

**Agilent 4155C  
Semiconductor Parameter  
Analyzer  
Agilent 4156C  
Precision Semiconductor  
Parameter Analyzer**

**If You Have a Problem**



**Agilent Technologies**

# Notices

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## In This Manual

This manual explains how to solve a problem or how to read status and error codes, if you encounter some problem.

This manual is organized into the following chapters:

- When you install Agilent 4155C/4156C

This chapter explains how to solve the problems that may occur when installing the 4155C/4156C.

- When you make a measurement

This chapter explains how to solve the problems that may occur when making a measurement.

- If errors occur

This chapter lists error codes and messages that may be displayed when operating Agilent 4155C/4156C. Also, this section describes how to read data status.

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## To Get Help Information

To start help function, press the Help front-panel key. Then, you can select one of the following primary softkeys.

- OVERVIEW

Briefly explains each help softkey.

- PAGE MAP

Shows a map of all screens, highlights the present screen name, and gives a brief description of the highlighted screen name. You can use the arrow keys to highlight another screen name, then can display the screen by selecting the SELECT secondary softkey.

- FIELD INFO

Describes field where the pointer is located on the screen, how to setup the field, and the setting restrictions. This softkey is not displayed for GRAPHICS, LIST, KNOB SWEEP, or STRESS FORCE screen.

- DATA STAT

Shows how to read data status, which is displayed at the bottom of GRAPHICS, LIST, KNOB SWEEP, or STRESS FORCE screen. This softkey is displayed only for these screens.

- INPUT AID

Displays variable names, mathematics functions, and read-out functions, and describes the highlighted name or function. This softkey is not displayed for GRAPHICS, LIST, KNOB SWEEP, or STRESS FORCE screen.

You can enter desired variable or function into the selected setup field of a screen by selecting ENTER secondary softkey, then pressing Enter front-panel key.

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**1** **When You Install the 4155C/4156C**

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## When You Install the 4155C/4156C

This section covers the following basic problems that you may encounter when you install the 4155C/4156C, and the solutions.

- “If the 4155C/4156C cannot be Powered on”
- “If Display screen does not Appear after Applying Power”
- “If Measurement Units of the 41501A/B are not Displayed on the Screen”
- “If External Keyboard does not Work”
- “If Network Function does not Work”
- “If the 16442A Test Fixture is not Stable”
- “To Simplify the Connections for the 4156C”



## **If the 4155C/4156C cannot be Powered on**

- Check that the power cable is firmly connected to the 4155C/4156C and to power outlet.
- Check that the front-panel LINE switch is on.

## **If Display screen does not Appear after Applying Power**

- If the 41501A/B is installed, *first* turn on the 41501A/B, *then* turn on the 4155C/4156C.
- If the self-test fails, see Chapter 3.

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## If Measurement Units of the 41501A/B are not Displayed on the Screen

1. Turn off the 4155C/4156C and the 41501A/B.
2. Check that the interface board of the 41501A/B is firmly connected to "**To Expander Box Interface**" connector of the 4155C/4156C rear panel.
3. (only for 41501A) Check that the voltage selector switch is set properly. The voltage selector switch is located in the lower-right corner of the rear panel. The following table shows the line voltage selector setting.

Position	Line Voltage
left	90 to 132 Vac
right	198 to 264 Vac

4. (only for 41501A) Check that the fuse is good. The fuse holder is located in the lower-right corner of the rear panel.
  - a. Disconnect the power cables from the 4155C/4156C and the 41501A/B.
  - b. Unscrew the fuse holder on the rear panel.
  - c. Inspect that the correct fuse is installed, and wire inside the fuse is *not* broken by using a tester.

Line	Fuse type	Agilent part number
100/120 Vac	UL/CSA T 8A, 250 Vac	2110-0383
220/240 Vac	UL/CSA T 4A, 250 Vac	2110-0014

- d. Replace the fuse, if necessary. Then, screw in the fuse holder.
5. Connect the power cables to the 4155C/4156C and the 41501A/B, and to power outlet.
  6. Turn on the 41501A/B, then turn on the 4155C/4156C.

## If External Keyboard does not Work

- Connect keyboard *first, then* turn on the 4155C/4156C.
- Turn off the 4155C/4156C, then check that the connector of keyboard is firmly connected into keyboard connector of the 4155C/4156C front panel.
- Execute the External Key Controller diagnostics test on the SYSTEM: SELF-CALIBRATION/DIAGNOSTICS screen. If error occurs, write down the displayed error codes and contact the nearest Agilent Technologies Sales and Service office.

## **If Network Function does not Work**

This section covers the problems on the 4155C/4156C network function, and the solutions.

- “If the 4155C/4156C cannot mount the network file system”
- “If CHANGE DIRECTORY Function does not work”
- “If GET Function does not work”
- “If SAVE Function does not work”
- “If PURGE Function does not work”
- “If RENAME Function does not work”
- “If the 4155C/4156C cannot print on a remote printer”

## **If the 4155C/4156C cannot mount the network file system**

Execute the LAN interface test. For this procedure, see *User's Guide: General Information*.

If the 4155C/4156C fails the test, contact to the nearest Agilent Technologies service office.

If the 4155C/4156C passes the test, do following:

1. Check the settings of the NETWORK SETUP table on the SYSTEM: MISCELLANEOUS screen, and set the table properly.

If the setting is ok, but the 4155C/4156C cannot mount the network file system, do following:

2. Send ping from NFS server to the 4155C/4156C.
  - If the 4155C/4156C returns the responses:
    - a. Check the settings of the NETWORK DRIVE SETUP table on the SYSTEM: MISCELLANEOUS screen, and set the table properly.

If the setting is ok, but the 4155C/4156C cannot mount the network file system, do following:
    - b. Check the setting of the NFS server, and set it properly.

Directory specified by the NETWORK DRIVE SETUP table must be exported for the 4155C/4156C.
  - If no response is returned: LAN or LAN cable may be defective. Contact to the network system administrator to solve the problem.

## **If CHANGE DIRECTORY Function does not work**

Check the permission of the directory. The execution permission must be set. Change the permission.

## **If GET Function does not work**

Check the permission of the file. The read permission must be set. Change the permission.

## **If SAVE Function does not work**

Check the following:

- Check the permission of the directory to save the file. The write permission must be set. Change the permission.
- If the file name has already existed on the directory, the write permission must be set for the file. Change the permission.
- If the directory has been exported with the read only permission, the 4155C/4156C cannot write a file on the directory. Retry to export the directory with read/write/execute permission.

## **If PURGE Function does not work**

Check the following:

- Check the permission of the file to be deleted. The write permission must be set. Change the permission.
- If the directory has been exported with the read only permission, the 4155C/4156C cannot delete a file on the directory. Retry to export the directory with read/write/execute permission.

## **If RENAME Function does not work**

Check the following:

- Check the permission of the source file. The read permission must be set. Change the permission.
- Check the permission of the directory for the target file. The write permission must be set. Change the permission.
- If the target file name has already existed on the directory, the write permission must be set for the file. Change the permission.
- If the directory has been exported with the read only permission, the 4155C/4156C cannot rename/copy a file on the directory. Retry to export the directory with read/write/execute permission.

## If the 4155C/4156C cannot print on a remote printer

If the 4155C/4156C cannot print on a remote printer, or the following error message is displayed on the screen, do following:

```
ERROR 18: Device I/O error. Unable to print out.
```

If you can use the 4155C/4156C as a NFS client, ignore step 1 and 2, and go to step 3.

1. Execute the LAN interface test. For this procedure, see *User's Guide: General Information*.

If the 4155C/4156C fails the test, contact to the nearest Agilent Technologies service office.

