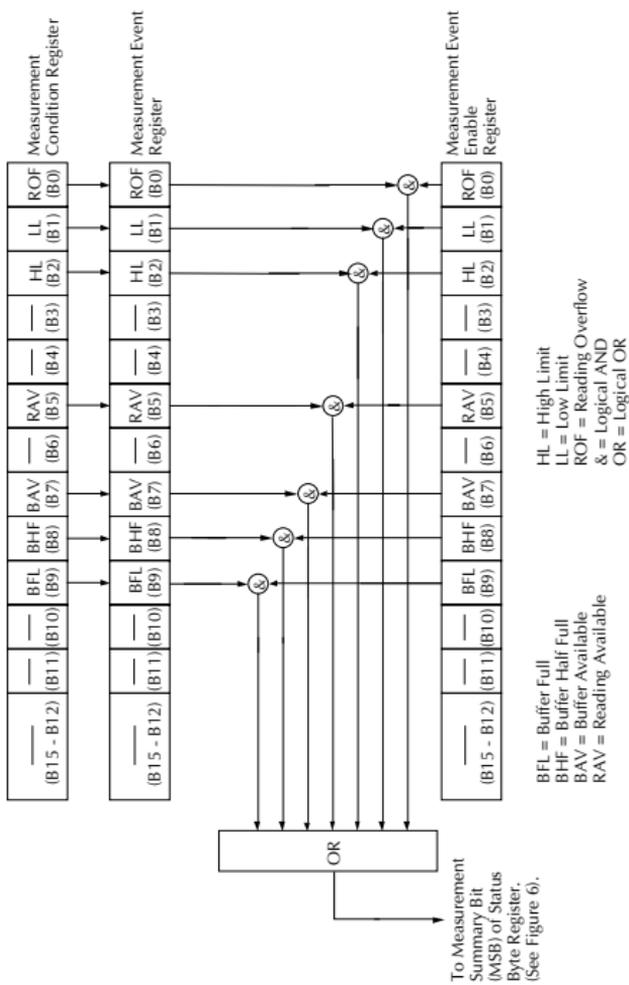


Figure 4. Measurement event status

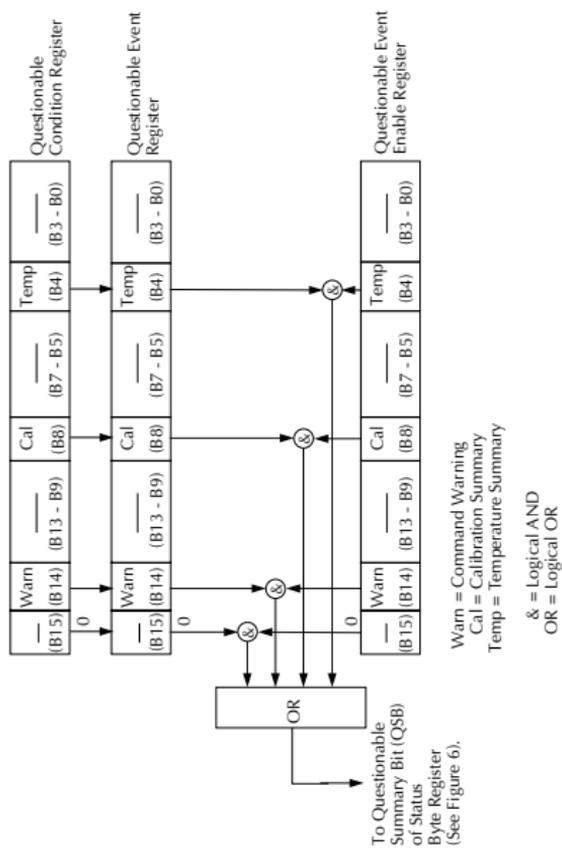


Figure 5. Questionable event status

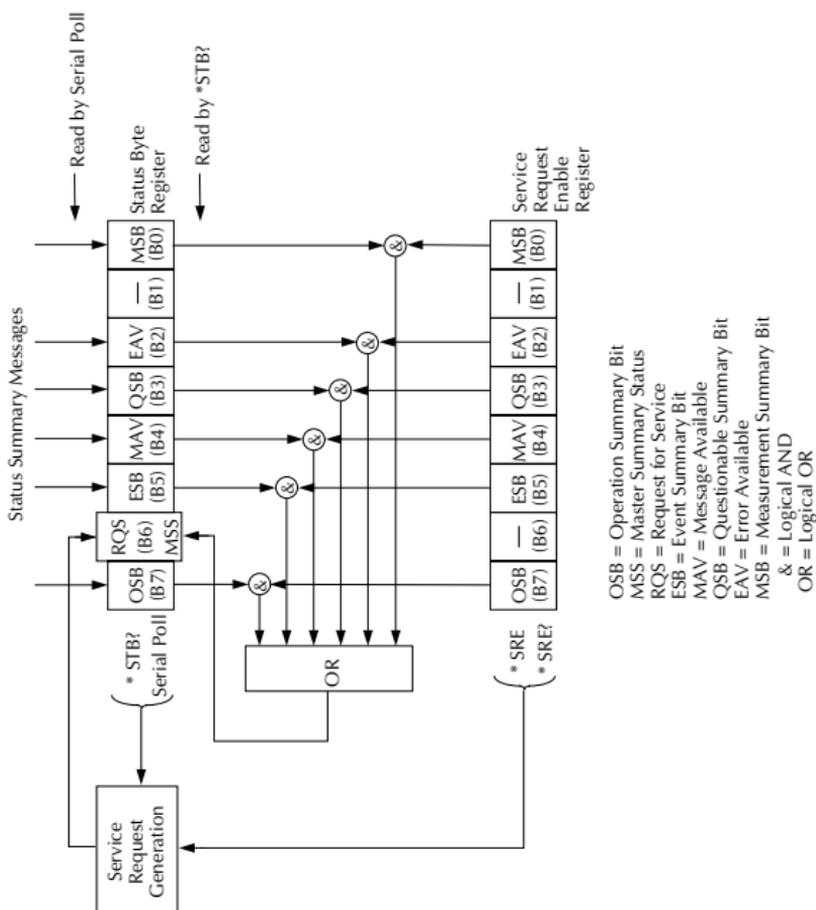


Figure 6. Status byte and service request (SRQ)

