Part No. IB036551
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Communication Interface Manual

Electrical Safety Analyzer
TOS93 Series

TOS9300
TOS9301
TOS9311
TOS9302
TOS9303

Contents

Command List

IEEE 488.2 Common Commands

*CLS

Clears all event registers including the status byte, event status, and error queue. *(p.42)*

*ESE

Sets the event status enable register that is counted by the event summary bit (ESB) of the status byte. *(p.42)*

*ESR?

Queries the event status register. *(p.42)*

*IDN?

Queries the model name and firmware version of the TOS93 series. *(p.43)*

*OPC

Sets the OPC bit (bit 0) of the event status register when all the commands that are in standby have been processed. *(p.43)*

*OPT?

Queries the options that are installed in the product. *(p.43)*

*PSC

Sets whether the event status enable register and service request enable register are cleared when the POWER switch is turned on. *(p.44)*

*RCL

Recalls memory content. Clears alarms. Aborts the trigger subsystem operation. *(p.44)*

*RST

Resets the panel settings (see the table below). *(p.44)*

*SAV

Saves the panel settings to the setup memory. *(p.45)*

*SRE

Sets the service request enable register. *(p.45)*

*STB?

Queries the contents of the status byte register and the MSS (master summary status)message. *(p.45)*

*TRG

Executes trigger on the TEST trigger group. *(p.46)*

*TST?

Executes a self-test. *(p.46)*

*WAI

Prevents the TOS93 series from executing subsequent commands until all operations that are in standby have completed. *(p.46)*

ABORt Command

ABOR

Aborts measurements, tests, and other operations in all trigger subsystems (ACQuire, TEST). *(p.51)*

ABOR:ACQ

Aborts measurement operations. *(p.51)*

ABOR:TEST

Stops the ongoing test. Clears the protection/ fail mode. *(p.51)*

CALCulate Command

CALC:SCAL:OFFS:AUTO

Sets whether to automatically set the offset before testing. *(p.52)*

CALCulate:ACW Command

CALC:ACW:SCAL

Sets whether to offset the current running through the stray capacitance in AC withstanding voltage tests. *(p.53)*

CALC:ACW:SCAL:OFFS

Sets the real part of the offset current in AC withstanding voltage tests. *(p.54)*

CALC:ACW:SCAL:OFFS:IMAG

Sets the imaginary part of the offset current in AC withstanding voltage tests. *(p.54)*

CALCulate:DCW Command

CALC:DCW:SCAL

Sets whether to offset the current running through the stray capacitance in DC withstanding voltage tests. *(p.55)*

CALC:DCW:SCAL:OFFS

Sets the offset current for DC withstanding voltage tests. *(p.55)*

CALCulate:EC Command

CALC:EC:DC:SCAL

Sets whether to offset the voltage drop caused by the contact resistance in earth continuity tests (DC). *(p.56)*

CALC:EC:DC:SCAL:OFFS

Sets the offset resistance for earth continuity tests (DC). *(p.57)*

CALC:EC:SCAL

Sets whether to offset the voltage drop caused by the contact resistance in earth continuity tests (AC). *(p.57)*

CALC:EC:SCAL:OFFS

Sets the offset resistance for earth continuity tests (AC). *(p.58)*

CALCulate:IR Command

CALC:IR:SCAL

Sets whether to offset the resistance applied to the stray capacitance in insulation resistance tests. *(p.59)*

CALC:IR:SCAL:OFFS

Sets the offset resistance for insulation resistance tests. *(p.59)*

CALibrate Command

CAL:DATE

Sets the calibration date. *(p.60)*

DATA Command

DATA:BSIZ

Sets the buffer size (maximum number of measurement data recordings) of thedata logger. *(p.61)*

DATA:FORM

Sets the response format to use when measurement data is queried. *(p.62)*

DATA:POIN?

Queries the number of measurements recorded in the data logger. *(p.62)*

DATA:REM?

Queries the measurement data recorded in the data logger. *(p.63)*

DATA:REM:ALL

Deletes all the measurement data recorded in the data logger. *(p.63)*

DISPlay Command

DISP:ACW:CURR:PHOL

Displays the maximum current measurement from the start of the test in AC withstanding voltage tests. *(p.64)*

DISP:ACW:VIEW

Selects the measurement screen to be displayed in the display area during the AC withstanding voltage test from the numerical value and graph. *(p.64)*

DISP:DCW:CURR:PHOL

Displays the maximum current measurement from the start of the test in DC withstanding voltage tests. *(p.65)*

DISP:DCW:VIEW

Selects the measurement screen to be displayed in the display area during the DC withstanding voltage test from the numerical value and graph. *(p.65)*

DISP:EC:RES:PHOL

Sets enabled/disabled of the display of the minimum resistance value from the start of an earth continuity (AC) test. *(p.66)*

DISP:EC:DC:RES:PHOL

Sets enabled/disabled of the display of the minimum resistance value from the start of an earth continuity (DC) test. *(p.66)*

RESult Command

ROUTe Command

SAMPle Command

SAMP:TIM

Sets a sampling interval. (p.96)

SENSe:ACW Command

SENS:ACW:CURR:FILT:HPAS

Sets the high-pass filter for AC withstanding voltage tests. (p.97)

SENS:ACW:CURR:FILT:LPAS

Sets the low-pass filter for AC withstanding voltage tests. (p.98)

SENS:ACW:CURR:FILT:TYPE

Sets the filter type for AC withstanding voltage tests. (p.98)

SENS:ACW:CURR:MODE

Sets the current measurement mode in AC withstanding voltage tests. (p.99)

SENS:ACW:JUDG

Sets the reference current for upper limit judgment in AC withstanding voltage tests. (p.99)

SENS:ACW:JUDG:LOW

Sets the reference current for the lower limit judgment in AC withstanding voltage tests. (p.100)

SENS:ACW:JUDG:LOW:STAT

Sets whether to judge with the lower limit in AC withstanding voltage tests. (p.100)

SENS:ACW:TERM:GRO

Sets whether to measure by including or excluding the current running through the stray capacitance in AC withstanding voltage tests. (p.101)

SENS:ACW:VOLT:MODE

Sets the voltage measurement mode in AC withstanding voltage tests. (p.101)

SENSe:DCW Command

SENS:DCW:CURR:FILT:HPAS

Sets the high-pass filter for DC withstanding voltage tests. (p.102)

SENS:DCW:CURR:FILT:LPAS

Sets the low-pass filter for DC withstanding voltage tests. (p.103)

SENS:DCW:CURR:FILT:TYPE

Sets the filter type for DC withstanding voltage tests. (p.103)

SENS:DCW:JUDG

Sets the reference current for upper limit judgment in DC withstanding voltage tests. (p.104)

SENS:DCW:JUDG:DEL

Sets the delay time until starting upper limit judgment in DC withstanding voltage tests. (p.104)

SENS:DCW:JUDG:DEL:AUTO

Sets whether to make the judgment delay automatic in DC withstanding voltage tests. (p.105)

SENS:DCW:JUDG:LOW

Sets the reference current for the lower limit judgment in DC withstanding voltagetests. (p.105)

SENS:DCW:JUDG:LOW:STAT

Sets whether to judge with the lower limit in DC withstanding voltage tests. (p.106)

SENS:DCW:TERM:GRO

Sets whether to measure by including or excluding the current running through the stray capacitance in DC withstanding voltage tests. (p.106)

SENS:DCW:VOLT:MODE

Sets the voltage measurement mode in DC withstanding voltage tests. (p.107)

SENSe:EC Command

SENS:EC:JUDG

Sets the reference resistance for upper limit judgment in earth continuity tests (AC). (p.108)

SENS:EC:JUDG:STAT

Sets whether to judge with the upper resistance limit in earth continuity tests (AC). (p.109)

SENS:EC:JUDG:LOW

Sets the reference resistance for lower limit judgment in earth continuity tests (AC). (p.109)

SENSe:IR Command

SENS:IR:JUDG:CURR:LOW

Sets the reference current for lower limit judgment in insulation resistance tests. (p.122)

SENS:IR:JUDG:CURR:LOW:STAT

Sets whether to judge with the lower current limit in insulation resistance tests. (p.123)

SENS:IR:JUDG:DEL

Sets the time until starting upper limit judgment. (p.123)

SENS:IR:JUDG:DEL:AUTO

Sets whether to make the judgment delay automatic. (p.124)

SENS:IR:JUDG:LOW

Sets the reference resistance for lower limit judgment in insulation resistance tests. (p.124)

SENS:IR:JUDG:LOW:STAT

Sets whether to judge with the lower resistance limit in insulation resistance tests. (p.125)

SENS:IR:JUDG:TYPE

Sets whether to use resistance or current to make upper limit judgment and lower limit judgment in insulation resistance tests. (p.125)

SENS:IR:TERM:GRO

Sets whether to measure by including or excluding the current running through the stray capacitance in insulation resistance tests. (p.126)

[SOURce:] Command

FUNC

Set the test mode. (p.127)

[SOURce:]ACW Command

ACW:VOLT

Sets the test voltage for AC withstanding voltage tests. (p.128)

ACW:VOLT:END:STAT

For AC withstanding voltage tests, enable or disable the end voltage. (p.128)

ACW:VOLT:FREQ

Sets the test voltage frequency for AC withstanding voltage tests. (p.129)

ACW:VOLT:PROT

Sets the limit voltage for AC withstanding voltage tests. (p.129)

ACW:VOLT:STAR

Sets the start voltage as a percentage for AC withstanding voltage tests. (p.130)

ACW:VOLT:STAR:STAT

Sets whether to set the start voltage for AC withstanding voltage tests. (p.130)

ACW:VOLT:SWE:FALL:TIM

Sets the voltage fall time for AC withstanding voltage tests. (p.131)

ACW:VOLT:SWE:FALL:TIM:STAT

Sets whether to set the voltage fall time for AC withstanding voltage tests. (p.131)

ACW:VOLT:SWE:TIM

Sets the voltage rise time for AC withstanding voltage tests. (p.132)

ACW:VOLT:TIM

Sets the test time for AC withstanding voltage tests. (p.132)

ACW:VOLT:TIM:STAT

Sets whether to set the test time for AC withstanding voltage tests. (p.133)

[SOURce:]DCW Command

DCW:VOLT

Sets the test voltage for DC withstanding voltage tests. (p.134)

DCW:VOLT:DISC:INT:STAT

Sets whether to discharge when interlock is activated in DC withstanding voltage tests. (p.134)

DCW:VOLT:DISC:TIM

Sets the discharge time for DC withstanding voltage tests. (p.135)

DCW:VOLT:END:STAT

Sets the terminating voltage for DC withstanding voltage tests. (p.135)

DCW:VOLT:PROT

Sets the limit voltage for DC withstanding voltage tests. (p.136)

DCW:VOLT:STAR

Sets the start voltage as a percentage for DC withstanding voltage tests. (p.136)

DCW:VOLT:STAR:STAT

Sets whether to set the start voltage for DC withstanding voltage tests. (p.137)

DCW:VOLT:SWE:FALL:TIM

Sets the voltage fall time for DC withstanding voltage tests. (p.137)

DCW:VOLT:SWE:FALL:TIM:STAT

Sets whether to set the voltage fall time for DC withstanding voltage tests. (p.138)

DCW:VOLT:SWE:TIM

Sets the voltage rise time for DC withstanding voltage tests. (p.138)

DCW:VOLT:TIM

Sets the test time for DC withstanding voltage tests. (p.139)

DCW:VOLT:TIM:STAT

Sets whether to set the test time for DC withstanding voltage tests. (p.139)

[SOURce:]EC Command

EC:AC:CURR

Sets the test current for earth continuity tests (AC). (p.140)

EC:AC:CURR:FREQ

Sets the test current frequency for earth continuity tests (AC). (p.140)

EC:AC:CURR:PROT

Sets the limit current for earth continuity tests (AC). (p.141)

EC:AC:CURR:SWE:FALL:TIM

Sets the current fall time for earth continuity tests (AC). (p.141)

EC:AC:CURR:SWE:FALL:TIM:STAT

Sets whether to set the current fall time for earth continuity tests (AC). (p.142)

EC:AC:CURR:SWE:TIM

Sets the current rise time for earth continuity tests (AC). (p.142)

EC:AC:CURR:TIM

Sets the test time for earth continuity tests (AC). (p.143)

EC:AC:CURR:TIM:STAT

Sets whether to set the test time for earth continuity tests (AC). (p.143)

EC:DC:CURR

Sets the test current for earth continuity tests (DC). (p.144)

EC:DC:CURR:PROT

Sets the limit current for earth continuity tests (DC). (p.144)

EC:DC:CURR:SWE:FALL:TIM

Sets the current fall time for earth continuity tests (DC). (p.145)

EC:DC:CURR:SWE:FALL:TIM:STAT

Sets whether to set the current fall time for earth continuity tests (DC). (p.145)

EC:DC:CURR:SWE:TIM

Sets the current rise time for earth continuity tests (DC). (p.146)

EC:DC:CURR:TIM

Sets the test time for earth continuity tests (DC). (p.146)

EC:DC:CURR:TIM:STAT

Sets whether to set the test time for earth continuity tests (DC). (p.147)

[SOURce:]IR Command

IR:TERM:POL?