If the 4155C/4156C passes the test, do following:

2. Check the settings of the NETWORK SETUP table on the SYSTEM: MISCELLANEOUS screen, and set the table properly.

If the setting is ok, but the 4155C/4156C cannot use the remote printer, do following:

3. Send ping from the print server to the 4155C/4156C.
  - If the 4155C/4156C returns the responses:
    - a. Check the settings of the NETWORK PRINTER SETUP table on the SYSTEM: MISCELLANEOUS screen, and set the table properly.

If the setting is ok, but the 4155C/4156C cannot use the remote printer, do following:
    - b. Confirm the setting of the print server, and set it properly. `lpd/lpr` must be effective.
  - If no response is returned: LAN or LAN cable may be defective. Contact to the network system administrator to solve the problem.

If the desired output is not printed out, or an unwanted control character is printed at the beginning of the hard copy, check the following entry fields of the NETWORK PRINTER SETUP table, and set the fields properly.

- TEXT OUT entry field
- GRAPH OUT entry field



## If the 16442A Test Fixture is not Stable

- Install stabilizers on the 16442A. For this procedure, see *User's Guide: General Information*.
- If you use the 16442A test fixture with the 16440A selector or 16441A R-Box, attach the 16442A to the 16440A or 16441A by using plates and screws. For this procedure, see *User's Guide: General Information*.

## To Simplify the Connections for the 4156C

If you want to simplify the connections for the 4156C, use the triaxial cables instead of the kelvin triaxial cables, and connect the triaxial cables between the Force terminals and the test fixture or the connector plate. Then the Sense terminals must be opened.

The Force terminals can be used to force and measure dc voltage or current as same as the Force terminals of the 4155C.

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### NOTE

The 4156C has the Force and Sense terminals to make the kelvin connection. And the kelvin triaxial cables are effective to extend the measurement terminals near by the device under test. Connecting the Force and Sense lines together at the device terminals can minimize the measurement error caused by the residual resistance of the connection cables. The kelvin connection is effective for the low resistance measurement and the high current measurement. Also it is one of the conditions to satisfy the measurement specifications of the 4156C.

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**2**

**When You Make a Measurement**

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## When You Make a Measurement

This section covers the following basic problems that you may encounter when you making a measurement, and the solutions.

- “After the Measurement”
- “If Measured Value Oscillates when Measuring High-Frequency Devices”
- “If Measured Value Oscillates when Measuring Negative Resistance”
- “If Noise Affects the Measured Values”
- “If Measured Voltage has some Error when Forcing a Large Current”
- “If Large Current Causes High Temperature (Thermal Drift)”
- “If Measurement Takes More Time than Specified”
- “If Measurement Damages the Device under Test”
- “If You Get Unexpected Data when Performing Sampling Measurement”

## After the Measurement

After the measurements, open the measurement terminals or disconnect the device under test from the measurement terminals. If you leave the connection with the device, the device may be damaged by unexpected operations.

Do not leave the connection over 30 minutes after the measurement if the auto calibration (AUTO CALIB) is set to ON. Then, the 4155C/4156C performs the self-calibration automatically every 30 minutes after the measurement. The calibration requires to open the measurement terminals.

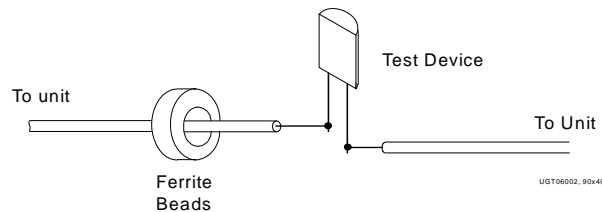
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## If Measured Value Oscillates when Measuring High-Frequency Devices

When measuring parameters of high-frequency devices, such as GaAs MESFETs or high-frequency bipolar transistors, oscillation may cause measurement problems. Normal measurement cannot be performed because of oscillation.

To solve this problem:

- For FETs, add resistive ferrite beads as close as possible to the gate.
- For bipolar transistors, add resistive ferrite beads as close as possible to the base or emitter.
- Make connection cables as short as possible. Long wires cause oscillation because of their large inductance.



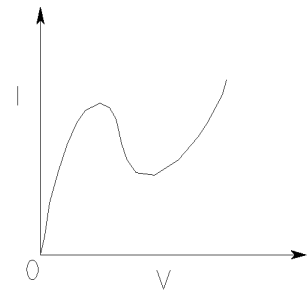
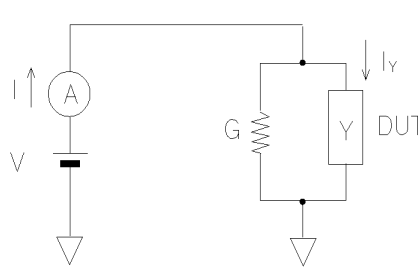
## If Measured Value Oscillates when Measuring Negative Resistance

If the DUT has negative resistance characteristics, SMUs may oscillate. Because SMUs operate as negative feedback amplifier.

To solve this problem:

- For voltage controlled negative resistance device
  - Connect G in parallel with your DUT to cancel negative resistance. To obtain an output I-V curve, use the following equation.

$$I_Y = I - G * V$$

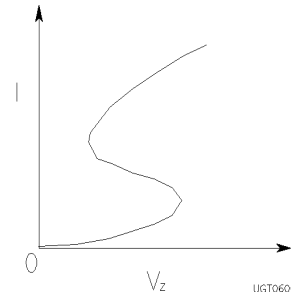
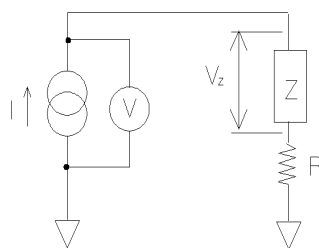


UGT06003, 110x50

- For current controlled negative resistance device
  - Connect R in series with your DUT to cancel negative resistance. To obtain an output I-V curve, use the following equation.

$$V_Z = V - R * I$$

- If the resistance of the DUT is less than 1 M $\Omega$ , you can use R-Box.



UGT06004, 110x50

## If Noise Affects the Measured Values

When you measure low current of a DUT, the measured values may not be stable.

To solve this problem:

- Set the power line frequency correctly. The value affects the integration time. So the wrong value causes the measurement error by the power line noise. Use the SYSTEM: MISCELLANEOUSE screen to set the power line frequency.
- Use guarding to reduce the leakage current between your prober and the 4155C/4156C. Note that long wires cause oscillation because of their large inductance. For details about connections, refer to *User's Guide: General Information*.
- If some high-power electric machines are operating around the 4155C/4156C, turn off the machines, then perform the measurements. The machines affect the power line waveform.
- Shut the lid of test fixture or shield box to prevent effects of light.
- If these are vibrations due to nearby machines or due to air flow, put cushioning material under prober, cable, and the 4155C/4156C; install stabilizer on the prober; and make the cables stable by taping.
- Wait several minutes after connecting cables or moving probe needles. Because these operations cause electromotive force.
- If you use only Force terminal and triaxial cables for HRSMUs or HPSMU, connect an open cap to sense terminal.
- Keep constant temperature in the room when you use the 4155C/4156C. Shift of 1 °C may shift the measurement values. Temperature change causes the following.
  - Offset current in the 4155C/4156C.
  - Thermoelectromotive force in DUT, which causes low current.
  - Expansion and contraction of cables, which causes noise.



## **If Measured Voltage has some Error when Forcing a Large Current**

Voltage measurement may have some error because of the effects of the cable resistance when forcing a large current.