IEEE-488.2 common commands and queries

Table 4. 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 | Program the Standard Event Enable Register. |
| *ESE? | Event enable query | Read the Standard Event Enable Register. |
| *ESR? | Event status register query | Read the Standard Event Enable Register and clear it. |
| *IDN? | Identification query | Returns the manufacturer, model number, serial number and firmware revision levels of the unit. |
| *OPC | Operation complete command | Set the Operation Complete 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 | Returns an ID code that indicates which memory option is installed and whether or not the optional scanner card is installed. |
| *RCL <NRf> | Recall command | Returns the Model 2000 to the setup configuration stored in the specified memory location. |
| *RST | Reset command | Returns the Model 2000 to the *RST default conditions. |
| *SAV <NRf> | Save command | Saves the current setup to the specified memory location. |

Table 4. IEEE-488.2 common commands and queries (cont.)

| Mnemonic | Name | Description |
|------------|--------------------------------|---|
| *SRE <NRf> | Service request enable command | Programs the Service Request Enable Register. |
| *SRE? | Service request enable query | Reads the Service Request Enable Register. |
| *STB? | Read status byte query | Reads the Status Byte Register. |
| *TRG | Trigger command | Sends a bus trigger to the 2000. |
| *TST? | Self-test query | Performs a checksum test on ROM and returns the result. |
| *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 5. Signal oriented measurement commands

| Command | Description |
|-----------------------|--|
| :CONFigure:<function> | Places the Model 2000 in a "one-shot" measurement mode for the specified function. |
| :FETCh? | Requests the latest reading. |
| :READ? | Performs an :ABORt, :INITiate, and a :FETCh?. |
| MEASure[:<function>]? | Performs an :ABORt, :CONFigure:<function>, and a :READ?. |

Table 6. CALCulate command summary

| Command | Description |
|---|---|
| <p>:CALCulate[1] :FORMat <name> :FORMat? :KMATH :MMFactor <NRf> :MMFactor? :MBFactor <NRf> :MBFactor? :MUNits <name> :MUNits? :PERCent <NRf> :ACQuire :PERCent? :STATe :STATe? :DATA?</p> | <p>Subsystem to control CALC 1: Select math format (NONE, MXB, PERCent). Query math format. Path to configure math calculations: Set "m" factor for mx+b (-100e6 to 100e6). Query "m" factor. Set "b" factor for mx+b (-100e6 to 100e6). Query "b" factor. Specify units for mx+b reading (three characters 'A' through 'Z'). Query "mx+b" units. Set target value for PERCent calculation (-100e6 to 100e6). Use input signal as target value. Query percent. Enable or disable kmath calculation. Query state of kmath function. Read result of kmath calculation.</p> |
| <p>:CALCulate2 :FORMat <name> :FORMat? :STATe :STATe? :IMMediate :IMMediate? :DATA?</p> | <p>Subsystem to control CALC 2: Select math format: (MEAN, SDEViation, MAXimum, MINimum, or NONE). Query math format. Enable or disable calculation. Query state of math function. Recalculate raw input data in buffer. Perform calculation and read result. Read math result of CALC 2.</p> |

Table 6. CALCulate command summary (cont.)

| Command | Description |
|--|--|
| :CALCulate3 :LIMit[1] :UPPer [:DATA] <n> [:DATA]? :LOWer [:DATA] <n> [:DATA]? :STATe :STATe? :FAIL? :CLEAR [:IMMEDIATE] :AUTO :AUTO? :IMMEDIATE | Subsystem to control CALC 3 (limit test): Path to control LIMIT 1 test: Path to configure upper limit: Set upper limit (-100e6 to 100e6). Query upper limit. Path to configure lower limit: Set lower limit (-100e6 to 100e6). Query lower limit. Enable or disable limit test. Query state of limit test. Query test result (1 = pass, 0 = fail). Path to clear failed test: Clear failed test indication. Enable or disable auto clear. Query auto clear. Re-perform limit tests. |

Table 7. DISPlay command summary

| Command | Description |
|--|--|
| :DISPlay [:WINDow[1]] :TEXT :DATA <a> :DATA? :STATe :STATe? :ENABLE :ENABLE? | Path to control user text messages. Define ASCII message "a" (up to 12 characters). Query text message. Enable or disable message mode. Query text message state. Enable or disable the front panel display. Query state of the display. |

Table 8. FORMat command summary

| Command | Description |
|---|--|
| :FORMat [:DATA] <type>[,<length>] [:DATA]? :ELEMents <item list> :ELEMents? :BORDER <name> :BORDER? | Select data format: (ASCIi, SREal or DREal). Query data format. Specify data elements: (READING, CHANnel, and UNITS). Query data elements. Select binary byte order: (NORMAL or SWAPPed). Query byte order. |

Table 9. ROUTe command summary

| Command | Description |
|---|---|
| :ROUTE :CLOSE <chan num> :STATE? :OPEN:ALL :MULTiple :CLOSE <list> :STATE? :OPEN <list> :SCAN [:INTERNAL] <list> [:INTERNAL]? :EXTERNAL <list> :EXTERNAL? :LSELECT <name> :LSELECT? | Commands to control scanner card: Close specified channel (1 to 10) or channel pair (1 to 5). Query closed channel (or channel pair). Open all input channels (1 through 10). Path to close and open multiple channels: Close specified channels (1 to 11). Query closed channel. Open specified channels (1 to 11). Path to scan channels. Specify internal scan list (2 to 10 channels). Query internal scan list. Specify external scan list (2 to 800 channels). Query external scan list. Select scan operation (INTERNAL, EXTERNAL, or NONE). Query scan operation. |