Queries the polarity of the power supplied to the output terminals in insulation resistance tests. *(p.148)*

IR:VOLT

Sets the test voltage for insulation resistance tests. *(p.148)*

IR:VOLT:DISC:INT:STAT

Sets whether to discharge when interlock is activated in insulation resistance tests. *(p.149)*

IR:VOLT:DISC:TIM

Sets the discharge time for insulation resistance tests. *(p.149)*

IR:VOLT:PROT

Sets the limit voltage for insulation resistance tests. *(p.150)*

IR:VOLT:RANG

Sets the output voltage range for insulation resistance tests. *(p.150)*

IR:VOLT:STAR

Sets the start voltage as a percentage for insulation resistance tests. *(p.151)*

IR:VOLT:STAR:STAT

Sets whether to set the start voltage for insulation resistance tests. *(p.151)*

IR:VOLT:SWE:TIM

Sets the voltage rise time for insulation resistance tests. *(p.152)*

IR:VOLT:TIM

Sets the test time for insulation resistance tests. *(p.152)*

IR:VOLT:TIM:STAT

Sets whether to set the test time for insulation resistance tests. *(p.153)*

STATus Command

STAT:OPER?

Queries the event of the OPERation status register. *(p.159)*

STAT:OPER:<bit-item>?

Queries the event of the specified bit in the OPERation status register bits. *(p.159)*

STAT:OPER:COND?

Queries the condition of the OPERation status register. *(p.159)*

STAT:OPER:COND:<bit-item>?

Queries the status of the specified bit in the OPERation status register bits. *(p.160)*

STAT:OPER:ENAB

Sets the enable register of the OPERation status register. *(p.160)*

STAT:OPER:ENAB:<bit-item>

Sets the enable register of the specified bit in the OPERation status register. *(p.160)*

STAT:OPER:NTR

Sets the negative transition filter of the OPERation status register. *(p.161)*

STAT:OPER:NTR:<bit-item>

Sets the negative transition filter of the specified bit in the OPERation status register. *(p.161)*

STAT:OPER:PTR

Sets the positive transition filter of the OPERation status register. *(p.161)*

STAT:OPER:PTR:<bit-item>

Sets the positive transition filter of the specified bit in the OPERation status register. *(p.162)*

STAT:OPER:PROT?

Queries the event of the OPERation:PROTecting status register. *(p.163)*

STAT:OPER:PROT:COND?

Queries the condition of the OPERation:PROTecting status register. *(p.164)*

STAT:OPER:PROT:ENAB

Sets the enable register of the OPERation:PROTecting status register. *(p.164)*

STAT:OPER:PROT:NTR

Sets the negative transition filter of the OPERation:PROTecting status register. *(p.164)*

SYSTem Command

SYST:TIME

Sets the time. *(p.191)*

SYST:TIME:ADJ

Automatically synchronizes the system clock using the NTP server on the network. *(p.191)*

SYST:TZON

Sets the time zone of the system clock. *(p.191)*

SYST:TZON:CAT?

Queries the time zone IDs that can be used. *(p.192)*

SYST:VERS?

Queries the version of the SCPI specifications that the product complies with. *(p.192)*

TRIGger Command

TRIG:ACQ

Executes a software trigger on the ACQ trigger subsystem. *(p.193)*

TRIG:ACQ:COUN

Sets the trigger count of the ACQ trigger subsystem. *(p.193)*

TRIG:ACQ:DEL

Sets the delay time from trigger application of the ACQ trigger subsystem until measured value recording. *(p.194)*

TRIG:ACQ:SOUR

Sets the condition (trigger source) for actually starting the measurement after the ACQ trigger subsystem receives an INIT:ACQ. *(p.194)*

TRIG:TEST

Executes a software trigger on the TEST trigger subsystem. *(p.195)*

TRIG:TEST:SOUR

Sets the condition (trigger source) for actually starting the test after the TEST trigger subsystem receives an INIT:TEST *(p.195)*

Introduction

The TOS9300 Series Communication Interface Manual explains the settings that are used to control the TOS9300 series remotely through the following interfaces and the available commands.

- RS232C interface
- USB interface
- LAN interface

When the product is operating under remote control, REMOTE appears on the front panel display. To switch the product back to local mode from the front panel, press LOCAL.

For the safety precautions, installation, operation, and specifications of the product, read the accompanying TOS93 Series User's Manual.

About This Manual

Intended readers

This manual is written for readers with sufficient basic knowledge of how to control measuring instruments using a PC.

Familiarize yourself with the syntax of the SCPI commands that are used with this product before you use them.

Model configurations

This document describes TOS9300, TOS9301, TOS9311, TOS9302, and TOS9303.

The full lineup of the TOS93 series is as follows.

Model	Supported tests[1]
TOS9300	ACW, IR
TOS9301	ACW, DCW, IR
TOS9311	ACW, DCW, IR
TOS9301PD	ACW, DCW, IR, PD
TOS9302	ACW, EC
TOS9303	ACW, DCW, IR, EC
TOS9303LC	ACW, DCW, IR, EC, LC

1. ACW: AC withstanding voltage, DCW: DC withstanding voltage, IR: insulation resistance, EC: earth continuity, PD: partial discharge, LC: leakage current

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Firmware versions that this manual covers

This manual applies to the products with the firmware of firmware version 2.1X.

Measuring instrument interface standards

This product complies with the following standards.

- IEEE Std 488.2-1992 IEEE Standard Codes, Formats, Protocols, and Common Commands For Use With IEEE Std 488.1-1987
- IEEE Std 488.1-1987 IEEE Standard Digital Interface for Programmable Instrumentation
- Standard Commands for Programmable Instruments (SCPI) version 1999.0
- Universal Serial Bus Specification Rev 2.0
- Universal Serial Bus Test and Measurement Class Specification (USBTMC) Rev 1.0
- Universal Serial Bus Test and Measurement Class, Subclass USB488 Specification (USBTMC-USB488) Rev 1.0
- TCP/IP Instrument Protcol Specification VXI-11 Rev 1.0 1995
- TCP/IP-IEEE488.2 Interface Specification VXI-11.3 Draft 0.3 1995
- 1.5 LXI Device Specification 2016
- LXI HiSLIP Extended Function Rev 1.01
- IVI-6.1 IVI High-Speed LAN Instrument Protocol (HiSLIP) Rev 1.0
- VPP-4.3 The VISA Library 2015 Rev 5.5

Copyright

Setup

Installing a VISA Library

VISA (Virtual Instrument Software Architecture) library was developed by the IVI Foundation. It is the standard specification for measuring instrument connection software.

Need for VISA library

To use the VISA library (VISA COM) with the I/O library, the VISA library must be installed on the controller (Windows).

Installing a VISA library

You have to install one of the following VISA libraries (driver software that is implemented according to the VISA specifications).

- NI-VISA by National Instruments Corporation (Ver. 5.1.1 or later)
- Keysight VISA (Keysight IO Libraries Suite 16.0 or later) by Keysight Technologies
- KI-VISA (Ver. 5.0.4 or later)

NOTE

- Do not install multiple VISA libraries on the same PC. Doing so may cause errors.
- If NI-VISA or Keysight VISA is already installed on your PC, you do not need to install KI-VISA.

Kikusui original KI-VISA that supports version 5.0 of the IVI VISA specification is available. You can also download from the Kikusui Electronics Corporation website (https://global.kikusui.co.jp/downloads/).

Setting Up the Interface

The product is standard equipped with RS232C, USB, and LAN interfaces.
There is no need to switch interfaces. All interfaces can be used simultaneously.

⚠WARNING

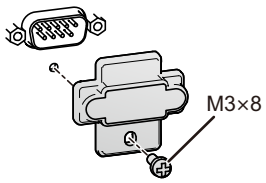
If the remote control via digital communication fails, this product will operate unexpectedly, resulting in electric shock, fire, or property damage to the device under test. When controlling this product from a remote location, take safety measures such as using a communication monitoring (WATCHDOG) timer.

RS232C

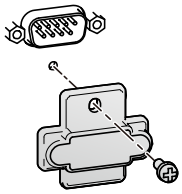
RS232C connection

The RS232C port on this product side is D-sub 9-pin. Check that this product and your PC are off, and then connect them.
When the product is shipped from the factory, a cover is attached to the RS232C port, so remove the cover.
The removed cover can be held as shown below.

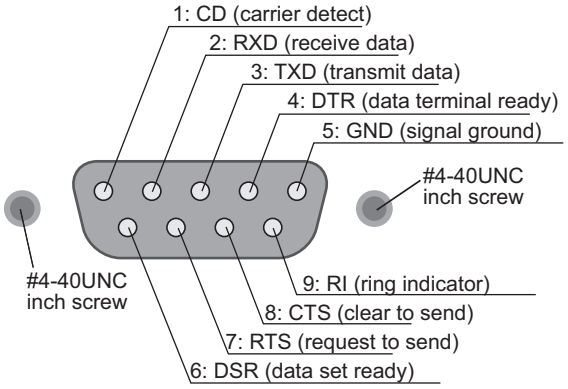
Remove the cover



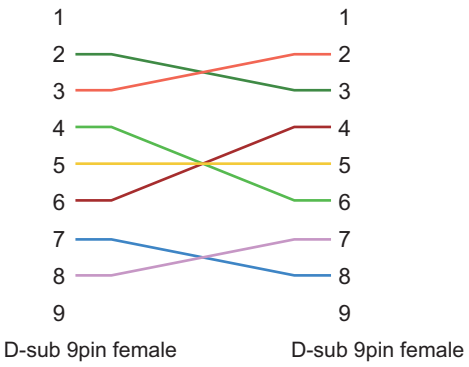
Hold the Cover



For the RS232C cable, use a D-sub, 9-pin, female-to-female crossover cable.
The figure below shows the port pinout.



RS232C pinout (viewed from the product's rear panel)



femaleCrossover cable example

Protocol

The RS232C protocol is shown in the following table.
The underlined value is the factory default value.

Item	Set value
Bitrate: data rate (bps)	9600, 19200, 38400, 57600, 115200
Data Bits: Data length	8 bits (fixed)
Stop Bits	1 bit (fixed)
Parity	None (fixed)
Flow Control	No, CTS-RTS

RS232C settings

For details, see the user's manual.