To solve this problem:

- Use Kelvin connections between SMUs and DUT. To cancel the effects of cable resistance, connect the sense line as close as possible to the terminal of the DUT.

For details of Kelvin connections, see *User's Guide: General Information*.

## **If Large Current Causes High Temperature (Thermal Drift)**

If a large current is forced to a DUT, the temperature of the DUT may increase, which may cause characteristics to drift.

To solve this problem:

- Use the pulse output mode of the SMU.

For large currents, the SMU should be set to pulse output mode. This decreases the average power output to prevent temperature rise of DUT.

## If Measurement Takes More Time than Specified

When measuring current that is 10  $\mu\text{A}$  or less, SMUs may take longer time to measure than the specified integration time. When measuring in a low current range, the SMUs automatically take longer integration time to perform accurate and stable measurements.

To solve this problem:

- Measure current using a fixed range that is more than 10  $\mu\text{A}$ . The measurement will be performed in the specified integration time.

If you set many measurement channels, measurement takes a longer time.

To solve this problem:

- Decrease measurement channels to reduce measurement time.

Note that the number of measurement channels automatically increases if you do *both* the following: force voltage from channels that are connected to R-Box *and* display the voltage values or use voltage values in user functions. The channels automatically measure current, which is used to compensate the voltage values.

## If Measurement Damages the Device under Test

### When Using SMU

When performing breakdown measurements by using SMU, DUTs may be damaged.

When voltage is forced from an SMU, the current is limited by the compliance setting, which prevents the DUT from being damaged by a large current. But when the current rapidly increases, the current limiter in the SMU cannot follow the rapid current increase, so a large amount of current may flow through the DUT for a moment, which may damage the DUT.

To solve this problem:

- Insert a protecting resistor as close as possible to DUT. You can also use a resistor of Agilent 16441A R-Box.

### When Using VMU

When the measurement terminal of VMU is open and when a coaxial cable is connected to VMU, current from the internal buffer amplifier charges up the VMU terminal voltage. After a long time charge, the increased terminal voltage is discharged by connecting DUT, which may damage the DUT.

To solve this problem:

- Set the VMU input DISCHARGE function to ON.

This function connects the discharge resistors to the VMU inputs internally. The resistors are automatically disconnected from the VMU in the measurement state.

## If You Get Unexpected Data when Performing Sampling Measurement

If initial interval is set to a short time and if FILTER ON is set, you may get unwanted data. FILTER ON causes a slower rise time, so short initial interval will sample during this rise time.

To solve this problem:

- Set FILTER field to OFF if you set initial interval to a short time.

Some data may be skipped because measurement takes a long time. Measurement takes a long time if measurement is performed in a low current range, if many measurement channels are set up, or if analysis, such as moving a marker, is performed during measurements.

To solve this problem:

- Measure current using a fixed range that is more than 10  $\mu\text{A}$ . For measurement ranges 10  $\mu\text{A}$  or less, measurement takes longer than the specified integration time.
- Decrease measurement channels to reduce measurement time.

Note that the number of measurement channels automatically increases if you do *both* the following: force voltage from channels that are connected to R-Box *and* display the voltage values or use voltage values in user functions. The channels automatically measure current, which is used to compensate the voltage values.

- Do not perform analysis operation during measurement state

When You Make a Measurement  
If You Get Unexpected Data when Performing Sampling Measurement

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**3**

**If Errors Occur**

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## If Errors Occur

If the 4155C/4156C is not operated correctly, or if diagnostics or calibration fails, error codes and error messages are displayed.

If measurement or forcing stress are not performed correctly, measurement data status is displayed at bottom of GRAPHICS, LIST, KNOB SWEEP, or STRESS FORCE screen.

This chapter describes the following:

- “If Errors Occur when You Perform Self-calibration or Diagnostics”
- “If Errors Occur when You Operate the 4155C/4156C”
- “If a Measurement Data Status is Displayed”



## If Errors Occur when You Perform Self-calibration or Diagnostics

The following are the error codes that are displayed at the bottom of the SYSTEM: SELF-CALIBRATION/DIAGNOSTICS screen if errors occur when you perform self-calibration or diagnostics.

If errors occur, write down the displayed error codes and contact the nearest Agilent Technologies Sales and Service office. Up to seven error codes can be displayed at the bottom of the SYSTEM: SELF-CALIBRATION/DIAGNOSTICS screen. To display the error codes, move pointer to a desired test item.

### Error codes for measurement unit

The following are the error codes for measurement units. Error codes are 5-digit numbers.

1xxyy

- xx: measurement unit
  - 00: VSU1,2 and VMU1,2
  - 01 to 06: SMU1 to SMU6
  - 07: PGU1,2
  - 08: GNDU
  - 09: AD converter
- yy: error number

**1xx05** AD converter failed ROM or RAM self-test. Measurement unit failed AD converter test as a pretest for calibration or self-test.

**1xx06** Successive approximation AD converter failed. Measurement unit failed AD converter test as a pretest for calibration or self-test.

**1xx07** Integrating type AD converter failed. Measurement unit failed AD converter test as a pretest for calibration or self-test.

**1xx08** AD converter test reached timeout. Measurement unit failed AD converter test as a pretest for calibration or self-test.

## If Errors Occur

### If Errors Occur when You Perform Self-calibration or Diagnostics

<b>1xx11</b>	Overvoltage occurred for a measurement unit.
<b>1xx12</b>	Overcurrent occurred for a measurement unit.
<b>1xx15</b>	Measurement units that are not supported are detected.
<b>1xx19</b>	Emergency occurred but the cause is unknown. This is displayed, for example, when unit is known but cause is unknown.
<b>1xx90</b>	AD converter test reached timeout during calibration or self-test for a measurement unit.
<b>1xx91</b>	FIFO (first-in, first-out) for AD converter overflowed because SMU controller takes long time to read measurement data.
<b>1xx92</b>	Calibration or diagnostics was aborted by an emergency or *RST command.
<b>1xx94</b>	4155C/4156C was turned on before 41501A/B.
<b>1xx97</b>	Communication failed between HOST controller and SMU controller. Or calibration/diagnostics was performed, but HOST controller couldn't receive the result from SMU controller.
<b>10030</b>	VSUs and VMUs failed default test of calibration.
<b>10031</b>	VSUs and VMUs failed function check.
<b>10032</b>	VSUs failed gain or offset calibration.
<b>10033</b>	VMUs failed gain or offset calibration.
<b>10034</b>	VMUs failed differential mode 2 V range gain or offset calibration.
<b>10035</b>	VSUs failed gain and offset calibration, VMUs failed gain and offset calibration, or VMU failed differential mode 2 V range gain and offset calibration.
<b>10036</b>	VMUs failed differential mode 0.2 V range gain or offset measurement.
<b>10037</b>	VMUs failed differential mode 0.2 V range gain and offset calibration.
<b>10038</b>	VMUs and VSUs failed CMR (Common Mode Rejection) amp adjustment.
<b>10040</b>	VSU1 and VMU1 failed $\pm 20$ V measurement self-test in 20 V range.
<b>10041</b>	VSU2 and VMU2 failed $\pm 20$ V measurement self-test in 20 V range.
<b>10042</b>	VSU1 and VMU2 failed $\pm 20$ V measurement self-test in 20 V range.
<b>10043</b>	VMU2 and VMU1 failed $\pm 20$ V measurement self-test in 20 V range.