Table 10. SENSE command summary

| Command | Description |
|--|---|
| <pre>[:SENSe[1]] :FUNctIon <name> :FUNctIon? :DATA? :FRESH? :HOLD :WINDow <NRf> :WINDow? :COUNT <NRf> :COUNT? :STATe <NRf> :STATe?</pre> | <p>Select measurement function: 'VOLTage:AC', VOLTage:DC', RESistance', 'FRESistance', 'CURRent:AC', 'CURRent:DC', 'FREQuency', 'TEMPerature', 'PERiod', 'DIODE', "CONTInuity'.</p> <p>Query function.</p> <p>Return the last instrument reading.</p> <p>Returns a new (fresh) reading.</p> <p>Path to control Hold feature:</p> <p>Set Hold window (%); 0.01 to 20.</p> <p>Query Hold window.</p> <p>Set Hold count; 2 to 100.</p> <p>Query Hold count.</p> <p>Enable or disable Hold.</p> <p>Query state of Hold.</p> |
| <pre>:CURRent:AC :NPLCycles <n> :NPLCycles? :RANGe [:UPPer] <n> [:UPPer]? :AUTO :AUTO? :REFerence <n> :STATe :STATe? :ACQuire :REFerence? :DIGits <n> :DIGits? :AVERAge :TCONtrol <name> :TCONtrol? :COUNT <n> :COUNT? :STATe :STATe?</pre> | <p>Path to configure AC current.</p> <p>Set integration rate (line cycles; 0.01 to 10).</p> <p>Query line cycle integration rate.</p> <p>Path to configure measurement range:</p> <p>Select range (0 to 3.1).</p> <p>Query range.</p> <p>Enable or disable auto range.</p> <p>Query auto range.</p> <p>Specify reference (-3.1 to 3.1).</p> <p>Enable or disable reference.</p> <p>Query state of reference.</p> <p>Use input signal as reference.</p> <p>Query reference value.</p> <p>Specify measurement resolution (4 to 7).</p> <p>Query resolution.</p> <p>Path to configure and control the filter.</p> <p>Select filter type: (MOVing or REPeat).</p> <p>Query filter type.</p> <p>Specify filter count (1 to 100).</p> <p>Query filter count.</p> <p>Enable or disable filter.</p> <p>Query state of digital filter.</p> |

Table 10. SENSE command summary (cont.)

| Command | Description |
|--|--|
| <pre> :CURRent:AC :DETEctor :BANdwidth <NRf> :BANdwidth? </pre> | <p>Path to configure bandwidth: Specify bandwidth (3 to 300e3). Query bandwidth.</p> |
| <pre> :CURRent:DC :NPLCycles <n> :NPLCycles? :RANGe [:UPPer] <n> [:UPPer]? :AUTO :AUTO? :REFerence <n> :STATe :STATe? :ACQuire :REFerence? :DIgits <n> :DIgits? :AVERage :TCONtrol <name> :TCONtrol? :COUNt <n> :COUNt? :STATe :STATe? </pre> | <p>Path to configure DC current. Set integration rate (line cycles; 0.01 to 10). Query line cycle integration rate. Path to configure measurement range: Select range (0 to 3.1). Query range. Enable or disable auto range. Query auto range. Specify reference (-3.1 to 3.1). Enable or disable reference. Query state of reference. Use input signal as reference. Query reference value. Specify measurement resolution (4 to 7). Query resolution. Path to configure and control the filter. Select filter type: (MOVing or REPeat). Query filter type. Specify filter count (1 to 100). Query filter count. Enable or disable filter. Query state of digital filter.</p> |
| <pre> :VOLTage:AC :NPLCycles <n> :NPLCycles? :RANGe [:UPPer] <n> [:UPPer]? :AUTO :AUTO? :REFerence <n> </pre> | <p>Path to configure AC voltage. Set integration rate (line cycles; 0.01 to 10). Query line cycle integration rate. Path to configure measurement range: Select range (0 to 757.5). Query range. Enable or disable auto range. Query auto range. Specify reference (-757.5 to 757.5).</p> |

Table 10. SENSE command summary (cont.)

| Command | Description |
|--|--|
| <pre> :VOLTage:AC :REference <n> :STATE :STATE? :ACQuire :REference? :DIGits <n> :DIGits? :AVERage :TCONtrol <name> :TCONtrol? :COUNT <n> :COUNT? :STATE :STATE? :DETEctor :BANDwidth <NRf> :BANDwidth? </pre> | <p>Enable or disable reference. Query state of reference. Use input signal as reference. Query reference value. Specify measurement resolution (4 to 7). Query resolution. Path to configure and control the filter. Select filter type: (MOVing or REPEAT). Query filter type. Specify filter count (1 to 100). Query filter count. Enable or disable filter. Query state of digital filter. Path to configure bandwidth: Specify bandwidth (3 to 300e3). Query bandwidth.</p> |
| <pre> :VOLTage:DC :NPLCycles <n> :NPLCycles? :RANGe [:UPPer] <n> [:UPPer]? :AUTO :AUTO? :REference <n> :STATE :STATE? :ACQuire :REference? :DIGits <n> :DIGits? </pre> | <p>Path to configure DC voltage: Set integration rate (line cycles; (0.01 to 10)). Query line cycle integration rate. Path to configure measurement range: Select range (0 to 1010). Query range. Enable or disable auto range. Query auto range. Specify reference (-1010 to +1010). Enable or disable reference. Query state of reference (0 or 1). Use input signal as reference. Query reference value. Specify measurement resolution (4 to 7). Query resolution.</p> |

Table 10. SENSE command summary (cont.)