1. **Press SYSTEM > Interface.**
2. **Press Modify, and use the rotary knob to select the parameter you want to change.**
3. **Press Edit, and then use the numeric keypad or the rotary knob to select the appropriate value.**
   Press ENTER to continue setting other parameters.
4. **Press Apply.**
   A confirmation screen appears.
5. **Press ENTER.**
   To cancel, use the rotary knob to select NO, and then press ENTER.

Break signal

The break signal is used as a substitute for the IEEE488.1 dcl/sdc (Device Clear, Selected Device Clear) message.

USB

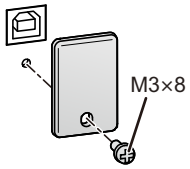
To use the USB interface to control this product, a device driver that supports the USB Test & Measurement class (USBTMC) must be installed on the controller. The USBTMC driver is installed automatically by the VISA library.

USB connection

Connect the TOS93 series to a PC using a USB cable. To prevent the USB cable from coming loose unexpectedly, fix the cable to the product using a cable tie.

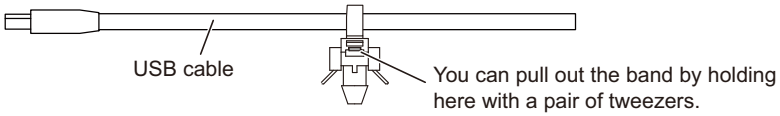
1 **Remove the USB port cover.**

Keep the removed cover while the USB port is in use.

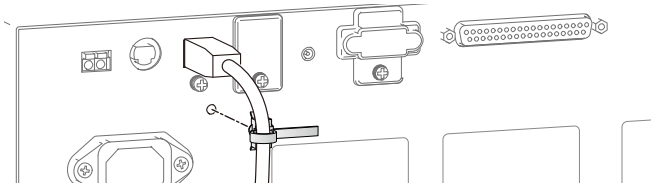


2 **Use the included cable tie to gently tie the cables as shown below.**

The cable tie can be reused. Do not cut the extraneous portion of the tie.



3 **Attach the tip of the cable tie to the product as shown below.**



4 **Firmly tighten the cable tie so that the USB cables do not come loose.**

Service request

The product is equipped with service request and serial polling functions.

USB specifications

Complies with USB specification 2.0
Complies with USBTMC specification 1.0 and USBTMC-USB488 specification 1.0
Baud rate: 480 Mbps maximum (high speed)
VID (vendor ID): 0x0B3E
PID (product ID): 0x104F

LAN

⚠WARNING

Possible damage to the equipment and electric shock. The LAN interface can be accessed from anywhere on the network that the product is connected to. Change the security settings if necessary. The security settings that you can apply are: password protection and IP address access control.

To use the LAN interface to control the product, middleware that supports the SCPI-Telnet, VXI-11, HiSLIP, or SCPI-RAW protocol is required. The middleware is installed automatically by the VISA library.

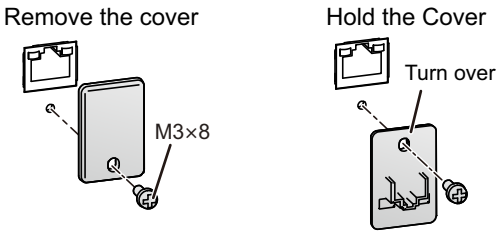
The LAN interface board has a Web browser interface (Web Browser Interface). You can configure the LAN interface settings from your PC's Web browser.

For information on topics such as connecting to your corporate LAN, your IP address, your host name, and security, contact your network administrator.

LAN connection

When the product is shipped from the factory, a cover is attached to the LAN port, so remove the cover.

The removed cover can be held as shown below.



Use a standard LAN cable (category 5 or later and straight) to connect this product to a network hub or router.

LAN settings

Normally, set "IP Address Method" to "Automatic" (factory default setting).

To set the IP address manually, set IP Address Method to Static, and then set the IP address. For details, see the user's manual.

1. **Press SYSTEM > Interface.**
2. **Press Modify, and use the rotary knob to select the parameter you want to change.**
3. **Press Edit, and then use the numeric keypad or the rotary knob to select the appropriate value.**
   Press ENTER to continue setting other parameters.
4. **Press Apply.**
   A confirmation screen appears.
5. **Press ENTER.**
   The LAN interface restarts, and the settings are applied. To cancel, use the rotary knob to select NO, and then press ENTER.

Service request

This product is equipped with service request and serial polling functions.

LAN specifications

Hardware

IEEE 802,3 100Base-TX/10Base-T Ethernet, Auto-MDIX, IPv4, RJ-45 connector
Complies with LXI Class C, Specification 1.5

Communication protocol

VXI-11, HiSLIP, SCPI-RAW, SCPI-Telnet

Program message terminator

VXI-11, HiSLIP: LF or END during reception, LF + END during transmission.
SCPI-RAW: LF during reception, LF during transmission

Restarting the LAN interface

You can use the SYSTEM settings to restart the LAN interface. Even if you restart the LAN interface, the settings that you have specified do not change. This operation does not affect the product's panel settings.

1. **Press SYSTEM > Interface.**
2. **Press Modify.**
3. **Press Apply.**
   A confirmation screen appears.
4. **Press ENTER.**
   The LAN interface restarts.

Resetting or Initializing the LAN interface

You can use the SYSTEM settings to reset or initialize the LAN settings. When reset or initialized, network settings are changed as follows. The items with an ✓ mark are returned to their default values.

Reset	Initialize	Parameter	Default value
✓	✓	IP Address Method	Auto
n/a	✓	DNS Server	0.0.0.0
n/a	✓	WINS Server	0.0.0.0
n/a	✓	Desired Hostname	Model name and serial number
n/a	✓	Desired Description	KIKUSUI XXXX Electrical Safety Analyzer (XXXX is the model name) and serial number
✓	✓	Dynamic DNS	Enable
✓	✓	mDNS	Enable
✓	✓	NetBIOS Over TCP/IP	Enable
✓	✓	Password for the Web browser interface	Not set

Resetting

1. **Press SYSTEM > Interface.**
2. **Press Modify > LAN Reset.**
   A confirmation screen appears.
3. **Press ENTER.**
   The LAN interface settings are reset.

Returning to factory default settings (Initializing)

1. **Press SYSTEM > Interface.**
2. **Press Modify > Default.**
   A confirmation screen appears.
3. **Press ENTER.**
   The LAN interface settings are returned to their factory default settings.

Accessing and Operating the Product from a Web Browser

If you connect a PC to the TOS93 series using the LAN interface, you can control the TOS93 series and acquire the information from the PC's browser.

Applicable browser

Microsoft Edge, Google Chrome, and Safari,

Use the latest version of the browser.

Access the Web browser interface

Enter the URL in the address bar of the browser

The IP address of the TOS93 series followed by http:// is the URL of the Web browser interface. You can check the IP address on the LAN and Network screen (press SYSTEM and then Information).

Example) When the IP address is 169.254.7.8

http://169.254.7.8

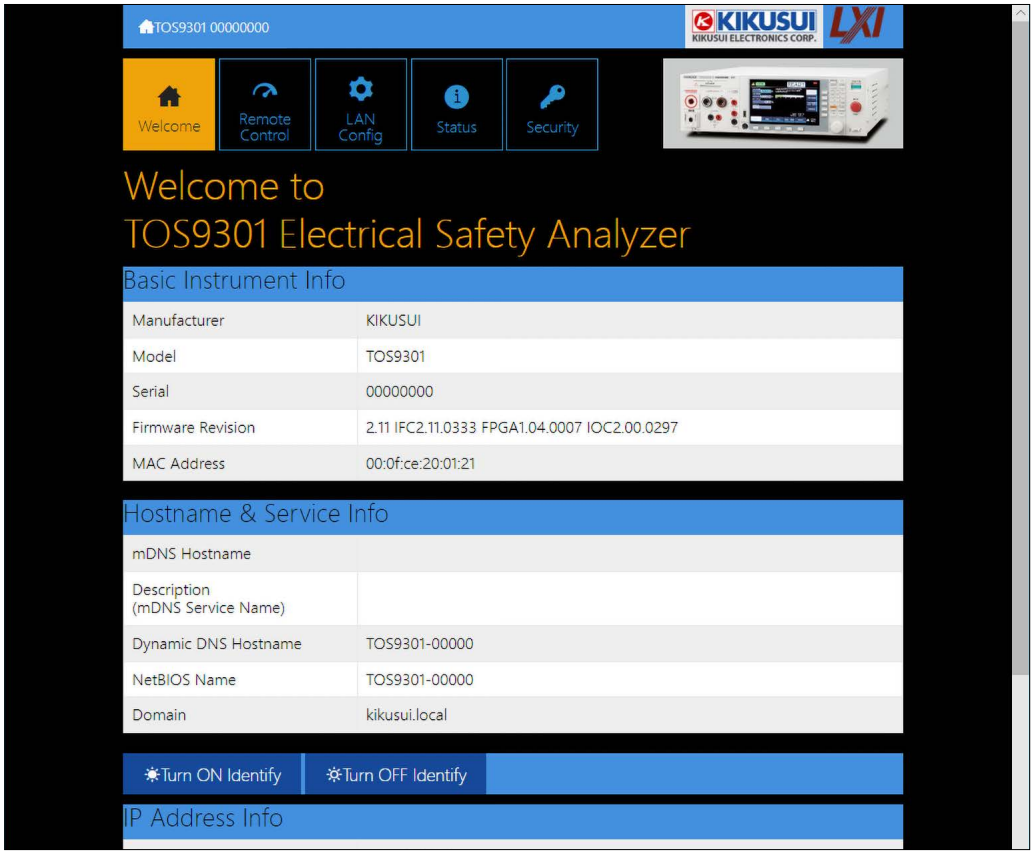
Search by VISA Application

If a VISA library is in use, the Web browser interface will open if you search for VXI-11 measuring instrument with the applications provided by each VISA vendor (National Instruments NI-MAX, Keysight Connection Expert, Kikusui KI-VISA Instrument Explorer, or the like) and click on the web link from the search results.

WELCOME page

When you connect to the Web browser interface, a WELCOME page appears first.

This page shows the measuring instrument information, network information, and VISA resource (I/O resource) information. Click the navigation menu to go to another page.



Turn ON Identify: “LXI Web Identify” appears in the front panel display of the connected TOS93. This allows you to identify the connected TOS93.

Turn OFF Identify: The displayed “LXI Web Identify” disappears.

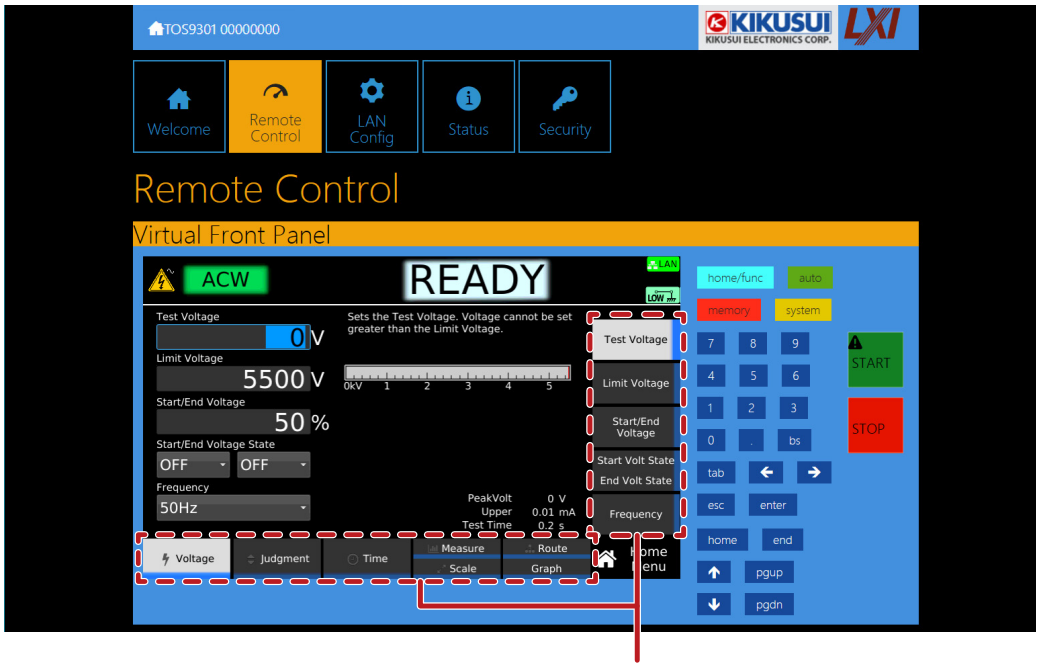
Remote Control page

⚠WARNING

When a problem occurs in the network, the information displayed in the browser may differ from the actual state of the device. As a result, an unexpected dangerous voltage may occur that may cause human death or injury, or physical damage to the DUT and so on Therefore, prior to touching the output terminals and connecting the DUT, be sure to check the status of the equipment.