- 10044** VSU1 and VMU1 failed  $\pm 2$  V measurement self-test in 2 V range.
- 10045** VSU2 and VMU2 failed  $\pm 2$  V measurement self-test in 2 V range.
- 10046** VSU1 and VMU2 failed  $\pm 2$  V measurement self-test in 2 V range.
- 10047** VSU2 and VMU1 failed  $\pm 2$  V measurement self-test in 2 V range.
- 10048** VMUs and VSUs failed differential 2 V range self-test. This test measures  $\pm 2$  V by VMUs in differential mode. (VSU1 is connected to VMU1, and VSU2 is connected to VMU2. VSU1 forces 0 V. VSU2 forces 2 V).
- 10049** VMUs and VSUs failed differential 2 V range self-test. This test measures 0 V by VMUs in differential mode. (VSU1 is connected to VMU1, and VSU2 is connected to VMU2. VSU1 forces 0 V.)
- 10050** VMUs and VSUs failed differential 0.2 V range self-test. This test measures 0 V by VMUs in differential mode. (VSU1 is connected to VMU1, and VSU2 is connected to VMU2. VSU1 forces 0 V.)
- 10051** VMUs and VSUs failed differential 2 V range self-test. This test measures 0 V by VMUs in differential mode. (VSU2 is connected to VMU1 and 2, and forces 0 V.)
- 10052** VMUs and VSUs failed differential 0.2 V range self-test. This test measures 0 V by VMUs in differential mode. (VSU2 is connected to VMU1 and 2, and forces 0 V.)
- 10x20** SMU failed function check.
- 10x21** SMU failed CMR (Common Mode Rejection) amp calibration.
- 10x22** SMU failed oscillation detector test.
- 10x23** SMU failed V set and V measure calibration.
- 10x24** SMU failed I set and I measure calibration.
- 10x25** SMU failed I bias test.
- 10x26** SMU failed V switch test.
- 10x27** HRSMU failed the test with QSCV measurement.
- 10760** PGU1 failed pulse gain calibration.
- 10761** PGU2 failed pulse gain calibration.
- 10762** PGU1 failed pulse offset calibration.
- 10763** PGU2 failed pulse offset calibration.

## If Errors Occur

### If Errors Occur when You Perform Self-calibration or Diagnostics

- 10764** PGU1 failed voltage calibration of base value.
- 10765** PGU2 failed voltage calibration of base value.
- 10766** PGU1 failed leading time calibration.
- 10767** PGU2 failed leading time calibration.
- 10768** PGU1 failed trailing time calibration.
- 10769** PGU2 failed trailing time calibration.
- 10770** PGU1 failed slope offset calibration.
- 10771** PGU2 failed slope offset calibration.
- 10772** PGU1 failed slope sampling calibration.
- 10773** PGU2 failed slope sampling calibration.
- 10875** GNDU failed offset calibration.
- 10905** AD converter failed ROM or RAM self-test.
- 10906** Successive approximation AD converter failed calibration or self-test.
- 10907** Integrating type AD converter failed calibration or self-test.
- 10908** AD converter reached timeout. AD converter did not return completion status within certain time after sending calibration or self-test command.

## Error code for CPU and peripherals

The following are the error codes for CPU and peripherals. Error codes are 5-digit numbers.

2wwwz

- www: test item number (on SYSTEM: SELF-CALIBRATION/DIAGNOSTICS screen).
- z: test number

<b>23010</b>	Host DRAM failed self-test.
<b>23021</b>	Host ROM failed checksum test.
<b>23022</b>	Host SRAM failed read and write test.
<b>23023</b>	EEPROM failed read and write test.
<b>23030</b>	Real-time clock failed timer test.
<b>23040</b>	GPIB controller failed self-test. This test sets some settings, then checks the status.
<b>23050</b>	Parallel interface controller failed self-test. This test sets some settings, then checks the status.
<b>23061</b>	Host controller sends a command and does not receive acknowledge from SMU controller.
<b>23062</b>	Host controller failed receiving response from SMU controller by sending a command.
<b>23071</b>	SMU controller ROM failed checksum test.
<b>23072</b>	SMU controller on-board SRAM failed read and write test.
<b>23073</b>	SMU controller internal SRAM failed read and write test.
<b>23074</b>	SMU controller internal timer failed self-test.
<b>23075</b>	SMU controller timer does not operate with correct frequency.
<b>23076</b>	SMU controller failed power on self-test.
<b>23077</b>	SMU controller test gets timeout.
<b>23080</b>	Access to graphics system processor failed read and write test.
<b>23091</b>	Graphic memories (SRAM) failed read and write test.

## If Errors Occur

### If Errors Occur when You Perform Self-calibration or Diagnostics

<b>23092</b>	Graphic memories (VRAM) failed read and write test.
<b>24017</b>	Parallel interface failed data line test.
<b>24018</b>	Parallel interface failed control line test.
<b>24021</b>	Trigger output test failed or reached timeout.
<b>24022</b>	Trigger input test failed.
<b>24041</b>	Flexible disk drive controller test failed.
<b>24042</b>	Flexible disk drive 5 V power line test failed.
<b>24051</b>	Flexible disk drive failed diskette change test.
<b>24052</b>	Flexible disk drive failed read and write test.
<b>24062</b>	12 V source on post regulator is not output.
<b>24063</b>	15 V source on post regulator is not output.
<b>24064</b>	3 V source on post regulator is not output.
<b>24065</b>	LAN interface test failed.
<b>24071</b>	A front-panel key is stuck in pressed position.
<b>24072</b>	Front key assembly may be disconnected.
<b>24073</b>	Front-panel key controller is not functioning properly.
<b>24100</b>	External key controller failed self-test.
<b>24120</b>	Selector test reached timeout.
<b>24130</b>	R-Box test reached timeout.

## If Errors Occur when You Operate the 4155C/4156C

The following error codes and messages can occur when operating the 4155C/4156C. The error codes and messages are displayed in a message window or in the message display area at the bottom of the screen.

- 1 Syntax error. Input should be integer number.
- 3 Syntax error. Input should be real number.
- 4 Syntax error. Unrecognized parameter.
- 5 Illegal setup. The parameter is out of range.
- 6 DATA buffer full. Too many APPEND.
- 7 DATA buffer full. Too many points.
- 8 Cannot define more than 6 User Vars.
- 9 Syntax error. First char should be Alphabet.
- 10 Syntax error. Must be alphanumeric.
- 11 Name must be set for user function/variable.  
Name setup cannot be omitted when setting a user function or a user variable name.
- 12 Syntax error. Unknown variable name.
- 13 System error. HOSTC received invalid data.  
The 4155C/4156C may be broken. Contact the nearest Agilent Technologies Sales and Service office.
- 14 System error. Unable to communicate with SMUC.  
The 4155C/4156C may be broken. Contact the nearest Agilent Technologies Sales and Service office.
- 15 System error. Illegal command to SMUC.  
The 4155C/4156C may be broken. Contact the nearest Agilent Technologies Sales and Service office.

## If Errors Occur

### If Errors Occur when You Operate the 4155C/4156C

- 16 Illegal operation. Too many LIST data.
- 17 Unable to display data list. Not enough memory.
- 18 Device I/O error. Unable to print out.  
The 4155C/4156C, printer, or plotter may be broken. Contact the nearest Agilent Technologies sales and service office.
- 19 Filer error. File name is required.
- 20 Filer error. File Type is required.
- 21 System error. Realtime clock has problem.  
The 4155C/4156C may be broken. Contact the nearest Agilent Technologies Sales and Service office.
- 22 Not 4155/4156 file.
- 23 File read error. Invalid setup for this model.
- 24 File may be corrupt.
- 25 Zero offset meas failed for <unit name>.  
Offset value is too large, so Zero offset measurement is aborted.
- 26 Too big offset for 10 pA Range of <unit name>.  
Offset value is too large, so offset cannot be canceled perfectly.
- 27 System busy. Measuring.
- 28 System busy. Forcing stress.
- 29 System error. EEPROM write error.  
The 4155C/4156C may be broken. Contact the nearest Agilent Technologies Sales and Service office.
- 30 Fixture open. Measurement aborted.
- 31 Auto calibration was aborted.
- 32 Auto calibration failed.
- 33 No data in internal memory.
- 34 Illegal data. File may be corrupt.
- 35 System busy. Unable to save/get when MEAS/STR.
- 36 System busy. Unable to change Y-axis.