| Command | Description |
|--|--|
| <p>:VOLTage:DC :AVERage</p> <p>:TCONtrol <name></p> <p>:TCONtrol?</p> <p>:COUNT <n></p> <p>:COUNT?</p> <p>:STATe </p> <p>:STATe?</p> | <p>Path to configure and control the filter.</p> <p>Select filter type: (MOVing or REPeat).</p> <p>Query filter type.</p> <p>Specify filter count (1 to 100).</p> <p>Query filter count.</p> <p>Enable or disable filter.</p> <p>Query state of digital filter.</p> |
| <p>:RESistance</p> <p>:NPLCycles <n></p> <p>:NPLCycles?</p> <p>:RANGe</p> <p>[:UPPer] <n></p> <p>[:UPPer]?</p> <p>:AUTO </p> <p>:AUTO?</p> <p>:REFerence <n></p> <p>:STATe </p> <p>:STATe?</p> <p>:ACQuire</p> <p>:REFerence?</p> <p>:DIGits <n></p> <p>:DIGits?</p> <p>:AVERage</p> <p>:TCONtrol <name></p> <p>:TCONtrol?</p> <p>:COUNT <n></p> <p>:COUNT?</p> <p>:STATe </p> <p>:STATe?</p> | <p>Path to configure resistance:</p> <p>Set integration rate (line cycles; 0.01 to 10).</p> <p>Query line cycle integration rate.</p> <p>Path to configure measurement range:</p> <p>Select range (0 to 120e6).</p> <p>Query range.</p> <p>Enable or disable auto range.</p> <p>Query auto range.</p> <p>Specify reference (0 to 120e6).</p> <p>Enable or disable reference.</p> <p>Query state of reference.</p> <p>Use input signal as reference.</p> <p>Query reference value.</p> <p>Specify measurement resolution (4 to 7).</p> <p>Query resolution.</p> <p>Path to configure and control filter.</p> <p>Select filter type: (MOVing or REPeat).</p> <p>Query filter type.</p> <p>Specify filter count (1 to 100).</p> <p>Query filter count.</p> <p>Enable or disable filter.</p> <p>Query state of digital filter.</p> |

Table 10. SENSE command summary (cont.)

| Command | Description |
|---|---|
| <p>:FRESistance</p> <p>:NPLCycles <n></p> <p>:NPLCycles?</p> <p>:RANGe</p> <p>[:UPPer] <n></p> <p>[:UPPer]?</p> <p>:AUtO </p> <p>:AUtO?</p> <p>:REFerence <n></p> <p>:STATe </p> <p>:STATe?</p> <p>:ACQuire</p> <p>:REFerence?</p> <p>:DIGits <n></p> <p>:DIGits?</p> <p>:AVERAge</p> <p>:TCONtrol <name></p> <p>:TCONtrol?</p> <p>:COUNt <n></p> <p>:COUNt?</p> <p>:STATe </p> <p>:STATe?</p> | <p>Path to configure four-wire resistance:</p> <p>Set integration rate (line cycles; 0.01 to 10).</p> <p>Query line cycle integration rate.</p> <p>Path to configure measurement range:</p> <p>Select range (0 to 101e6).</p> <p>Query range.</p> <p>Enable or disable auto range.</p> <p>Query auto range.</p> <p>Specify reference (0 to +101e6).</p> <p>Enable or disable reference.</p> <p>Query state of reference.</p> <p>Use input signal as reference.</p> <p>Query reference value.</p> <p>Specify measurement resolution (4 to 7).</p> <p>Query resolution.</p> <p>Path to configure and control filter.</p> <p>Select filter type: (MOVing or REPeat).</p> <p>Query filter type.</p> <p>Specify filter count (1 to 100).</p> <p>Query filter count.</p> <p>Enable or disable filter.</p> <p>Query state of digital filter.</p> |
| <p>:TEMPerature</p> <p>:NPLCycles <n></p> <p>:NPLCycles?</p> <p>:REFerence <n></p> <p>:STATe </p> <p>:STATe?</p> <p>:ACQuire</p> <p>:REFerence?</p> <p>:DIGits <n></p> <p>:DIGits?</p> <p>:AVERAge</p> | <p>Path to configure temperature:</p> <p>Set integration rate (line cycles; 0.01 to 10).</p> <p>Query line cycle integration rate.</p> <p>Specify reference; -200 to 1372.</p> <p>Enable or disable reference.</p> <p>Query state of reference.</p> <p>Use input signal as reference.</p> <p>Query reference value.</p> <p>Specify measurement resolution (4 to 7).</p> <p>Query resolution.</p> <p>Path to configure and control the filter.</p> |

Table 10. SENSE command summary (cont.)

| Command | Description |
|---|--|
| <p>:TEMPerature :AVERage :TCONtrol <name></p> <p>:TCONtrol? :COUNT <n> :COUNT? :STATE :STATE?</p> <p>:TCouple :TYPE <name></p> <p>:TYPE? :RJUNction :RSElect <name></p> <p>:RSElect? :SIMulated <n></p> <p>:SIMulated?</p> <p>:REAL :TCoefficient <n></p> <p>:TCoefficient? :OFFSET <n></p> <p>:OFFSet?</p> | <p>Select filter type: (MOVing or REPEat).</p> <p>Query filter type.</p> <p>Specify filter count (1 to 100).</p> <p>Query filter count.</p> <p>Enable or disable filter.</p> <p>Query state of digital filter.</p> <p>Path to configure thermocouple: Select thermocouple type (J, K, or T).</p> <p>Query thermocouple type.</p> <p>Path to configure reference junction: Select reference type (SIMulated or REAL).</p> <p>Query reference type.</p> <p>Specify simulated temperature in °C (0 to 50).</p> <p>Query simulated temperature.</p> <p>Path to configure real reference junction: Specify temp coefficient (-0.09999 to 0.09999).</p> <p>Query temp coefficient.</p> <p>Specify voltage offset at 0°C (-0.09999 to 0.09999).</p> <p>Query voltage offset.</p> |

Table 10. SENSE command summary (cont.)

| Command | Description |
|---|--|
| :FREQuency :APERTure :APERTure? :THReshold :VOLTage :RANGe <n> :RANGe? :REFerence <n> :STATe :STATe? :ACQuire :REFerence? :DIGits <n> :DIGits? | Path to configure frequency. Sets gate time for period measurements (0.01-1.0s). Query period gate time. Path to select the threshold voltage range: Select threshold range (0 to 1010). Query threshold range. Specify reference (0 to 1.5e7) Enable or disable reference. Query state of reference. Use input signal as reference. Query reference value. Specify measurement resolution (4 to 7). Query resolution. |
| :PERiod :APERTure :APERTure? :THReshold :VOLTage :RANGe <n> :RANGe? :REFerence <n> :STATe :STATe? :ACQuire :REFerence? :DIGits <n> :DIGits? | Path to configure period. Sets gate time for period measurements (0.01-1.0s). Query period gate time. Path to select the threshold voltage range: Select threshold range (0 to 1010). Query threshold range. Specify reference (0 to 1). Enable or disable reference. Query state of reference. Use input signal as reference. Query reference value. Specify measurement resolution (4 to 7). Query resolution. |
| :DIODE :CURRent :RANGe [:UPPer] <NRf> [:UPPer]? | Paths to configure diode test: Path to select range. Select range (0 to 1e-3) Query range. |