You can remotely control the TOS93 from a browser. The various buttons have the same functions as those on the front panel of the TOS93.

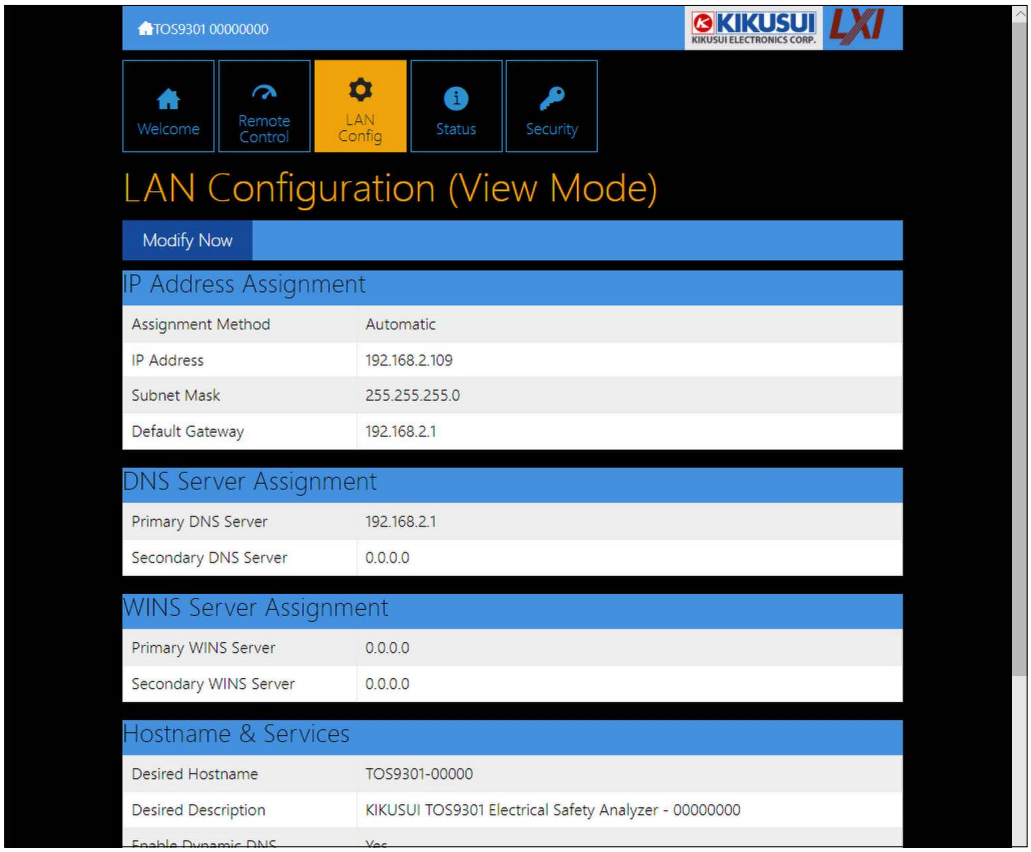
If you control the TOS93 from the Remote Control page, display updating slows down, but this does not affect the actual operation. If you turn off the TOS93 while the Remote Control page is displayed, the settings will not be saved. To save the settings, close the browser, and then turn off the power.



Function area/sub-function area items can be executed by clicking on them.

LAN Configuration page

You can display (View Mode) and change (Modify Mode) the network settings.



Navigation (View Mode)

Modify Now: Changes to the network setting edit screen (Modify Mode).

Navigation (Modify Mode)

Undo: Returns the edited contents to the state before editing.

Apply: Applies the edited contents.

Reset: Resets the network settings.

Default: Returns the network settings to the factory default settings.

Back to View Mode: Changes to the network setting view screen (View Mode).

IP Address Assignment

You can set the IP address. You can choose between automatic assignment and assignment of a fixed address. In the case of automatic assignment of IP address, we recommend using the DHCP server function using a router as far as possible.

If the DHCP server function is not used, it takes about 60 seconds until determination that address assignment with DHCP has failed. Then, an address between 169.254.0.0 to 169.254.255.255 is assigned by link local address (Auto-IP).

DNS Server Assignment

Sets the address of the DNS server.

WINS Server Assignment

Sets the address of the WINS server.s

Hostname & Services

You can set the host name and so on. If you set the host name, you can use it in place of the IP address to access the LAN interface. Normally, we recommend that you select “Enable Dynamic DNS”, “Enable mDNS”, and “Enable NetBIOS Over TCP/IP”.

If you leave the Hostname and Description boxes empty and click “Apply,” the host name will be created from the model name and serial number.

TCP Ports (View Mode)

The number of the TCP port in use is displayed. You cannot change the port number.

Reset and factory default settings

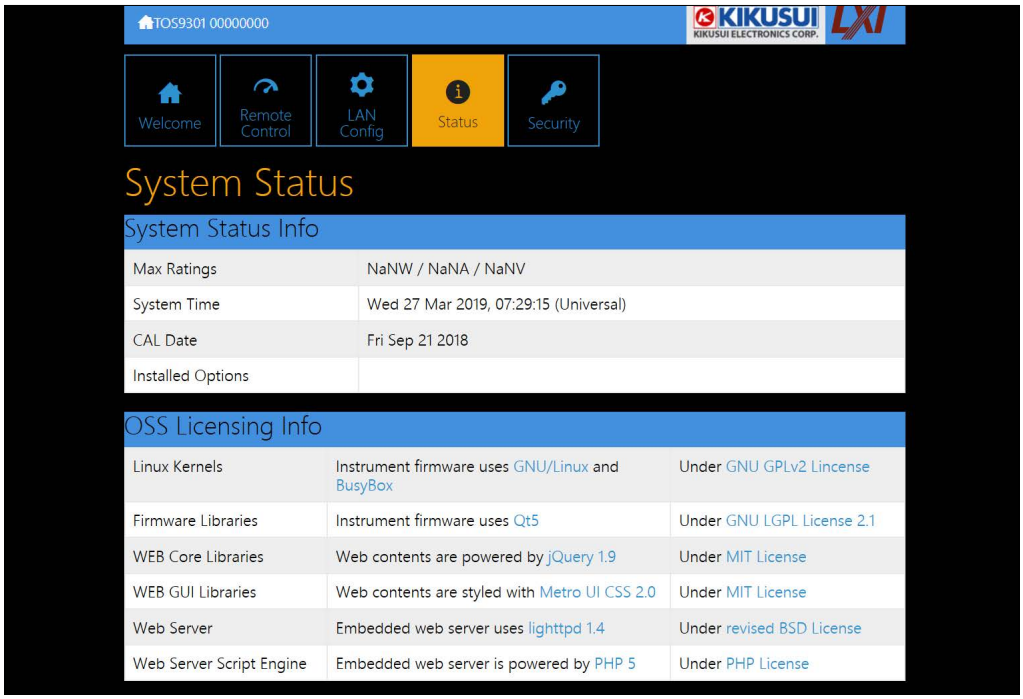
If you click Reset or Default, network settings are changed as follows.

The items with an ✓ mark are returned to their default values.

Reset	Default	Item	Default value
✓	✓	IP Address Assignment	Automatic
✓	✓	DNS Server Assignment	0.0.0.0
✓	✓	WINS Server Assignment	0.0.0.0
n/a	✓	Desired Hostname	Model name and serial number
n/a	✓	Desired Description	KIKUSUI XXXX Electrical Safety Analyzer (XXXX is the model name) and serial number
✓	✓	Enable Dynamic DNS	Yes
✓	✓	Enable mDNS	Yes
✓	✓	Enable NetBIOS Over TCP/IP	Yes

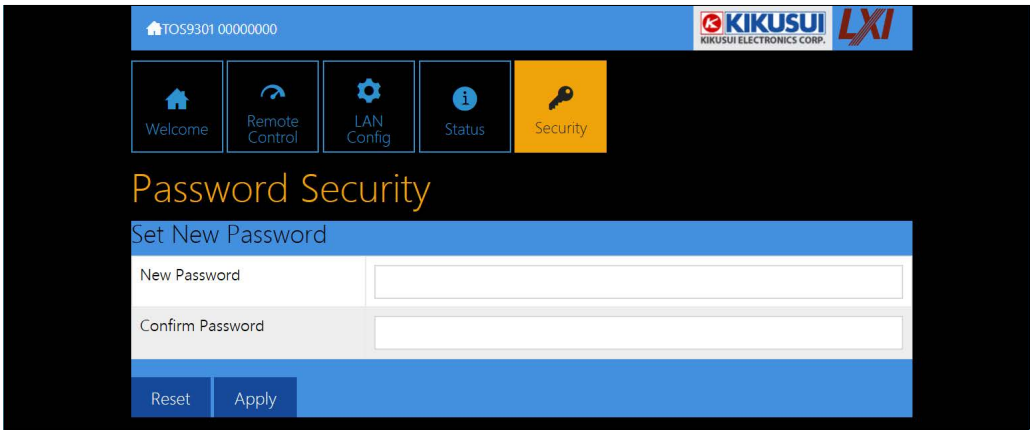
System Status page

This page shows the system information and the license information of the opensource software.



Password Security page

You can set and change the password for the Web browser interface here.



When a password has been set, that password is required in order to use the following functions.

- Remote control from Remote Control page
- Editing of LAN Configuration page
- Changing/deleting the password

Set New Password

Enter the password (4 to 15 characters). You can use alphanumeric characters, hyphens, and underscores for the password.

Changing or deleting the password

After the password has been set, the screen for changing the password appears when you enter the password. To change the password, enter the present password in “Current Password”, enter the new password in “New Password” and “Confirm Password”, and then click “Apply”.

To disable password protection, enter the present password in “Current Password”, leave “New Password” and “Confirm Password” blank, and click “Apply”.

If you forget the password

If you forget the password, reset the LAN interface setting in the SYSTEM settings or initialize the product to its factory default settings.

About Commands

The information that is transferred between the controller (PC) and the device (TOS93 series) is referred to as messages. This product uses the SCPI language for these messages.

The messages that the PC sends to the product are commands. The messages that the product sends to the PC are responses.

Command Hierarchy

SCPI is an ASCII-based command language that was designed for test and measuring equipment. The command structure is composed of the common roots or nodes that are the building blocks of the SCPI subsystem. A command consists of a program header, parameters, and punctuation marks.

The following table uses the SOURce subsystem as an example to explain the hierarchy.

Program header	Parameter	Node level
[:SOUR]		Root node
:DCW		2nd level
:VOLT		3rd level
:STAR	<character>	4th level
:IR		2nd level
:VOLT		3rd level
:RANG	<character>	4th level
:STAR	<character>	4th level

A colon (:) separates a higher node from a lower node.

Command Syntax

NOTE

To use the communication interface, you must enable the remote control by issuing the command: SYST:COMM:RLST REM. To use remote programming, send “SYST:COMM:RLST REM” at the beginning of the program.