- 37           System error. SMUC lost data.  
              The 4155C/4156C may be broken. Contact the nearest Agilent  
              Technologies Sales and Service office.
- 38           Buffer overflowed. Aborted.
- 39           Syntax error. Undisplayable character.
- 40           Illegal setup. One unit assigned several CH.
- 41           Illegal disk. Revision mismatch.
- 42           Read error occurred.
- 43           File name is not LIF type.
- 44           File name is not DOS type.
- 45           File name is not LIF/DOS type.
- 46           Volume label is not LIF type.
- 47           Volume label is not DOS type.
- 48           Incorrect memory number.
- 49           Source and Target are same.
- 50           Unable to copy. Memory full.
- 51           Unable to copy. SRC and TGT mem num is same.  
              You cannot specify same memory number in both SOURCE and  
              TARGET name fields.
- 52           Illegal suffix.
- 53           System busy. Emergency handling.
- 54           System busy. Measuring.
- 55           System busy. Executing cal/diag.
- 56           System busy. Executing auto calibration.
- 57           System busy. Printing out hard copy.
- 58           Unable to copy 4145 data file to memory.
- 59           Unable to graph plot. Recover error state.  
              Unable to print out or plot out when error message is displayed.

## If Errors Occur

### If Errors Occur when You Operate the 4155C/4156C

- 60** Cal/diag must be performed in the idle state.  
Calibration and Diagnostics cannot be performed unless the 4155C/4156C is in the idle state. For example, this error is displayed if the SCPI calibration command is sent when the 4155C/4156C is not in the idle state.
- 61** ADC time out.  
The AD converter has caused a time out. Perform 109: ADC test on the SYSTEM: SELF-CALIBRATION/DIAGNOSTICS screen. If this test fails, the 4155C/4156C may need service. Contact the nearest Agilent Technologies Sales and Service office.
- 62** ADC FIFO overflow.  
The AD converter has caused a FIFO overflow. A data transfer error occurred between the AD converter and the SMUC. The 4155C/4156C may need service. Contact the nearest Agilent Technologies Sales and Service office.
- 63** SMUC failed to send data to HOSTC.  
The SMU controller failed to send data to the host controller. Retry the measurement. If this error is still displayed, recycle the power by turning the instrument off and then on again.
- 64** TIFF format supports SCREEN DUMP only.  
The TIFF format is only supported by the SCREEN DUMP function.
- 65** TIFF image can only be written to a FILE.  
A TIFF image can only be written to a FILE. The 4155C/4156C cannot output TIFF format images to a printer or plotter.
- 66** HR TIFF format supports DUMP and GRAPH PLOT.  
A high resolution TIFF image is only supported by the DUMP and GRAPH PLOT functions.
- 67** HR TIFF image can only be written to a FILE.  
A high resolution TIFF image can only be written to a FILE.
- 100** VAR1 is not assigned.
- 101** VAR1 assigned to multiple Channels.
- 102** VAR2 assigned to multiple Channels
- 103** VAR1' assigned to multiple Channels.

- 104 VAR1 and VAR1' must be same MODE.
- 105 Cannot set multiple SMUs to pulse mode
- 106 Cannot use VAR when SAMPLING.
- 107 Cannot use SMU pulse when SAMPLING.
- 108 Duplicate variable names exist.
- 109 The setup is not finished.
- 110 Standby chan cannot use R-BOX resistor  
For standby channel, you cannot use R-Box resistor.
- 111 Common chan cannot use R-BOX resistor.  
For common mode channel, you cannot use R-Box resistor.
- 112 VAR1 step number is out of range.
- 113 START and STOP have different sign.
- 115 SMU pulse Period must be  $\geq$  Width+4ms.
- 116 VAR1 output power too large for unit.
- 117 VAR1' output power too large for unit.
- 118 VAR2 output power too large for unit.
- 119 TOT SMP TM=AUTO is for LINEAR only.  
AUTO can be specified for total sampling time *only when* LINEAR sampling mode is selected.
- 120 Only LINEAR when init int  $\leq$  480 us.  
When initial interval is set to 480  $\mu$ s or less, you *cannot* specify LOG or THINNED-OUT sampling mode.
- 121 For LINEAR set AUTO if init int $\leq$ 480us  
When initial interval is set to 480  $\mu$ s or less *and* when LINEAR sampling mode is set, AUTO must be set in TOTAL SAMP. TIME field.
- 122 TOT SP TM must be  $\geq$  INIT INT(NOofSMP-1)  
Total sampling time must be set in the following range:  
*total sampling time  $\geq$  initial interval  $\times$  (number of samples -1)*
- 123 STOP CONDITION NAME is not set.

## If Errors Occur

### If Errors Occur when You Operate the 4155C/4156C

- 124** PGU pulse Period must be  $>$  Width.
- 125** PGU pulse Period must be  $\geq$  Delay.
- 126** PG leading/trailing must be same range  
PGU leading and trailing time must be set in the same range. For details about the ranges, see *User's Guide: Measurement and Analysis*.
- 127** PGU Leading must be  $\leq 0.8 \times \text{WIDTH}$ .  
Leading time must satisfy the following equation.  
 $\text{leading time} \leq \text{pulse width} \times 0.8$
- 128** PGU Trailing must be  $\leq 0.8 \times (\text{Peri-Wid})$ .  
Trailing time must satisfy the following equation.  
 $\text{trailing time} \leq (\text{pulse period} - \text{pulse width}) \times 0.8$
- 129** SMU I range must be  $\leq$  Compliance range.
- 130** SYNC channel is not assigned.  
At least one SYNC channel must be specified.
- 131** Assigned more than 4 SYNC channels.
- 132** Set INIT INT  $\geq 2$ ms for multi-CH MEAS.  
When you perform multi-channel measurements, initial interval must be 2 ms or more.
- 133** Use FIXED range when INIT INT  $< 2$ ms.  
When you use auto ranging or limited auto ranging measurement, you must set initial interval to 2 ms or more.
- 134** Cannot disable STBY-ON ch in stress.  
On STRESS: CHANNEL DEFINITION screen, you cannot disable (delete entries in row) channels that are set to STBY ON on the CHANNELS: CHANNEL DEFINITION screen.
- 135** Undefined symbol in user function.
- 136** Syntax error in user function.
- 137** Too few arguments in user function.
- 138** Too many arguments in user function.
- 139** User function area is full.
- 140** Recursive call in user function.