Table 10. SENSE command summary (cont.)

| Command | Description |
|--|--|
| :CONTinuity :THReshold <NRf> :THReshold? | Path to configure continuity test: Set threshold resistance (1 to 1000). Query threshold resistance. |

Table 11. STATus command summary

| Command | Description |
|--|---|
| :STATus :MEASurement [:EVENT]? :ENABLE <NRf> :ENABLE? :CONDition? :OPERation [:EVENT]? :ENABLE <NRf> :ENABLE? :CONDition? :QUESTionable [:EVENT]? :ENABLE <NRf> :ENABLE? :CONDition? :PRESet :QUEue [:NEXT]? :ENABLE <list> :ENABLE? :DISable <list> :DISable? :CLEar | Path to control measurement event registers: Read the event register. Program the enable register. Read the enable register. Read the condition register. Path to control operation status registers: Read the event register. Program the enable register. Read the enable register. Read the condition register. Path to control questionable status registers: Read the event register. Program the enable register. Read the enable register. Read the condition register. Return status registers to default states. Path to access error queue: Read the most recent error message. Specify error and status messages for queue. Read the enabled messages. Specify messages not to be placed in queue. Read the disabled messages. Clears all messages from Error Queue. |

Table 12. SYSTEM command summary

| Command | Description |
|-----------------|--|
| :SYSTEM | |
| :PRESet | Return to :SYST:PRES defaults. |
| :POSetup <name> | Select power-on setup: (RST, PRESet or SAV0). |
| :POSetup? | Query power-on setup. |
| :FRSWitch? | Query INPUTS switch (0=rear, 1=front). |
| :VERSion? | Query rev level of SCPI standard. |
| :ERRor? | Query (read) Error Queue. |
| :AZERo | Path to set up autozero. |
| :STATe | Enable or disable autozero. |
| :STATe? | Query autozero. |
| :KEY <NRf> | Simulate key-press (1 to 31; see Figure 5-10 of the User's Manual). |
| :KEY? | Query the last "pressed" key. |
| :CLEar | Clears messages from the Error Queue. |
| :BEEPer | Path to control beeper. |
| [:STATe] | Enable or disable beeper. |
| [:STATe]? | Query state of beeper. |
| :LOCal | Take 2000 out of remote and restore operation of front panel controls (RS-232 only). |
| :REMote | Place 2000 in remote (RS-232 only). |
| :RWLock | Lockout front panel controls (RS-232 only). |
| :KCLick | Turn the keyclick on/off. |
| :KCLick | Query the keyclick status. |
| :LFRequency? | Query power line frequency. |

Table 13. TRACe command summary

| Command | Description |
|-----------------|---|
| :TRACel:DATA | Use :TRACe or :DATA as root command. |
| :CLear | Clear readings from buffer. |
| :FREE? | Query bytes available and bytes in use. |
| :POINTs <NRf> | Specify size of buffer (2 to 1024). |
| :POINTs? | Query buffer size. |
| :FEED <name> | Select source of readings (SENSE[1], CALCulate[1], NONE). |
| :CONTrol <name> | Select buffer control mode (NEVer or NEXT) |
| :CONTrol? | Query buffer control mode. |
| :FEED? | Query source of readings for buffer. |
| :DATA? | Read all readings in the buffer. |

Table 14. Trigger command summary

| Command | Description |
|------------------------|---|
| :INITiate | Subsystem command path: |
| [:IMMediate] | Initiate one trigger cycle. |
| :CONTInuous | Enable or disable continuous initiation. |
| :CONTInuous? | Query continuous initiation. |
| :ABORT | Reset trigger system. |
| :TRIGger[:SEquence[1]] | Path to program Trigger Layer: |
| :COUNT <n> | Set measure count (1 to 9999, or INF). |
| :COUNT? | Query measure count. |
| :DELay <n> | Set delay (0 to 999999.999 sec) |
| :AUTO | Enable or disable auto delay. |
| :AUTO? | Query state of delay. |
| :DELay? | Query delay. |
| :SOURce <name> | Select control source (IMMediate, TIMer, MANual, BUS, or 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. |
| :SAMPLe | |
| :COUNT <NRf> | Specify sample count (1 to 1024). |
| :COUNT? | Query sample count. |

Table 15. TEMPerature command summary

| Command | Description |
|---------------------|--|
| :UNIT | |
| :TEMPerature <name> | Select temperature measurement units (C, F, or K). |
| :TEMPerature? | Query temperature units. |
| :VOLTage | Path to configure voltage units. |
| :AC <name> | Select ACV measurement units (V, DB or DBM). |
| :DB | Path to set DB reference voltage. |
| :REFerence <n> | Specify reference in volts ($1e^{-7}$ to 1000). |
| :REFerence? | Query DB reference. |
| :DBM | Path to set DBM reference impedance. |
| :IMPedance <n> | Specify reference impedance (1 to 9999). |
| :IMPedance? | Query DBM reference impedance. |
| :AC? | Query ACV units. |
| [:DC] <name> | Select DCV measurement units (V, DB, or DBM) |
| :DB | Path to set DB reference voltage: |
| :REFerence <n> | Specify reference in volts (0 to 1000). |
| :REFerence? | Query reference. |
| :DBM | Path to set DBM refernece impedance: |
| :IMPedance <n> | Specify reference impedance ($1e^{-7}$ to 9999). |
| :IMPedance? | Query reference impedance. |
| :DC? | Query DCV units. |