In this manual, SCPI commands are expressed in the following format.

```
[SOURce:][ACW:]VOLTage[:LEVel][:IMMediate][:AMPLitude] <numeric>
```

SCPI commands are also available in the short form. In the short form, the lowercase characters in SCPI commands are omitted.

SCPI commands can be sent either in the long form or short form. Because SCPI commands are not case-sensitive, VOLT, Volt, and volt are all acceptable as short form notations. In the long form, VOLTAGE, Voltage, and voltage are all acceptable.

- A space separates a program header and its parameters.
- Multiple parameters are separated by commas.
- Multiple commands are separated by semicolons (compound command).

```
IR:VOLTage:STARt 50PCT;STATe ON
```

In the second command, VOLTage:STARt: is omitted. This is because the first command, VOLTage:STARt:LEVel , specifies the path to VOLTage:STARt.

This compound command is equivalent to entering the following commands.

```
VOLTage:STARt:LEVel 50PCT
VOLTage:STARt:STATe ON
```

If you specify a node that is not defined in the current path, an error will occur.

By using colons and semicolons, you can concatenate commands of different subsystems.

```
SOURce:FUNCtion ACW;:DISPlay:CURRent:PHOLd ON
```

There are two root nodes in this compound command: SOURce and DISPlay.

When the second command or later begins with a colon, the path that was specified by the previous command is cleared. The maximum length of a command that you can transmit on a single line is 512 bytes.

Special symbols

The special symbols that are used in this manual for the SCPI command syntax are explained below.

- Characters and numbers enclosed by { and } and delimited by “|” indicate that one of the delimited items is to be selected.
  Do not include the { and } symbols in the actual program.
- <> denotes program data.
  Do not include the < and > symbols in the actual program.
- [ ] denotes optional data.
  When optional data is not sent with the program, the default value is applied. Do not include the [and] symbols in the actual program.

Query

You can query the device settings and status.

To make a query, append a question mark to the end of the program header section. If the query has parameters, insert a space after the question mark, and then write the parameters.

```
VOLTage? MIN
```

Response

This is the response to a query. It is a message always sent from the device to the PC. It conveys device status or measured value to the PC.

NOTE

If you want to send two queries on separate lines, send the second query after you have received the response to the first one.

Program terminator

All commands must be terminated with a valid terminator.

The terminator for receiving and sending is LF (line feed, ASCII 0x0A) or EOI (end of identify, only for USB). When you terminate a command string, the path is reset to the root level.

NOTE

CR (ASCII 0x0D) is not a terminator.

Common commands

There are commands that are common to the IEEE-488.2 and SCPI standards for functions such as resetting devices and performing self-diagnoses. These common commands start with an asterisk (“*”). These commands may have one or multiple parameters.

Parameter

The SCPI parameter format is derived from the program parameter format that is defined in IEEE 488.2.

The program data expression format that the this product uses is shown below.

Non-numeric parameters

String data (String)

String data is used when a series of ASCII characters (20H to 7EH) are requested.

Enclose strings in single (‘’) or double quotation (“”) marks. The opening and closing quotation marks must match (you cannot mix single and double quotation marks).

```
PROGram:CREate "/BASIC/My test program"
```

If you want to include a quotation mark as part of the string, enter consecutive quotation marks (with no characters between them).

Character data (Character)

Character data is used when only a limited number of values are available for a program setting. Responses are returned in short form.

```
TRIGger:TEST:SOURce {IMMediate|BUS|EXTernal|ONCE}
```

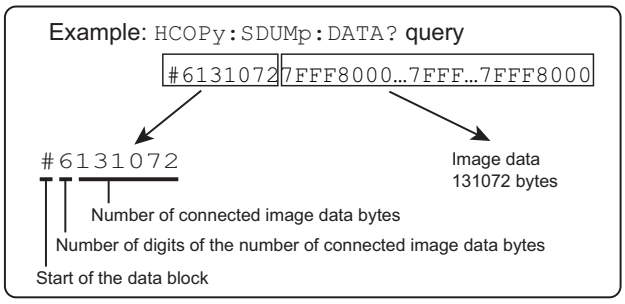
Boolean data (Boolean)

Boolean data is used to express a condition of 1 or 0, or ON or OFF. Responses are returned as 1 or 0.

```
SYSTem:BEEPer {ON|OFF|1|0}
```

Block data (block)

Arbitrary block data that starts with #.



Numeric parameters

NR1

Represents an integer value.

Details are given in the “IEEE 488.2 Standard Digital Interface for Programmable Instrumentation.” If a 0 is returned in the response data, it is returned as +0.

NR2

Represents a real number in floating-point format.

Details are given in the “IEEE 488.2 Standard Digital Interface for Programmable Instrumentation.”

NR3

Represents a real number in scientific notation.

Details are given in the “IEEE 488.2 Standard Digital Interface for Programmable Instrumentation.” If 380 is returned in the response data, it is returned as +3.80000E+02. Five decimal places are used.

If the value is invalid or the measurement has failed, it is returned as +9.91000E+37.

In the event of +OVER, it is returned as +9.90000E+37.

In the event of -OVER, it is returned as -9.90000E+37.

NRf

NRf is a generic term that includes NR1, NR2, and NR3.

If a value outside the setting range is specified, an error (-222, “Data out of range”) will occur.

Numeric

Numeric parameter for values such as the decimal point, optional prefixes, and measurement units.

Numbers are expressed the same as NRf. MINimum, MAXimum, and the like are available as substitutes for declaring certain values.

You can also use units such as V, A, and W in numeric parameters.

If a value outside the setting range is specified, an error (-222, “Data out of range”) will occur.

Special form numeric parameters

The special form numeric parameters MINimum and MAXimum can be used as substitutes for the actual maximum and minimum values when the parameter is numeric.

In the following example, the test voltage of the ACW test is set to the minimum value.

```
ACW:VOLTage MINimum
```

You can query the minimum and maximum values for most parameters.

```
ACW:VOLTage? MAX
ACW:VOLTage? MIN
```

Measurement units

The default measurement units are listed below. Commands are accepted even if measurement units are not specified.

V (voltage)	A (current)	HR (hours)	MIN (minutes)
S (seconds)	HZ (frequency)	OHM (resistance)	

The following optional prefixes are supported. If you use optional prefixes, specify the measurement unit.

G (giga)	MA (mega)	M (milli, mega)
K (kilo)	P(pico)	U (micro)

NOTE

- The unit symbols in the International System of Units contain lowercase characters. The IEEE standard uses uppercase characters. SCPI commands are not case sensitive.
- Commands are accepted whether or not measurement units are specified.
- The optional prefix “M” is interpreted as “mega” when the measurement unit is ”HZ” or “OHM.” For other measurement units, it is interpreted as “milli.”
- To enter “μ” in the data, use “U” instead.

IEEE 488.2 Common Commands

Applicable commonly to the units conforming to IEEE488.2.

*CLS

Clears all event registers including the status byte, event status, and error queue.
Clears the operations waiting for being completed by *OPC or *OPC?.

Command

```
*CLS
```

*ESE

Sets the event status enable register that is counted by the event summary bit (ESB) of the status byte.

Command

```
*ESE <NRf>
*ESE?
```

Parameter

Set value: 0 to 255

Example: When *ESE 16 is transmitted, bit 4 of the event status enable register is set. Each time the execution error bit (bit 4) of the event status register is set, the summary bit (ESB) of the status byte is set.

Response

NR1

*ESR?

Queries the event status register.
The event status register is cleared when read.

Command

```
*ESR?
```

Response

NR1

*IDN?

Queries the model name and firmware version of the TOS93 series.

Command

```
*IDN?
```

Response example

For a TOS9301 with serial number AB123400 and version 1.17 IFC1.07.0133, FPGA1.04.0007, IOC1.07.0105

```
KIKUSUI,TOS9301,AB123400,1.17 IFC1.07.0133 FPGA1.04.0007 IOC1.07.0105
```

*OPC

Sets the OPC bit (bit 0) of the event status register when all the commands that are in standby have been processed. See IEEE 488.2-1992 section 12.5.3.

Command

```
*OPC
*OPC?
```

Response

Returns “1” when the processing of all commands in standby is complete.

*OPT?

Queries the options that are installed in the product.

Command

```
*OPT?
```

Response

Returns the installed options in comma-separated string format. Returns “0” if no options are installed.

*PSC

Sets whether the event status enable register and service request enable register are cleared when the POWER switch is turned on.

Command

```
*PSC <boolean>
*PSC?
```

Parameter

Set value:	ON(1)	When the POWER switch is turned on, the *ESE and *SRE settings are cleared.
	OFF(0)	When the POWER switch is turned on, the *ESE and *SRE settings are not cleared.

Response

boolean

Setting example

To enable the power-on SRQ function:

```
*PSC 0;*SRE 32;*ESE 128
```

*RCL

Recalls memory content. Clears alarms. Aborts the trigger subsystem operation.

For the commands affected, see "List of Parameters Applicable to *RCL, *RST, and *SAV and Each Setting Command" (*p.47*).

Command

```
*RCL <NRf>
```

Parameter

Set value: 0 to 50 memory number

Example

```
*RCL 1
```

*RST

Resets the panel settings (see the table below).

Clears alarms (if they cannot be cleared, alarms continue). Aborts the trigger subsystem operation. Clears the OPC bit (bit 0) of the status event register.

For the commands affected, see "List of Parameters Applicable to *RCL, *RST, and *SAV and Each Setting Command" (*p.47*).

Command

```
*RST
```

*SAV

Saves the panel settings to the setup memory.
For the commands affected, see "List of Parameters Applicable to *RCL, *RST, and *SAV and Each Setting Command" (p.47) .

Command

```
*SAV <NRf>
```

Parameter

Set value: 0 to 50 memory number

Example

```
*SAV 1
```

*SRE

Sets the service request enable register.
The service request enable register can be used to select which summary messages in the status byte register will perform service requests.
To clear the service request enable register, send *SRE 0. If the register is cleared, service requests cannot be generated using status information.

Command

```
*SRE <NRf>
*SRE?
```

Parameter

Set value: 0 to 255
Example: Sending *SRE 8 sets bit 3 of the service request enable register. Each time the summary bit (bit 3) of the QUEStionable status register in the status byte is set, a service request message is generated.

Response

```
NR1
```

*STB?

Queries the contents of the status byte register and the MSS (master summary status)message.
The response is the same as serial polling only with the exception that the MSS message appears in place of the RQS message in bit 6.

Command

```
*STB?
```

Response

NR1

*TRG

Executes trigger on the TEST trigger group.
This is a substitute command for IEEE 488.1 get (Group Execute Trigger). If the device is in a state in which it does not accept triggers, an SCPI error (-211, “Trigger ignored”) occurs. See IEEE 488.2-1992 section 10.37.

Command

```
*TRG
```

*TST?

Executes a self-test.
You can check which error occurred with SYST:ERR? command. See IEEE 488.2-1992 section 10.38.

Command

```
*TST?
```

Response

If there is no problem, returns 0 in response to *TST?. Returns an error code if there is a problem.

*WAI

Prevents the TOS93 series from executing subsequent commands until all operations that are in standby have completed.