- 141 User function is undefined.
- 142 Stack overflow in user function.
- 143 COMMON channel FCTN must be CONST.
- 144 COMMON channel FCTN must be NSYNC.
- 145 System busy. Unable to change page when MEAS.
- 146 System busy. Unable to change page when STRS.
- 147 Ineffective page in this setup.
- 148 X axis is not assigned.
- 149 Y1 axis is not assigned.
- 150 ENABLE DELAY must be  $\leq 32767 \times \text{INIT INT}$   
For sampling measurements, when stop condition is set to ENABLE, *enable delay* must be *initial interval*  $\times 32767$  or less.
- 151 No unit is set to STANDBY ON.
- 152 System busy. MEASURING (or 4145 USER MODE).
- 153 MIN, MAX have different sign in LOG.
- 154 Can do such operation only for USER VAR.
- 155 Illegal setup. The name was already used.
- 156 User variable is used in user function.  
If a user variable is used in user functions, the user variable cannot be deleted.
- 157 AUTO Analysis is undefined.
- 158 TOT SAMP TIME must be  $\leq \text{INIT INT} \times 32767$ .  
*Total sampling time* must be *initial interval*  $\times 32767$  or less and  $1 \times 10^{11}$  or less.
- 159 Measure channel is not assigned.
- 160 Unable to find approximate data.
- 161 Illegal graph scale setup.
- 163 The Sweep/Pulse Polarity is not same.
- 164 SYNC can not be set for standby CH.

## If Errors Occur

### If Errors Occur when You Operate the 4155C/4156C

- 165** Set value is too small for range.  
For LOG sweep measurement, start and stop value must be equal or more than setup resolution. For sweep measurement, step value of VAR1 and VAR2 must be equal or more than setup resolution.
- 166** PGU Peak/Base difference must be  $\leq 40V$
- 170** Use Sweep/Bias instead of SMU Pulse.
- 171** Knob Sweep sets VAR1' to CONST.  
If you set VAR1' for knob sweep measurement, the VAR1' channel forces a constant value equal to START value. VAR1' cannot be a sweep source for Knob Sweep measurement.
- 172** Cannot do SAMPLING when Knob Sweep.
- 173**  $|\text{STEP}|$  must be  $\leq |\text{STOP}-\text{START}|$ .
- 174** Cannot set CONT AT ANY if PCOMP is ON.  
When you set power compliance, you cannot select CONT AT ANY secondary softkey.
- 175** CONST setup must be  $\leq$  unit output range.
- 176** Pulse BASE must be  $\leq$  unit output range.
- 177** PGU pulse WIDTH must be  $\geq$  setup res.  
Pulse width of PGUs must be greater than or equal to unit setup resolution.
- 178** TRIG OUT DELAY is too long.  
Trigger out delay must be 32.7 ms or pulse width you specified, whichever is shorter.
- 179** Cannot ENABLE stop if INIT INT  $< 2$  ms.  
When initial interval is set to less than 2 ms, you cannot set stop condition.
- 180** Illegal setup. Target module is not installed.
- 181** Illegal setup. Invalid command.
- 182** Cannot define more than 6 User functions.
- 183** Cannot define more than 8 data vars in lists.
- 184** Cannot define more than 2 display data vars.

- 185 ASCII format does not allow block transfer.
- 186 Block size mismatched with data format.
- 187 Y2 axis is not assigned.
- 188 List name is not assigned.
- 189 The specified name is not list name.
- 190 Illegal file type is requested.
- 191 System busy. Printing out hard copy.
- 192 Unable to set. Another controller is on bus.
- 193 Unable to specify this name here.
- 194 PGU Pulse DELAY must be  $\geq$  setup res.  
PGU pulse delay time must be  $\geq$  setup resolution.
- 195 Cal/Diag failed. Cannot use unit.
- 196 Compliance too low to force pulse.
- 197 Compliance too high to force pulse.
- 198 Two VPULSE PGUs must be same STBY.
- 199 Two VPULSE PGUs must be same FCTN.
- 200 Improper parameter for file operation.  
An option for the file operation command has been set up incorrectly.
- 201 System error. Filer memory overflow.
- 202 Filer error. Integer overflow.
- 203 Bad volume specifier.  
Volume label for mass storage is incorrect. Initialization may have been performed on an incompatible system, or the disk may be defective.
- 204 Filer error. File type is wrong.
- 205 Filer error. EOF found.
- 206 Filer error. EOR found.
- 207 File error. Illegal DISK parameter.  
Illegal disk parameter was detected. The mass storage device is set up incorrectly.

## If Errors Occur

### If Errors Occur when You Operate the 4155C/4156C

- 208** System error. Controller not found.  
Unable to access the file system. The file system controller cannot be found. The 4155C/4156C may need service. Contact the nearest Agilent Technologies Sales and Service office.
- 210** File error. Unable to execute. File open.  
Unable to perform the requested file operation. The file is already open. Close the file and retry the operation.
- 211** Unable to operate the device. File is open.  
Unable to perform the requested file operation on the specified device because the device has a file open.
- 212** File error. DISK or DISK drive may be broken.  
DISK or DISK drive hardware may be in need of service.
- 213** Filer error. DISK record is not found.
- 214** File error. DISK record address error.  
Unable to find record because the mass storage device has a problem.
- 215** Filer error. DISK record data error.
- 216** File error. DISK system error.  
The hardware or the device are causing a problem.
- 217** File error. Bad volume label.  
The mass storage has an incorrect volume label. Verify the volume number is set correctly.
- 218** System error. No interface found.  
The network interface was not found because of a wrong select code setup. Verify the select code is set correctly.
- 219** File error. Device timeout.  
Time-out occurred on the device.
- 220** Filer error. Undefined I/O path.
- 221** Filer error. Permission denied.
- 222** File error. Too many files open.  
Unable to open multiple files at the same time. Close the file that is currently open before opening a second file.



- 223 Unable to PURGE the file or directory.  
Unable to purge the file or the directory, for example, permission denied.
- 224 Filer error. The directory is not empty.
- 225 Filer error. No DISK in the drive.
- 226 Filer error. Initialization failed.
- 227 Filer error. Invalid DISK volume label.
- 228 File error. DISK volume label is undefined.  
Volume label is undefined or was not found. Verify the volume number is set correctly.
- 229 Filer error. DISK is not initialized.
- 230 Filer error. Checkread error.
- 231 Filer error. Bad HFS DISK.
- 232 Filer error. DISK is full.
- 233 Filer error. Directory is full.
- 234 Filer error. File name is undefined.
- 235 Filer error. File name is wrong.
- 236 Filer error. The file name is already used.
- 237 Filer error. Bad device type.
- 238 Filer error. Unable to use wildcard.
- 239 Filer error. Operations failed.
- 241 Filer error. The target type is wrong.
- 242 Filer error. The file is protected.
- 243 Filer error. DISK is protected.
- 244 System error. Unable to verify.
- 245 Filer error. Unable to copy between LIF/DOS.
- 246 Filer error. Reason Unknown.
- 265 HOLD TM must be  $\geq 0$  when INIT INT  $\geq 2$ ms.
- 280 VAR1' output value is out of range.

## If Errors Occur

### If Errors Occur when You Operate the 4155C/4156C

- 282** Set INIT INT > 640 us for THINNED-OUT.  
When you perform thinned-out sampling measurements, the initial interval must be more than 640  $\mu$ s.
- 284** Sampling range must be  $\leq$  11decades.
- 286** Cannot execute cal/diag after power fail.  
Turn on the 4155C/4156C again to perform calibration or diagnostics.
- 288** MEAS not finished. Incomplete data deleted.  
If you press Stop front-panel key before the specified measurement finishes, incomplete measurement data is deleted.
- 289** STBY ON ch MODE(MEAS/STR) must be same
- 290** Cannot use unit after power fail.
- 292** VAR1' parameters must be  $\geq$  output res  
Start, stop, and step value of VAR1' channel must be unit output resolution or more.
- 293** Cal/Diag aborted (failed on some units).  
Calibration or diagnostics was aborted by receiving \*RST command. So, some units maybe failed.
- 300** Over voltage is detected.
- 301** Over Current is detected.
- 302** Power failure at Main Frame.  
Turn on the 4155C/4156C again. You can use filer functions after selecting OK secondary softkey (except when this error occurs during power-on test).
- 303** Power failure at Expander Box.  
Turn on the 4155C/4156C again. You can use filer functions after selecting OK secondary softkey (except when this error occurs during power-on test).
- 305** Cannot shutdown Main Frame.
- 306** Emergency. Reason unknown.  
An emergency occurred on an empty slot. Or an emergency occurred on an existing slot, but the reason is unspecified.