Models 196/199 and 8840A/8842A commands

Table 16. Models 196/199 device-dependent command summary

| Mode | Command | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--|---|------------|------------|---------------|---------------|-------------|--|------------|------------|------------|------------|--------------|---------------|-------------|----|------|------|------|------|------|------|---|----|----|----|-------|----|-------------|----|------|----|-----|-----|----|----|--------------|-----|----|----|------|------|----|----|---------------|------|-----|----|-------|------|----|----|-------------|------|------|----|-------|------|----|----|--------------|------|------|----|-------|------|----|----|---------------|------|---|----|-------|------|----|----|---------------|------|---|
| Execute | X | Execute other device-dependent commands. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Function | F0 F1 F2 F3 F4 F5 F6 F7 F8 F9 | DC volts AC volts 2-wire ohms DC current AC current ACV dB Not valid Frequency Temperature 4-wire ohms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Range | <table border="1"> <thead> <tr> <th></th> <th><u>DCV</u></th> <th><u>ACV</u></th> <th><u>DCA</u></th> <th><u>ACA</u></th> <th><u>Ohms*</u></th> <th><u>ACV dB</u></th> <th><u>Freq</u></th> </tr> </thead> <tbody> <tr> <td>R0</td> <td>Auto</td> <td>Auto</td> <td>Auto</td> <td>Auto</td> <td>Auto</td> <td>Auto</td> <td>—</td> </tr> <tr> <td>R1</td> <td>1V</td> <td>1V</td> <td>100mA</td> <td>1A</td> <td>1kΩ</td> <td>1V</td> <td>0.1V</td> </tr> <tr> <td>R2</td> <td>10V</td> <td>10V</td> <td>3A</td> <td>3A</td> <td>10kΩ</td> <td>10V</td> <td>1V</td> </tr> <tr> <td>R3</td> <td>100V</td> <td>100V</td> <td>3A</td> <td>3A</td> <td>100kΩ</td> <td>100V</td> <td>10V</td> </tr> <tr> <td>R4</td> <td>1000V</td> <td>750V</td> <td>3A</td> <td>3A</td> <td>1MΩ</td> <td>750V</td> <td>100V</td> </tr> <tr> <td>R5</td> <td>1000V</td> <td>750V</td> <td>3A</td> <td>3A</td> <td>10MΩ</td> <td>750V</td> <td>750V</td> </tr> <tr> <td>R6</td> <td>1000V</td> <td>750V</td> <td>3A</td> <td>3A</td> <td>100MΩ</td> <td>750V</td> <td>—</td> </tr> <tr> <td>R7</td> <td>1000V</td> <td>750V</td> <td>3A</td> <td>3A</td> <td>100MΩ</td> <td>750V</td> <td>—</td> </tr> </tbody> </table> <p>*2-wire and 4-wire ohms</p> | | | | | | | | <u>DCV</u> | <u>ACV</u> | <u>DCA</u> | <u>ACA</u> | <u>Ohms*</u> | <u>ACV dB</u> | <u>Freq</u> | R0 | Auto | Auto | Auto | Auto | Auto | Auto | — | R1 | 1V | 1V | 100mA | 1A | 1k Ω | 1V | 0.1V | R2 | 10V | 10V | 3A | 3A | 10k Ω | 10V | 1V | R3 | 100V | 100V | 3A | 3A | 100k Ω | 100V | 10V | R4 | 1000V | 750V | 3A | 3A | 1M Ω | 750V | 100V | R5 | 1000V | 750V | 3A | 3A | 10M Ω | 750V | 750V | R6 | 1000V | 750V | 3A | 3A | 100M Ω | 750V | — | R7 | 1000V | 750V | 3A | 3A | 100M Ω | 750V | — |
| | <u>DCV</u> | <u>ACV</u> | <u>DCA</u> | <u>ACA</u> | <u>Ohms*</u> | <u>ACV dB</u> | <u>Freq</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R0 | Auto | Auto | Auto | Auto | Auto | Auto | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R1 | 1V | 1V | 100mA | 1A | 1k Ω | 1V | 0.1V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R2 | 10V | 10V | 3A | 3A | 10k Ω | 10V | 1V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R3 | 100V | 100V | 3A | 3A | 100k Ω | 100V | 10V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R4 | 1000V | 750V | 3A | 3A | 1M Ω | 750V | 100V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R5 | 1000V | 750V | 3A | 3A | 10M Ω | 750V | 750V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R6 | 1000V | 750V | 3A | 3A | 100M Ω | 750V | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R7 | 1000V | 750V | 3A | 3A | 100M Ω | 750V | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zero (rel) | Z0 Z1 Z2 | Zero disabled Zero enabled Zero enabled using a zero value (V) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Filter | P0 P1 P2 | Filter disabled Moving filter (count = 10) Repeat filter (count = 10) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rate | S0 S1 S2 | 0.1 PLC integration Line cycle integration (16.67msec, 60Hz; 20msec, 50Hz) 10 PLC (166.67msec integration, 60Hz; 200msec integration, 50Hz) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 16. Models 196/199 device-dependent command summary (cont.)

| Mode | Command | Description |
|--------------------|--|--|
| Trigger mode | T0 T1 T2 T3 T4 T5 T6 T7 | Continuous on Talk One-shot on Talk Continuous on GET One-shot on GET Continuous on X One-shot on X Continuous on External Trigger One-shot on External Trigger |
| Reading mode | B0 B1 B2 | Readings from A/D converter Individual readings from data store All readings from data store (buffer dump) |
| Data store size | I0 In | Disable data store Data store of n (n=1 to 500), fill and stop |
| Interval | Q0 Qn | Default interval, 175msec (SELECT OFF) n=interval in milliseconds (15msec to 999999msec) |
| Value | $V \pm nn.nnnn$ or $V \pm n.nnnnnnE+n$ | Zero value, simulated reference junction temperature |
| Default conditions | L0 L1 | Restore factory default conditions and save (L1) Save present machine states as default conditions |
| Data format | G0 G1 G2 G3 G4 G5 G6 G7 | Reading with prefix. Reading without prefix. Reading and buffer location with prefix. Reading and buffer location without prefix. Reading and channel with prefix. Reading and channel without prefix. Reading, buffer location, and channel with prefix. Reading, buffer location, and channel without prefix. |