Command

```
*WAI
```

List of Parameters Applicable to *RCL, *RST, and *SAV and Each Setting Command

Command	Factory default settings
ACW:VOLT	0V
ACW:VOLT:END:STAT	OFF
ACW:VOLT:FREQ	50HZ
ACW:VOLT:PROT	5500V
ACW:VOLT:STAR	50PCT
ACW:VOLT:STAR:STAT	OFF
ACW:VOLT:SWE:FALL:TIM	0.1S
ACW:VOLT:SWE:FALL:TIM:STAT	OFF
ACW:VOLT:SWE:TIM	0.1S
ACW:VOLT:TIM	0.2S
ACW:VOLT:TIM:STAT	ON
CALC:ACW:SCAL	OFF
CALC:ACW:SCAL:OFFS	0A
CALC:ACW:SCAL:OFFS:IMAG	0A
CALC:DCW:SCAL	OFF
CALC:DCW:SCAL:OFFS	0A
CALC:EC:DC:SCAL	OFF
CALC:EC:DC:SCAL:OFFS	0OHM
CALC:EC:DC:SCAL	OFF
CALC:EC:SCAL:OFFS	0OHM
CALC:IR:SCAL	OFF
CALC:IR:SCAL:OFFS	100MOHM
CALC:SCAL:OFFS:AUTO	OFF
DATA:BSIZ	1024
DATA:FORM	CURR,CRE,CIM,VOLT,RES,ETIM
DCW:VOLT	0V
DCW:VOLT:DISC:INT:STAT	ON
DCW:VOLT:DISC:TIM	0S
DCW:VOLT:END:STAT	OFF
DCW:VOLT:PROT	7500V
DCW:VOLT:STAR	50PCT
DCW:VOLT:STAR:STAT	OFF
DCW:VOLT:SWE:FALL:TIM	0.1S
DCW:VOLT:SWE:FALL:TIM:STAT	OFF
DCW:VOLT:SWE:TIM	0.1S
DCW:VOLT:TIM	0.2S
DCW:VOLT:TIM:STAT	ON

Command	Factory default settings
DISP:ACW:CURR:PHOL	OFF
DISP:ACW:VIEW	NUM
DISP:DCW:CURR:PHOL	OFF
DISP:DCW:VIEW	NUM
DISP:EC:RES:PHOL	OFF
DISP:EC:DC:RES:PHOL	OFF
DISP:IR:RES:PHOL	OFF
DISP:IR:VIEW	NUM
EC:AC:CURR	3A
EC:AC:CURR:PROT	42A
EC:AC:CURR:SWE:FALL:TIM	0.1S
EC:AC:CURR:SWE:FALL:TIM:STAT	OFF
EC:AC:CURR:SWE:TIM	0.1S
EC:AC:CURR:TIM	0.2S
EC:AC:CURR:TIM:STAT	ON
EC:DC:CURR	3A
EC:DC:CURR:PROT	42A
EC:DC:CURR:SWE:FALL:TIM	0.1S
EC:DC:CURR:SWE:FALL:TIM:STAT	OFF
EC:DC:CURR:SWE:TIM	0.1S
EC:DC:CURR:TIM	0.2S
EC:DC:CURR:TIM:STAT	ON
FUNC	ACW
GRAP:ACW:MARK	ON
GRAP:ACW:SCAL	AUTO
GRAP:DCW:MARK	ON
GRAP:DCW:SCAL	AUTO
GRAP:IR:FORM	VRT
GRAP:IR:MARK	ON
GRAP:IR:SCAL	AUTO
IR:VOLT	0V
IR:VOLT:DISC:INT:STAT	ON
IR:VOLT:DISC:TIM	0S
IR:VOLT:PROT	1020V
IR:VOLT:RANG	1000V
IR:VOLT:STAR	50PCT
IR:VOLT:STAR:STAT	OFF
IR:VOLT:SWE:TIM	0.1S
IR:VOLT:TIM	0.2S
IR:VOLT:TIM:STAT	ON
PROG	“” (No selection)

Command	Factory default settings
RES:TZON	UTC
ROUT:ACW:TERM	OPEN
ROUT:ACW:TERM:CCH	OFF
ROUT:DCW:TERM	OPEN
ROUT:DCW:TERM:CCH	OFF
ROUT:IR:TERM	OPEN
ROUT:IR:TERM:CCH	OFF
SAMP:COUN	INF
SAMP:TEST:ENAB	ON
SAMP:TIM	0
SENS:ACW:CURR:FILT:HPAS	SLOW
SENS:ACW:CURR:FILT:LPAS	SLOW
SENS:ACW:CURR:FILT:TYPE	LOW
SENS:ACW:CURR:MODE	RMS
SENS:ACW:JUDG	0.01MA
SENS:ACW:JUDG:LOW	0A
SENS:ACW:JUDG:LOW:STAT	OFF
SENS:ACW:TERM:GRO	LOW
SENS:ACW:VOLT:MODE	RMS
SENS:DCW:CURR:FILT:HPAS	SLOW
SENS:DCW:CURR:FILT:LPAS	SLOW
SENS:DCW:CURR:FILT:TYPE	LOW
SENS:DCW:JUDG	0.01MA
SENS:DCW:JUDG:DEL	0.1S
SENS:DCW:JUDG:DEL:AUTO	OFF
SENS:DCW:JUDG:LOW	0A
SENS:DCW:JUDG:LOW:STAT	OFF
SENS:DCW:TERM:GRO	LOW
SENS:DCW:VOLT:MODE	AVER
SENS:EC:DC:JUDG	0.0001OHM
SENS:EC:DC:JUDG:LOW	0OHM
SENS:EC:DC:JUDG:LOW:STAT	OFF
SENS:EC:DC:JUDG:STAT	ON
SENS:EC:DC:JUDG:TYPE	RES
SENS:EC:DC:JUDG:VOLT	2.5V
SENS:EC:DC:JUDG:VOLT:LOW	0V
SENS:EC:DC:JUDG:VOLT:LOW:STAT	OFF
SENS:EC:DC:JUDG:VOLT:STAT	ON
SENS:EC:DC:TERM:CCH	OFF
SENS:EC:DC:TERM:WIRE	4
SENS:EC:JUDG	0.0001OHM

Command	Factory default settings
SENS:EC:JUDG:LOW	0OHM
SENS:EC:JUDG:LOW:STAT	OFF
SENS:EC:JUDG:STAT	ON
SENS:EC:JUDG:TYPE	RES
SENS:EC:JUDG:VOLT	2.5V
SENS:EC:JUDG:VOLT:LOW	0V
SENS:EC:JUDG:VOLT:LOW:STAT	OFF
SENS:EC:JUDG:VOLT:STAT	ON
SENS:EC:TERM:CCH	OFF
SENS:EC:TERM:WIRE	4
SENS:IR:CURR:FILT:LPAS:STAT	OFF
SENS:IR:JUDG	100MOHM
SENS:IR:JUDG:CURR	0.0001MA
SENS:IR:JUDG:CURR:LOW	0A
SENS:IR:JUDG:CURR:LOW:STAT	OFF
SENS:IR:JUDG:CURR:STAT	ON
SENS:IR:JUDG:DEL	0.1S
SENS:IR:JUDG:DEL:AUTO	OFF
SENS:IR:JUDG:LOW	1MOHM
SENS:IR:JUDG:LOW:STAT	ON
SENS:IR:JUDG:STAT	OFF
SENS:IR:JUDG:TYPE	RES
SENS:IR:TERM:GRO	LOW
TRIG:ACQ:COUN	1
TRIG:ACQ:DEL	0
TRIG:ACQ:SOUR	TST
TRIG:TEST:SOUR	IMM

ABORt Command

Aborts the ongoing measurement operation and test operation.
TOS93 series has two trigger subsystems (ACQuire, TEST).
ACQuire is a measurement trigger subsystem.
TEST is a test trigger subsystem.

ABOR

Aborts measurements, tests, and other operations in all trigger subsystems (ACQuire, TEST).
The product's trigger state immediately after it turns on is the same as its trigger state after it receives an ABOR command. If you send an ABOR command without initiating, the measured data is not discarded. You cannot specify a trigger subsystem with the ABOR command. It is always interpreted as ALL.

Command

```
ABORt[:ALL]
```

ABOR:ACQ

Aborts measurement operations.
If you send an ABOR command without initiating, the measured data is not discarded.

Command

```
ABORt:ACQuire
```

ABOR:TEST

Stops the ongoing test. Clears the protection/ fail mode.
If you send an ABOR command without initiating, the test data is not discarded.

Command

```
ABORt:TEST
```

CALCulate Command

The command relates to the offset of the measured value.

CALC:SCAL:OFFS:AUTO

Sets whether to automatically set the offset before testing.
If the setting is set to ON (automatically), the this setting turns OFF when a test is performed.
Valid test mode: ACW, DCW, IR, ECAC, ECDC

Command

```
CALCulate:SCALe:OFFSet:AUTO[:MEASure] <boolean>
CALCulate:SCALe:OFFSet:AUTO[:MEASure]?
```

Parameter

Set value:	ON(1)	Offset is applied.
	OFF(0)	Offset is not applied. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
CALC:SCAL:OFFS:AUTO ON
```

CALCulate:ACW Command

The command relates to the offset of the value measured on the AC withstanding voltage tests.

The ACW in the second node can be omitted, but to distinguish it from the DC withstanding voltage test, we recommend that you do not.

The offset current is converted into resistance and sent to the TOS93 series. The TOS93 series calculates the current from the resistance and voltage and displays the result on the panel. Since the resistance resolution is 100 Ω , an error may occur between the offset current setting and panel reading.

CALC:ACW:SCAL

Sets whether to offset the current running through the stray capacitance in AC withstanding voltage tests.

Set the real part of the current with CALC:ACW:SCAL:OFFS.

Set the imaginary part of the current with CALC:ACW:SCAL:OFFS:IMAG.

Command

```
CALCulate[:ACW]:SCALe[:STATe] <boolean>
CALCulate[:ACW]:SCALe[:STATe]?
```

Parameter

Set value:	ON(1)	Offset is applied.
	OFF(0)	Offset is not applied. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
CALC:ACW:SCAL ON
```

CALC:ACW:SCAL:OFFS

Sets the real part of the offset current in AC withstanding voltage tests.
This is valid when CALC:ACW:SCAL ON.

Command

```
CALCulate[:ACW][:CURRent]:SCALe:OFFSet[:REAL] <numeric>
CALCulate[:ACW][:CURRent]:SCALe:OFFSet[:REAL]?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (0 A)

Response

NR3

Example

```
CALC:ACW:SCAL:OFFS 123MA
```

CALC:ACW:SCAL:OFFS:IMAG

Sets the imaginary part of the offset current in AC withstanding voltage tests.
This is valid when CALC:ACW:SCAL ON.

Command

```
CALCulate[:ACW][:CURRent]:SCALe:OFFSet:IMAGinary <numeric>
CALCulate[:ACW][:CURRent]:SCALe:OFFSet:IMAGinary?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (0 A)

Response

NR3

Example

```
CALC:ACW:SCAL:OFFS:IMAG 123UA
```

CALCulate:DCW Command

The command relates to the offset of the value measured on the DC withstanding voltage tests.
The offset current is converted into resistance and sent to the TOS93 series. The TOS93 series calculates the current from the resistance and voltage and displays the result on the panel. Since the resistance resolution is 100 Ω , an error may occur between the offset current setting and panel reading.

CALC:DCW:SCAL

Sets whether to offset the current running through the stray capacitance in DC withstanding voltage tests.
Set the current with CALC:DCW:SCAL:OFFS.

Command

```
CALCulate:DCW:SCALe[:STATe] <boolean>
CALCulate:DCW:SCALe[:STATe]?
```

Parameter

Set value:	ON(1)	Offset is applied.
	OFF(0)	Offset is not applied. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
CALC:DCW:SCAL 1
```

CALC:DCW:SCAL:OFFS

Sets the offset current for DC withstanding voltage tests.
This is valid when CALC:DCW:SCAL ON.

Command

```
CALCulate:DCW[:CURRent]:SCALe:OFFSet[:REAL] <numeric>
CALCulate:DCW[:CURRent]:SCALe:OFFSet[:REAL]?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (0 A)

Response

NR3

Example

```
CALC:DCW:SCAL:OFFS 123MA
```

CALCulate:EC Command

The command relates to the offset of the value measured on the earth continuity tests.

CALC:EC:DC:SCAL

Sets whether to offset the voltage drop caused by the contact resistance in earth continuity tests (DC).
Set the voltage with CALC:EC:DC:SCAL:OFFS.