- 307** Cannot shutdown Power Supply.  
Turn on the 4155C/4156C again. You can use filer functions after selecting OK secondary softkey (except when this error occurs during power-on test).
- 308** Unknown emergency (SMUC time out).  
Perform 305: HOSTC <--> SMUC I/F test on the SYSTEM: SELF-CALIBRATION/DIAGNOSTICS screen. If this test fails, the 4155C/4156C may need service. Contact the nearest Agilent Technologies Sales and Service office.
- 309** The SMU AND PULSE GENERATOR EXPANDER is not turned on.  
Turn on the expander, then cycle mainframe power.
- 310** Unsupported unit detected in Slot ##. Turn off the power and remove the unit.  
The displayed unit must be changed. Contact the nearest Agilent Technologies Sales and Service office.
- 320** Not enough memory. Cannot display >=200 files.  
The 4155C/4156C cannot display more than 199 files on the FILE CATALOG because of an internal memory limitation. If you create more than 199 files, move the additional files to another directory.
- 321** Too many links.  
The file has too many links. Remove extra links or use symbolic links.
- 322** File system down or network disconnected.  
Unable to access the network directory. The file system was down or the network was disconnected.
- 323** The network address is already used.  
A process has already been bound to the address. The current process must finish before the new process can use the address.
- 324** Change dir failed. File is not a directory.  
Change directory failed because you specified a file, not a directory.
- 325** Unable to open file. Deadlock occurred.  
Unable to open the file. Deadlock occurred in the resource where you tried to open the file.

## If Errors Occur

### If Errors Occur when You Operate the 4155C/4156C

- 326** Device not present. Unsupported file type.  
Device or driver was not found to open the file. Unable to open file because the file type is not supported.
- 327** Interrupted system call.  
The lpr driver received a signal from the system, that interrupted the data transfer from the lpr driver.
- 328** lpd time out occurred. Try again ?  
A time out occurred when trying to connect to the lpd server because the lpd server did not respond.
- 329** lpd print server cannot be recognized.  
Unable to recognize the lpd print server. Verify the address setup or setup syntax is correct.
- 330** lpd server connection failed or was denied.  
The lpd server connection failed, or was denied, because the lpd server was already connected or the server was blocked.
- 331** lpr data transfer failed.  
Data transfer from the lpr server failed because lpr data communication was disconnected. Verify the network is working properly and check to see if the server is up.
- 332** Unable to print out. Not enough device space.  
Unable to print out because the device connection failed. There is not enough available space in the buffer for the communication.
- 334** lpr failed data transfer. Data size mismatch.  
Unable to print out because the lpr server failed data transfer. The size of the data was not the expected size.
- 335** lpr Network interface is down. Try again ?  
The network interface cannot be found because the network interface for the lpr server is down.
- 336** Unable to print out. Reason unknown.  
Network connection failed. The reason for the failure is unknown.

- 337** Cannot set 0.0.0.0 for 4155/4156 IP address.  
When a valid host name for the 4155C/4156C network setup is specified, the IP address of the 4155C/4156C cannot be set to 0.0.0.0.
- 338** Cannot set 0(zero) for 4155/4156 User ID.  
When a valid host name for the 4155C/4156C network setup is specified, the User Id of the 4155C/4156C cannot be set to 0 (zero).
- 339** No response from NFS. Try again ?  
There is no response from the Network File System (NFS) when trying to mount a network disk. Verify the network is operating properly and the file export executed properly.
- 340** Host name must be <= 15 alphanumeric character.  
The 4155C/4156C host name must be 15 or less alphanumeric characters.
- 344** System busy. Cannot execute US/US42 command.  
Unable to move to FLEX command control mode, because the US or US42 command cannot be executed while system is busy; making measurement, operating file functions, executing calibration or diagnostics, printing, emergency, and so on.
- 345** Change display page. DISP OFF(0) is not allowed.  
Unable to enter the :DISP OFF (or 0) command when the 4155C/4156C screen displays System screen group or KNOB SWEEP screen.
- 346** Enter DISP ON(1) to execute this command.  
Unable to enter the :PAGE:KSW command group, :PAGE:SCON:KSW command, or :DIAG:TEST *test\_no* (*test\_no*: 201 to 413) command when the 4155C/4156C screen is set to the update *disable* state by the :DISP OFF (or 0) command.
- 350** Unable to transfer data. Name buffer full.  
Cannot maintain the buffer required for transferring data.
- 351** File operation was interrupted by system call.  
The lpr driver received a signal from the system, which interrupted an open, read, or write operation.

## If Errors Occur

### If Errors Occur when You Operate the 4155C/4156C

- 352** Network is down after receiving a reset.  
The network is down after receiving a reset. Try again after network recovers.
- 353** Network is down. No response from server.  
Network is down. There is no response from the server.
- 354** Operation canceled.  
Operation canceled by user. For example, an abort command was sent.
- 355** Cannot create file/dir. Change permission.  
Write permission is not set for the directory where you are trying to create a file or subdirectory.
- 357** Unable to go to the dir. Permission denied.  
Cannot move to the specified directory. To access the directory, change the permissions.
- 358** Select UPDATE/ADD to update/add printer setup.  
To update or add your new or modified network printer setup, the UPDATE or ADD secondary softkey must be selected after finishing the initial setup.
- 363** Duplicate file names exist.  
The same file name cannot be used for multiple files.
- 364** No such file or directory.  
Cannot find the specified file or directory.
- 365** Unable to read or write to directory.  
A file read or write operation cannot be performed in the specified directory.
- 366** Invalid argument. Check command syntax.  
Specified argument did not work when executing the command. Verify the command syntax and argument are correct.
- 367** Seek operation failed.  
Seek for file operation failed, or append write failed to open the specified file.

- 368** NFS Software caused connection abort.  
Network file system (NFS) was disconnected. Verify the NFS server is operating correctly.
- 369** Connection reset by peer. Remote disconnected.  
Remote connection was terminated. Verify the remote setup and the executed operation are correct. Verify the local and remote systems are operating properly.
- 370** Unable to transfer data. Communication down.  
Data cannot be transferred because the communication was shutdown.
- 371** NFS Connection refused.  
Connection to NFS was refused. Verify the refused device was properly exported.
- 372** Connection failed. Socket was not sent.  
NFS Connection failed because the socket was not sent.
- 373** Too many levels of symbolic links.  
The file is linked to itself, or the linked file is linked back to the file.
- 375** Cross-device link.  
Unable to hard link different physical file systems. Hard link must be done to same file system.
- 377** Unable to use this protocol.  
Unable to use this protocol on the network.
- 378** This protocol is not supported.  
This protocol is not supported on the network.
- 381** This type of protocol is not supported.  
This type of protocol is not supported on the network.
- 383** NFS too many references, can't splice.
- 386** System busy. Saving/getting text files.  
The 4155C/4156C cannot be interrupted by other operations. For example, files cannot be saved or retrieved while making measurements.