Table 16. Models 196/199 device-dependent command summary (cont.)

| Mode | Command | Description |
|----------------------|--|--|
| SRQ | M0 M1 M2 M4 M8 M16 M32 | Disable Reading overflow Data store full Data store half full Reading done Ready Error |
| EOI and bus hold-off | K0 K1 K2 K3 | Enable EOI and bus hold-off on X Disable EOI, enable bus hold-off on X Enable EOI, disable bus hold-off on X Disable both EOI and bus hold-off on X |
| Terminator | Y0 Y1 Y2 Y3 | CR LF LF CR CR LF |
| Status | U0 U1 U2 U3 U4 U5 U6 | Send machine status word (199 format only) Send error conditions (only supports no scanner, IDDC, IDDCO) Send Translator word list (since Translator is not supported, replies with one space character) Send buffer size Send current value of "V" (199 format, equivalent to U7 for 196) Send input switch status (front/rear) (199 format, equivalent to U8 for 196) Send simulated temperature (set by H0) |
| Multiplex | A0 A1 | Auto/Cal multiplex disabled Auto/Cal multiplex enabled |
| Delay | Wn | n=delay period in milliseconds, (0msec to 999999msec) |

Table 16. Models 196/199 device-dependent command summary (cont.)

| Mode | Command | Description |
|-------------|------------------------------|--|
| Display | Da | Display up to 12-character message (a=character) |
| | D | Cancel display mode |
| Scanning | N0 | Open all - stop scanning or stepping if applicable |
| | N1 | Close channel 1 |
| | N2 | Close channel 2 |
| | N3 | Close channel 1 |
| | N4 | Close channel 4 |
| | N5 | Close channel 5 |
| | N6 | Close channel 6 |
| | N7 | Close channel 7 |
| | N8 | Close channel 8 |
| | N9 | Close channel 9 |
| | N10 | Close channel 10 |
| | N11 | Step mode, max channel is 2 |
| | N12 | Step mode, max channel is 3 |
| | N13 | Step mode, max channel is 4 |
| | N14 | Step mode, max channel is 5 |
| | N15 | Step mode, max channel is 6 |
| | N16 | Step mode, max channel is 7 |
| | N17 | Step mode, max channel is 8 |
| | N18 | Step mode, max channel is 9 |
| | N19 | Step mode, max channel is 10 |
| | N20 | Open all - stop scanning or stepping if applicable |
| | N21 | Scan mode, max channel is 2 |
| | N22 | Scan mode, max channel is 3 |
| | N23 | Scan mode, max channel is 4 |
| | N24 | Scan mode, max channel is 5 |
| | N25 | Scan mode, max channel is 6 |
| | N26 | Scan mode, max channel is 7 |
| | N27 | Scan mode, max channel is 8 |
| | N28 | Scan mode, max channel is 9 |
| N29 | Scan mode, max channel is 10 | |

Table 16. Models 196/199 device-dependent command summary (cont.)

| Mode | Command | Description |
|--------------|----------------------------------|------------------------------|
| Thermocouple | J0 | Type J thermocouple |
| | J1 | Type K thermocouple |
| | J2 | Type T thermocouple |
| | O0 | Simulated reference junction |
| | | (for temperature function) |
| | O1 | Real reference junction (for |
| | temperature function) | |
| H0 | Set simulated reference junction | |
| | temperature using "V" | |
| | command; 0 to 50 (°C). | |