Command

```
CALCulate:EC:DC:SCALe[:STATe] <boolean>
CALCulate:EC:DC:SCALe[:STATe]?
```

Parameter

Set value:	ON(1)	Offset is applied.
	OFF(0)	Offset is not applied. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
CALC:EC:DC:SCAL ON
```

CALC:EC:DC:SCAL:OFFS

Sets the offset resistance for earth continuity tests (DC).
This is valid when CALC:EC:DC:SCAL ON.

Command

```
CALCulate:EC:DC[:RESistance]:SCALe:OFFSet[:REAL] <numeric>
CALCulate:EC:DC[:RESistance]:SCALe:OFFSet[:REAL]?
```

Parameter

Unit: OHM

Settings are reset to default when the *RST command is sent. (0 OHM)

Response

NR3

Example

```
CALC:EC:DC:SCAL:OFFS 5OHM
```

CALC:EC:SCAL

Sets whether to offset the voltage drop caused by the contact resistance in earth continuity tests (AC).
Set the voltage with CALC:EC:SCAL:OFFS.

Command

```
CALCulate:EC[:AC]:SCALe[:STATe] <boolean>
CALCulate:EC[:AC]:SCALe[:STATe]?
```

Parameter

Set value:	ON(1)	Offset is applied.
	OFF(0)	Offset is not applied. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
CALC:EC:SCAL ON
```

CALC:EC:SCAL:OFFS

Sets the offset resistance for earth continuity tests (AC).
This is valid when CALC:EC:SCAL ON.

Command

```
CALCulate:EC[:AC][:RESistance]:SCALe:OFFSet[:REAL] <numeric>
CALCulate:EC[:AC][:RESistance]:SCALe:OFFSet[:REAL]?
```

Parameter

Unit: OHM

Settings are reset to default when the *RST command is sent. (0 OHM)

Response

NR3

Example

```
CALC:EC:SCAL:OFFS 5OHM
```

CALCulate:IR Command

The command relates to the offset of the value measured on the insulation resistance tests.

CALC:IR:SCAL

Sets whether to offset the resistance applied to the stray capacitance in insulation resistance tests.
Set the resistance with CALC:IR:SCAL:OFFS.

Command

```
CALCulate:IR:SCALe[:STATe] <boolean>
CALCulate:IR:SCALe[:STATe]?
```

Parameter

Set value:	ON(1)	Offset is applied.
	OFF(0)	Offset is not applied. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
CALC:IR:SCAL 1
```

CALC:IR:SCAL:OFFS

Sets the offset resistance for insulation resistance tests.
This is valid when CALC:IR:SCAL ON.

Command

```
CALCulate:IR[:RESistance]:SCALe:OFFSet[:REAL] <numeric>
CALCulate:IR[:RESistance]:SCALe:OFFSet[:REAL]?
```

Parameter

Unit: OHM

Settings are reset to default when the *RST command is sent. (100 MOHM)

Response

NR3

Example

```
CALC:IR:SCAL:OFFS 10KOHM
```

CALibrate Command

Relates to calibration.

CAL:DATE

Sets the calibration date.

This command can be executed when password protection (SYST:PASS) is set. Queries can be executed regardless of the SYST:PASS setting.

Command

```
CALibrate:DATE <year_NR1>,<month_NR1>,<day_NR1>
CALibrate:DATE?
```

Parameter <year_NR1>

Set value: 2016 to 2037 Year

Parameter <month_NR1>

Set value: 1 to 12 Month

Parameter <day_NR1>

Set value: 1 to 31 Day

Response

Returns the year, month, and day in a comma-separated NR1 format.

Example

```
CAL:DATE 2025,4,14
```

DATA Command

Relates to measurement values.
The measurement conditions to be stored on the data logger depend upon the TRIG:ACQ and SAMP subsystems.
Graphs are drawn using measurement data stored on the data logger.

DATA:BSIZ

Sets the buffer size (maximum number of measurement data recordings) of thedata logger.
If the buffer overflows during continuous measurement recording, data is deleted with the oldest entry. When you set the buffer size, recorded data is cleared.

Command

```
DATA:BSIZe <NRf>
DATA:BSIZe?
```

Parameter

Set value: 1024, 2048, 4096, 8192

Settings are reset to default when the *RST command is sent. (1024)

Response

NR1

Example

```
DATA:BSIZ 4096
```

DATA:FORM

Sets the response format to use when measurement data is queried.
The response format is used for DATA:REM? or FETC?/READ?/MEAS?. The same parameter cannot be specified twice.

Command

```
DATA:FORMat <character>[,<character>[,<character>...]]
DATA:FORMat?
```

Parameter

Value	Description	Response unit	Response-enabled tests[1]
VOLTage	Voltage	V	All
CURRent	Current	A	ACW, DCW, IR, EC
ETIMe	Elapsed test time[2]	S	All
MTIMe	Measurement time	S	All
CREal	Real current	A	ACW, DCW, IR, EC
CIMaginary	Imaginary current	A	ACW
RESistance	Resistance	OHM	DCW, IR, EC
VARiant	Imaginary current	A	ACW
	Resistance	OHM	DCW, IR, EC

1. ACW: AC withstanding voltage, DCW: DC withstanding voltage, IR: insulation resistance, EC: earth continuity
2. When the test status (RISE, TEST, FALL) changes, the elapsed time returns to 0 seconds.

Settings are reset to default when the *RST command is sent. (CURR,CRE,CIM,VOLT,RES,ETIM)

Response

```
character,character,…
```

Example: When voltage and current are set CURR,VOLT is returned.

Example

```
DATA:FORM CURR,VOLT,ETIM
```

DATA:POIN?

Queries the number of measurements recorded in the data logger.

Command

```
DATA:POINt?
```

Response

```
NR1
```

DATA:REM?

Queries the measurement data recorded in the data logger.
Data that is queried is cleared. The number of data points that can be referenced at once varies depending on the number of items specified by DATA:FORM.

Number of items specified by DATA:FORM	Number of data points that can be queried
8	512
7	640
6	768
5	896
4	1152
3	1536
2	2304
1	4608

Command

```
DATA:REMove? [<NRf>]
```

Response

NR3,NR3,...	Describes from the older data. The number of data points that is returned is the number of items specified by DATA:FORM × the number of data points specified by DATA:REM? <NRf>.If the specified value is large, or if it exceeds the data points that can be queried or the number of points of the actual valid measurement data, only the data with smaller number of points shall be returned.
EMPT	No measurement data exists in the data logger. Measurement is in progress.
IDLE	No measurement data exists in the data logger. The end of measurement.

Example

```
DATA:REM? 512
```

DATA:REM:ALL

Deletes all the measurement data recorded in the data logger.

Command

```
DATA:REMove:ALL
```

DISPlay Command

Relates to display settings.

DISP:ACW:CURR:PHOL

Displays the maximum current measurement from the start of the test in AC withstanding voltage tests.
The ACW in the second node can be omitted, but to distinguish it from the DC withstanding voltage test, we recommend that you do not.

Command

```
DISPlay[:ACW]:CURRent:PHOLd <boolean>
DISPlay[:ACW]:CURRent:PHOLd?
```

Parameter

Set value:	ON(1)	The maximum current measurement is displayed.
	OFF(0)	The maximum current measurement is not displayed. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DISP:ACW:CURR:PHOL ON
```

DISP:ACW:VIEW

Selects the measurement screen to be displayed in the display area during the AC withstanding voltage test from the numerical value and graph.
The ACW in the second node can be omitted, but to distinguish it from the DC withstanding voltage test, we recommend that you do not.

Command

```
DISPlay[:ACW]:VIEW <character>
DISPlay[:ACW]:VIEW?
```

Parameter

Set value:	NUMeric	Displays the measurement screen of the numerical value during the test. (default)
	GRAPh	Displays the measurement screen of the graph during the test.

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DISP:ACW:VIEW GRAP
```

DISP:DCW:CURR:PHOL

Displays the maximum current measurement from the start of the test in DC withstanding voltage tests.

Command

```
DISPlay:DCW:CURRent:PHOLd <boolean>
DISPlay:DCW:CURRent:PHOLd?
```

Parameter

Set value:	ON(1)	The maximum current measurement is displayed.
	OFF(0)	The maximum current measurement is not displayed. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DISP:DCW:CURR:PHOL ON
```

DISP:DCW:VIEW

Selects the measurement screen to be displayed in the display area during the DC withstanding voltage test from the numerical value and graph.

Command

```
DISPlay:DCW:VIEW <character>
DISPlay:DCW:VIEW?
```

Parameter

Set value:	NUMeric	Displays the measurement screen of the numerical value during the test. (default)
	GRAPh	Displays the measurement screen of the graph during the test.

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DISP:DCW:VIEW GRAP
```

DISP:EC:RES:PHOL

Sets enabled/disabled of the display of the minimum resistance value from the start of an earth continuity (AC) test.

Command

```
DISPlay:EC[:AC]:RESistance:PHOLd <boolean>
DISPlay:EC[:AC]:RESistance:PHOLd?
```

Parameter

Set value:	ON(1)	The minimum current measurement is displayed.
	OFF(0)	The minimum current measurement is not displayed. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DISP:EC:RES:PHOL ON
```

DISP:EC:DC:RES:PHOL

Sets enabled/disabled of the display of the minimum resistance value from the start of an earth continuity (DC) test.

Command

```
DISPlay:EC:DC:RESistance:PHOLd <boolean>
DISPlay:EC:DC:RESistance:PHOLd?
```

Parameter

Set value:	ON(1)	The minimum current measurement is displayed.
	OFF(0)	The minimum current measurement is not displayed. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DISP:EC:DC:RES:PHOL ON
```

DISP:IR:RES:PHOL

Displays the minimum resistance measurement from the start of the test in insulation resistance tests.

Command

```
DISPlay:IR:RESistance:PHOLd <boolean>
DISPlay:IR:RESistance:PHOLd?
```

Parameter

Set value:	ON(1)	The minimum current measurement is displayed.
	OFF(0)	The minimum current measurement is not displayed. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DISP:IR:RES:PHOL ON
```

DISP:IR:VIEW

Sets enabled/disabled of the display of the minimum resistance value from the start of an insulation resistance tests.

Command

```
DISPlay:IR:VIEW <character>
DISPlay:IR:VIEW?
```

Parameter

Set value:	NUMeric	Displays the measurement screen of the numerical value during the test. (default)
	GRAPh	Displays the measurement screen of the graph during the test.

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DISP:IR:VIEW GRAP
```

GRAPh Command

The command relates to the graph display.

GRAP:ACW:MARK

For AC withstanding voltage tests, set whether to mark the upper and lower limits on the graph.
The ACW in the second node can be omitted, but to distinguish it from the DC withstanding voltage test, we recommend that you do not. The graph shall be displayed when DISP:ACW:VIEW *(p.64)* is set at GRAP.

Command

```
GRAPh[:ACW][:JUDGment]:MARKer[:STATe] <boolean>
GRAPh[:ACW][:JUDGment]:MARKer[:STATe]?
```

Parameter

Set value:	ON(1)	Marks ON (default)
	OFF(0)	Marks OFF

Settings are reset to default when the *RST command is sent.

Response

boolean

Example

```
GRAP:ACW:MARK OFF
```

GRAP:ACW:SCAL

For AC withstanding voltage tests, select whether the scale is fixed or auto-set for the voltage-axis and current-axis of the graph.
The ACW in the second node can be omitted, but to distinguish it from the DC withstanding voltage test, we recommend that you do not. The graph shall be displayed when DISP:ACW:VIEW *(p.64)* is set at GRAP.

Command

```
GRAPh[:ACW]:SCALe <character>
GRAPh[:ACW]:SCALe?
```

Parameter

Set value:	AUTO	Both minimum value and maximum value shall be set at auto-scale. (default)
	FIX	Voltage-axis: The minimum value shall be fixed at 0 V, while the maximum value shall be fixed at ACW:VOLT +10 % or more. Current-axis: The minimum value shall be fixed at 0 A, while the maximum value shall be fixed at SENS:ACW:JUDG +10 % or more.

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
GRAP:ACW:SCAL FIX
```

GRAP:DCW:MARK

For DC withstanding voltage tests, set whether to mark the upper and lower limits on the graph.
The graph shall be displayed when DISP:DCW:VIEW *(p.65)* is set at GRAP.