## If Errors Occur

### If Errors Occur when You Operate the 4155C/4156C

- 387** Unable to access file. The file is locked.  
Unable to write to this file. The file is locked by another process.
- 388** No such device or address.  
The 4155C/4156C cannot find the specified network device or address. Verify the correct device file exists, the select code/major number/minor number are correct, and that the device is correctly connected (high speed or low speed port).
- 389** System busy. File operation is in progress.  
File operation is in progress. During a file operation, the 4155C/4156C cannot perform other operations, such as making measurements, changing setup fields, printing and so forth.
- 391** Network printer connection time out.  
A time out occurred when connecting the network printer to the print server or NFS server.
- 392** Network File System server is down.  
Server for the Network File System is down. Contact your network system administrator.
- 393** Communication to desired server failed.  
Communication to desired server failed.
- 394** System busy. Mounting device.  
When mounting a device, the 4155C/4156C cannot be interrupted by another operation, such as making a measurement.
- 400** System bug. Undefined method.
- 401** System bug. Invalid parameter.
- 402** System bug. Inconsistency.
- 410** Unable to display. Number must be <10001.  
Unable to display the measurement results because the data size of the result is too large. The number of the measurement results must be less than 10001.
- 411** Connection failed. Set Destination address.  
Network connection to destination failed. Verify the destination address is set correctly.
- 412** Address family not supported.  
Specified address family is not supported for the currently used socket.



- 415**      `SUBNET MASK must be n.n.n.n (n:numeric value).`  
An invalid character was set to SUBNET MASK. The format is *n.n.n.n*, a string of up to 15 characters, where *n* is 3-digit maximum numeric value.
- 416**      `GATEWAY must be n.n.n.n (n:numeric value).`  
An invalid character was set to GATEWAY. The format is *n.n.n.n*, a string of up to 15 characters, where *n* is 3-digit maximum numeric value.
- 417**      `GPIB busy. Cannot control E5250A.`  
Cannot control the E5250A because the GPIB is busy. Try again when the GPIB is ready.
- 418**      `Timeout occurred to control E5250A.`  
Cannot find the E5250A at the specified GPIB address. Turn the E5250A on, and set the E5250A control mode to ON again. Confirm the cable connection and GPIB address setting are correct, and then try again.
- 419**      `4155/4156 must be system controller.`  
Set the 4155C/4156C to SYSTEM CONTROLLER to use the built-in E5250A control function. If an external computer controls the 4155C/4156C, pass the active controller capability to the 4155C/4156C to use this function.
- 420**      `E5250A control was rejected.`  
E5250A control command was rejected due to a GPIB error, an interrupt, or an incorrect address setting. Confirm the cable connection and GPIB address setting are correct, and then try again.
- 421**      `Improper response from E5250A.`  
An improper response was returned from the E5250A. Turn the instrument off and on, and then try again. The E5250A could be defective.
- 422**      `Invalid command or parameter for E5250A.`  
An invalid command was sent to the E5250A. Turn the instruments off and on, and then try again. The E5250A or 4155C/4156C could be defective.

## If Errors Occur

### If Errors Occur when You Operate the 4155C/4156C

- 423** E5252A must be in E5250A slot 1.  
Install the E5252A matrix card into slot 1 of the E5250A. The E5252A must be installed in the E5250A slots continuously, starting with slot number 1.
- 424** Apply or cancel the setup change.  
Before closing the E5250A CONNECTION SETUP screen, select the APPLY SETUP, APPLY OPEN ALL, or CANCEL SETUP CHANGE softkey.
- 425** E5250A control mode must be ON.  
To enable the built-in E5250A control function, the E5250A control mode must be ON. This makes it possible to display the E5250A connection setup screen, to control the E5250A, and to access the matrix setup data file (.MAT).
- 426** Too many relays closed. Max 200.  
E5250A connection setup error. Too many physical relays have been closed. To close new relays, must open some relays. Maximum 200 relays can be closed.
- 428** VAR1 channel must be V mode in QSCV measurement.  
The VAR1 channel must be set to the voltage source when making a quasi-static CV measurement. Set the VAR1 channel mode to V.
- 429** Knob sweep is not allowed in QSCV measurement.  
The knob sweep function is not available during the quasi-static CV measurement.
- 430** Integration time too short for QSCV zero cancel.  
The integration time specified is too short to execute the zero offset cancel during the quasi-static CV measurement. Set a longer value.
- 431** Offset value too large for QSCV zero cancel.  
The measurement unit measured a leakage current greater than 70 % of the measurement range of the QSCV zero offset measurement. Use the next greater measurement range.
- 432** Duplicate responses from NFS server.  
The 4155C/4156C cannot mount the specified network file system because of the incorrect response from the NFS server. Export another file system on the server, and try to mount it.

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## If a Measurement Data Status is Displayed

If measurement or stress force cannot be performed correctly, the measurement data status is displayed at the bottom of the GRAPHICS, LIST, KNOB SWEEP, or STRESS FORCE screen. The status indicates hardware and calculation errors.

The status format depends on the displayed screen as follows:

### GRAPH/LIST: GRAPHICS and KNOB SWEEP screen

Status is displayed in following format:

STATUS : *AB AB AB ( A A A A A A A C )*

- *AB AB AB* is for X, Y1, and Y2 axis respectively. No Y2 for KNOB SWEEP.
- *A A A A A A A C* is for SMU1 to SMU6, VMU1, VMU2, and PGU1/2 respectively.

For non-measurement channels, “\_” is displayed.

Where, *A*, *B*, and *C* mean as follows:

**A** hardware status error. If multiple errors occur, numbers are added and displayed as a hexadecimal number.

- 1 : AD converter overflow.
- 2 : Oscillation
- 4 : Other channel reached compliance limit.
- 8 : This channel reached compliance limit.

For QSCV measurement, 8 will be set if the integration time for the capacitance measurement is too short. Then set longer value, or use higher measurement range.

**B** data error. If multiple errors occur, numbers are added and displayed as a hexadecimal number.

- 1 : stack register overflow
- 2 : calculation error
- 4 : only one data for delta measurement. At least 2 data needed.

**C** PGU status

- 1 : PGU average output current exceeds 100 mA.

If Errors Occur

If a Measurement Data Status is Displayed

## GRAPH/LIST: LIST screen

Status on GRAPH/LIST: LIST screen is displayed in following format:

STATUS : *AB AB AB AB AB AB AB AB* ( *A A A A A A A C* )

- *AB AB AB AB AB AB AB AB* is for the up to 8 LIST variables that can be set up.
- *A A A A A A A C* is for SMU1 to SMU6, VMU1, VMU2, and PGU1/2 respectively.

For non-measurement channels, “\_” is displayed.

Where, *A*, *B*, and *C* mean as follows:

**A** hardware status error. If multiple errors occur, numbers are added and displayed as a hexadecimal number.

- 1 : AD converter overflow.
- 2 : Oscillation
- 4 : Other channel reached compliance limit.
- 8 : This channel reached compliance limit.

For QSCV measurement, 8 will be set if the integration time for the capacitance measurement is too short. Then set longer value, or use higher measurement range.

**B** data error. If multiple errors occur, numbers are added and displayed as a hexadecimal number.

- 1 : stack register overflow
- 2 : calculation error
- 4 : only one data for delta measurement. At least 2 data needed.

**C** PGU status

- 1 : PGU average output current exceeds 100 mA.

## **STRESS: STRESS FORCE screen**

Status on STRESS: STRESS FORCE screen is displayed in following format:

STATUS : *A C*

Where, *A* and *C* mean as follows:

- A* hardware status error. If multiple errors occur, numbers are added and displayed as a hexadecimal number.
- 2 : Oscillation.
  - C : Some channel has reached compliance limit.
  - E : Oscillation and some channel has reached compliance limit.
- C* PGU status
- 1 : PGU average current exceeds 100 mA.

If Errors Occur  
If a Measurement Data Status is Displayed