Table 17. Models 8840A/8842A device-dependent command summary

| Mode | Command | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|---|---|---------------------|---------------------------|--------------------|--------------------|--------------------|-------------|----------|---------|----|----------|----------|----|----------|---------|-----|----------|----------|------|----|-----|----|------|------|-------|-------|----|------|----|-------|------|-----|----|----|------|----|-------|------|------|----|----|------|----|-------|------|-------|----|----|------|----|-----|-----|-----|-----|-----|---|----|-------|------|------|----|----|------|--|
| Function | F1 F2 F3 F4 F5 F6 F7 F8 | VDC (default) VAC 2-wire kΩ 4-wire kΩ mA DC mA AC Freq Temp | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Range | <table border="1"> <thead> <tr> <th></th> <th><u>VDC</u> **</th> <th><u>VAC</u> **</th> <th><u>kΩ*</u> **</th> <th><u>mA DC</u> **</th> <th><u>mA AC</u> **</th> <th><u>Freq</u></th> </tr> </thead> <tbody> <tr> <td>R0</td> <td>1V</td> <td>1V</td> <td>1kΩ</td> <td>10mA</td> <td>3A</td> <td>1V</td> </tr> <tr> <td>R1</td> <td>10V</td> <td>10V</td> <td>10kΩ</td> <td>10mA</td> <td>3A</td> <td>10V</td> </tr> <tr> <td>R2</td> <td>100V</td> <td>100V</td> <td>100kΩ</td> <td>100mA</td> <td>3A</td> <td>100V</td> </tr> <tr> <td>R3</td> <td>1000V</td> <td>750V</td> <td>1MΩ</td> <td>1A</td> <td>1A</td> <td>750V</td> </tr> <tr> <td>R4</td> <td>1000V</td> <td>750V</td> <td>10MΩ</td> <td>3A</td> <td>3A</td> <td>750V</td> </tr> <tr> <td>R5</td> <td>1000V</td> <td>750V</td> <td>100MΩ</td> <td>3A</td> <td>3A</td> <td>750V</td> </tr> <tr> <td>R6</td> <td>***</td> <td>***</td> <td>***</td> <td>***</td> <td>***</td> <td>—</td> </tr> <tr> <td>R7</td> <td>100mV</td> <td>750V</td> <td>100Ω</td> <td>3A</td> <td>3A</td> <td>750V</td> </tr> </tbody> </table> <p>*2-wire and 4-wire ohms **Auto on ***Auto off</p> | | <u>VDC</u> ** | <u>VAC</u> ** | <u>kΩ*</u> ** | <u>mA DC</u> ** | <u>mA AC</u> ** | <u>Freq</u> | R0 | 1V | 1V | 1kΩ | 10mA | 3A | 1V | R1 | 10V | 10V | 10kΩ | 10mA | 3A | 10V | R2 | 100V | 100V | 100kΩ | 100mA | 3A | 100V | R3 | 1000V | 750V | 1MΩ | 1A | 1A | 750V | R4 | 1000V | 750V | 10MΩ | 3A | 3A | 750V | R5 | 1000V | 750V | 100MΩ | 3A | 3A | 750V | R6 | *** | *** | *** | *** | *** | — | R7 | 100mV | 750V | 100Ω | 3A | 3A | 750V | |
| | <u>VDC</u> ** | <u>VAC</u> ** | <u>kΩ*</u> ** | <u>mA DC</u> ** | <u>mA AC</u> ** | <u>Freq</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R0 | 1V | 1V | 1kΩ | 10mA | 3A | 1V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R1 | 10V | 10V | 10kΩ | 10mA | 3A | 10V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R2 | 100V | 100V | 100kΩ | 100mA | 3A | 100V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R3 | 1000V | 750V | 1MΩ | 1A | 1A | 750V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R4 | 1000V | 750V | 10MΩ | 3A | 3A | 750V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R5 | 1000V | 750V | 100MΩ | 3A | 3A | 750V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R6 | *** | *** | *** | *** | *** | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R7 | 100mV | 750V | 100Ω | 3A | 3A | 750V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reading rate | S0 S1 S2 | Slow, 10 PLC Medium, 1 PLC, 6½-digit resolution (default) Fast, 0.1 PLC, 5½-digit resolution | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trigger mode | T0 (default) T1 T2 T3 T4 | <table border="1"> <thead> <tr> <th><u>Trigger mode</u></th> <th><u>Rear panel trigger</u></th> <th><u>Auto delay</u></th> </tr> </thead> <tbody> <tr> <td>Internal</td> <td>Disabled</td> <td>—</td> </tr> <tr> <td>External</td> <td>Enabled</td> <td>On</td> </tr> <tr> <td>External</td> <td>Disabled</td> <td>On</td> </tr> <tr> <td>External</td> <td>Enabled</td> <td>Off</td> </tr> <tr> <td>External</td> <td>Disabled</td> <td>Off</td> </tr> </tbody> </table> <p>Note: Delay is enabled by entering EXT TRIG mode while in local.</p> | <u>Trigger mode</u> | <u>Rear panel trigger</u> | <u>Auto delay</u> | Internal | Disabled | — | External | Enabled | On | External | Disabled | On | External | Enabled | Off | External | Disabled | Off | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>Trigger mode</u> | <u>Rear panel trigger</u> | <u>Auto delay</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Internal | Disabled | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| External | Enabled | On | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| External | Disabled | On | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| External | Enabled | Off | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| External | Disabled | Off | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Offset (Rel) | B0 B1 | Offset off (default) Offset on | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Display | D0 D1 | Normal display (default) Blank display | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 17. Models 8840A/8842A device-dependent command summary (cont.)

| Mode | Command | Description |
|----------------|---------|---|
| Suffix | Y0 | Disable output suffix (default) |
| | Y1 | Enable output suffix |
| Terminator | W0 | Enable CR LF EOI (default) |
| | W1 | Enable CR LF only |
| | W2 | Enable CR EOI only |
| | W3 | Enable CR only |
| | W4 | Enable LF EOI only |
| | W5 | Enable LF only |
| | W6 | Enable EOI only |
| | W7 | Disable all output terminators |
| Clear | * | Device clear (resets 8842A to default conditions) |
| | X0 | Clear error register |
| Single-trigger | ? | Trigger measurement |
| GET | G0 | Get instrument configuration (function, range, speed, trigger) |
| | G1 | Get SRQ mask |
| | G2 | Get calibration input prompt (generates error message 51) |
| | G3 | Get user-defined message (replies with 16 space characters) |
| | G4 | Get calibration status (replies with "1000") |
| | G5 | Get IAB status (input F/R, autorange on/off, offset on/off) |
| | G6 | Get YW status (suffix enabled/disabled, terminator selection) |
| | G7 | Get error status |
| | G8 | Get instrument ID (replies with "FLUKE,8842A,0,EMUL") |
| | G9 | Get status of JKM commands (temp. units; TC type and junction) String = 1jkm |

Table 17. Models 8840A/8842A device-dependent command summary (cont.)

| Mode | Command | Description |
|---------------------------------|--|---|
| GET (cont.) | G10 | Get closed channel number String = 10nn Where: nn = 00 (all open) 01 through 10 (closed channel) |
| | G11 | Get simulated reference junction temperature String = xx.xxx (in °C) Note: G2 valid only in calibration mode. |
| PUT | P0 | Put instrument configuration (function, range, speed, trigger) |
| | P1 | Put SRQ mask |
| | P4 | Set simulated junction temperature; 0 to 50 (°C) Default temperature = 23°C |
| PUT format | N <value> P0 N <value> P1 N <value> P4 | |
| Thermocouple type | K0 | Type J thermocouple (default) |
| | K1 | Type K thermocouple |
| | K2 | Type T thermocouple |
| Temperature unit | J0 | °C (default) |
| | J1 | K |
| | J2 | °F |
| Thermocouple reference junction | M0 | Select simulated junction (default) |
| | M1 | Select real junction (channel 1 for 2001-TCSCAN card) |

Table 17. Models 8840A/8842A device-dependent command summary (cont.)

| Mode | Command | Description |
|-----------------|----------------------|--|
| Scanner channel | Ln | Control specified channel of internal scan card where: n = 0 (Open all channels) 1 through 10 (close specified channel) Note: For 4-wire ohms, only channels 1 through 5 are valid due to automatic channel pairing. |
| SRQ mask values | 00 01 16 32 | SRQ disabled (default) SRQ on overrange SRQ on data available SRQ on any error Note: Add SRQ mask values for combinations. Example: 33 for SRQ on overrange or any error. |



Test Instrumentation Group
28775 Aurora Road / Cleveland, Ohio 44139