Command

```
GRAPh:DCW[:JUDGment]:MARKer[:STATe] <boolean>
GRAPh:DCW[:JUDGment]:MARKer[:STATe]?
```

Parameter

Set value:	ON(1)	Marks ON (default)
	OFF(0)	Marks OFF

Settings are reset to default when the *RST command is sent.

Response

boolean

Example

```
GRAP:DCW:MARK OFF
```

GRAP:DCW:SCAL

For DC withstanding voltage tests, select whether the scale is fixed or auto-set for the voltage-axis and current-axis of the graph.
The graph shall be displayed when DISP:DCW:VIEW *(p.65)* is set at GRAP.

Command

```
GRAPh:DCW:SCALe <character>
GRAPh:DCW:SCALe?
```

Parameter

Set value:	AUTO	Both minimum value and maximum value shall be set at auto-scale. (default)
	FIX	Voltage-axis: The minimum value shall be fixed at 0 V, while the maximum value shall be fixed at DCW:VOLT +10 % or more. Current-axis: The minimum value shall be fixed at 0 A, while the maximum value shall be fixed at SENS:DCW:JUDG +10 % or more.

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
GRAP:DCW:SCAL FIX
```

GRAP:IR:FORM

For insulation resistance tests, set values to be displayed on the Y-axis in the graph. Always displays time (seconds) on the X-axis.
The graph shall be displayed when DISP:IR:VIEW *(p.67)* is set at GRAP.

Command

```
GRAPh:IR:FORMat <character>
GRAPh:IR:FORMat?
```

Parameter

Set value:	VRT	Displays voltage on the left side of Y-axis, while resistance on the right side. (default)
	IRT	Displays current and resistance on the right side of Y-axis.
	VIRT	Displays voltage on the left side of Y-axis, while current and resistance on the right side.

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
GRAP:IR:FORM IRT
```

GRAP:IR:MARK

For insulation resistance tests, set whether to mark the upper and lower limits on the graph.
The graph shall be displayed when DISP:IR:VIEW *(p.67)* is set at GRAP.

Command

```
GRAPh:IR[:JUDGment]:MARKer[:STATe] <boolean>
GRAPh:IR[:JUDGment]:MARKer[:STATe]?
```

Parameter

Set value:	ON(1)	Marks ON (default)
	OFF(0)	Marks OFF

Settings are reset to default when the *RST command is sent.

Response

boolean

Example

```
GRAP:IR:MARK OFF
```

GRAP:IR:SCAL

For insulation resistance tests, select whether the scale is fixed or auto-set for the voltage-axis and resistance-axis of the graph.
The graph shall be displayed when DISP:IR:VIEW *(p.67)* is set at GRAP.
The scale of the current-axis is always auto.
FIX cannot be selected when SENS:IR:JUDG:STAT is set to OFF or SENS:IR:JUDG:TYPE is set to CURR.

Command

```
GRAPh:IR:SCALe <character>
GRAPh:IR:SCALe?
```

Parameter

Set value:	AUTO	Both minimum value and maximum value shall be set at auto-scale. (default)
	FIX	Voltage-axis: The minimum value shall be fixed at 0 V, while the maximum value shall be fixed at IR:VOLT +10 % or more. Resistance-axis: The minimum value shall be fixed at 0 Ω, while the maximum value shall be fixed at SENS:IR:JUDG +10 % or more.

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
GRAP:IR:SCAL FIX
```

HCOPy Command

This is a command which relates to screen capture.

HCOP:SDUM:DATA?

Retrieves the screen capture of the present screen.

Command

```
HCOPy:SDUMp:DATA?
```

Response

The screen image (PNG) is returned in block (#6<length><data>) format.

INITiate Command

Starts trigger function.

INIT

Invalidates the present measurement data (data logger) and starts a new measurement.
Starts the test trigger function.

Command

```
INITiate[:IMMediate][:ALL]
```

INIT:ACQ

Invalidates the present measured data (data logger) and starts a new measurement.

Command

```
INITiate[:IMMediate]:ACQuire
```

INIT:TEST

Starts the test trigger function.
When the trigger source is set to IMM, the auto test is executed immediately. When the trigger source is set to BUS, the device waits for a software trigger and then executes the auto test. For EXT/ONCE, execution takes place after the start operation on the unit.

Command

```
INITiate[:IMMediate]:TEST
```

MEASure / READ / FETCh Command

Queries the measurement results.

MEAS changes the TRIGger and SAMPle subsystem settings to the values shown below, makes a new measurement, and then queries the measurement data. The present valid measurement data is invalidated.

Command	Value
TRIG:ACQ:COUN	1
TRIG:ACQ:DEL	0.0
TRIG:ACQ:SOUR	IMM
SAMP:COUN	INF
SAMP:TEST:ENAB	ON
SAMP:TIM	0.0

READ makes a new measurement and queries the measurement data. The present valid measurement data is invalidated.

FETC queries data that has already been measured. If there are multiple measurement data entries, the most recent data is returned.

->"Querying Measured Values" (*p.211*)

MEAS? / READ? / FETC?

Queries the measurement data in the order specified by DATA:FORM.

->"Querying Measured Values" (*p.211*)

Command

```
FETCh?
READ?
MEASure?
```

Response

The response is returned in nr3,nr3,... format in the order specified by DATA:FORM.

FETC:CIM?/ READ:CIM?/ MEAS:CIM?

Queries the imaginary part of the current.
->"Querying Measured Values" (*p.211*)

Command

```
FETCh:CIMaginary?
READ:CIMaginary?
MEASure:CIMaginary?
```

Response

NR3
Unit: A

FETC:CRE?/ READ:CRE?/ MEAS:CRE?

Queries the real part of the current.
->"Querying Measured Values" (*p.211*)

Command

```
FETCh:CREal?
READ:CREal?
MEASure:CREal?
```

Response

NR3
Unit: A

MEAS:CURR? / READ:CURR? / FETC:CURR?

Queries the current.
->"Querying Measured Values" (*p.211*)

Command

```
MEASure:CURRent?
READ:CURRent?
FETCh:CURRent?
```

Response

NR3
Unit: A

MEAS:ETIM? / READ:ETIM ?/ FETC:ETIM?

Queries the elapsed test time.
When the test status (RISE, TEST, FALL) changes, the elapsed time returns to 0 seconds.
->"Querying Measured Values" (*p.211*)

Command

```
MEASure:ETIMe?
READ:ETIMe?
FETCh:ETIMe?
```

Response

NR3
Unit: S

MEAS:MTIM? / READ:MTIM? / FETC:MTIM?

Queries the measurement time from the start of measurement to the end of measurement.
->"Querying Measured Values" (*p.211*)

Command

```
MEASure:MTIMe?
READ:MTIMe?
FETCh:MTIMe?
```

Response

NR3
Unit: S

MEAS:RES? / READ:RES? / FETC:RES?

Queries the resistance.
->"Querying Measured Values" (*p.211*)

Command

```
MEASure:RESistance?
READ:RESistance?
FETCh:RESistance?
```

Response

NR3
Unit: OHM

MEAS:VOLT? / READ:VOLT? / FETC:VOLT?

Queries the voltage.

->"Querying Measured Values" (*p.211*)

Command

```
MEASure:VOLTage?
READ:VOLTage?
FETCh:VOLTage?
```

Response

NR3

Unit: V

PROGram Command

It is a command that controls the program and the step.

PROG

Sets the program to be edited.
Specifying a blank program name ("") clears the selection.

Command

```
PROGram[:SELected] "<string>"
PROGram[:SELected]?
```

Parameter

For tests , include “/BASIC/” before the program name.
When specifying a program in program memory, include “/SIGNAL IO/BASIC/” before the program name.
Settings are reset to default when the *RST command is sent. ("" by default)

Response

string

Example

When specifying a test with the name “My test program”

```
PROG "/BASIC/My test program"
```

PROG:CRE

Creates a new program.
To edit a program, use PROG to specify the program to be edited after creating the program.

Command

```
PROGram:CREate "<string>"
```

Parameter

Naming convention: Alphabet characters A-Za-z, numbers 0-9, dot (.), comma (,), parentheses (), brackets [], braces {}, and (&), dollar ($), hash (#), caret (^), percent (%), equal (=), hyphen (-), plus (+), underscore (_), space ( ), case-sensitive. Up to 255 characters

For tests , include “/BASIC/” before the program name.

Example

```
PROG:CRE "/BASIC/My test program"
```

PROG:DEL

Deletes a program.

Command

```
PROGram:DELete "<string>"
```

Example

```
PROG:DEL "/BASIC/My test program"
```

PROG:FAIL:CONT

Sets the operation to be executed when a fail judgment occurs.

Command

```
PROGram[:SELected][:JUDGment]:FAIL:CONTinue <boolean>
PROGram[:SELected][:JUDGment]:FAIL:CONTinue?
```

Parameter

Set value:	ON(1)	A fail judgment is indicated after the completion of all the steps.
	OFF(0)	Auto test ends when a failure occurs, and a fail judgment is indicated.

Response

NR1

Example

```
PROG:FAIL:CONT ON
```

PROG:INT:TIM

Sets the step interval time.

Command

```
PROGram[:SELected]:INTerval:TIMer <NRf>
PROGram[:SELected]:INTerval:TIMer?
```

Parameter

Unit: S

Response

NR3

Example

```
PROG:INT:TIM 10S
```

PROG:LIST?

Queries stored programs.

Command

```
PROGram:LIST?
```

Response

```
"string","string"...
```

Returns “” if no programs are stored.

PROG:REN

Changes the name of the selected program.

Command

```
PROGram[:SELected]:REName "<string>"
```

Parameter

Naming convention: Alphabet characters A-Za-z, numbers 0-9, dot (.), comma (,), parentheses (), brackets [], braces {}, and (&), dollar ($), hash (#), caret (^), percent (%), equal (=), hyphen (-), plus (+), underscore (_), white space ( ), case-sensitive. Up to 255 characters.

For tests, include “/BASIC/” before the program name.

Example

```
PROG:REN "/BASIC/Your test program"
```

PROG:SAVE

Saves the selected program.

Command

```
PROGram[:SELected]:SAVE
```

PROG:STEP<n>:<prog_item>

Sets the test condition indicated by <prog-item> to step n of the selected program.
For details on the parameters, see the test condition command of each test.

Command

```
PROGram[:SELected]:STEP<n>:<prog-item>
PROGram[:SELected]:STEP<n>:<prog-item>?
```

Parameter <n>

Specify the step number. Step numbers start at 0.

Parameter <prog-item>

You can set the following values.

<prog-item>	Description	Parameter	Applicable tests[1]
CURRent:FILTer:HPASs	High-pass filter	character	ACW/DCW
CURRent:FILTer:LPASs	Low-pass filter	character	ACW/DCW/IR
CURRent:FILTer:LPASs:STATe	Low-pass filter on/off	boolean	IR
CURRent:FILTer:TYPE	Filter type	character	ACW/DCW
[CURRent:]FREQuency	Test current frequency	numeric	EC:AC
[CURRent:][2][LEVel][3]	Test current	numeric	EC
CURRent:MODE	Current measurement method	character	ACW
[CURRent:][2]SCALe:OFFSet:IMAGinary	Offset current (imaginary)	numeric	ACW
[CURRent:][2]SCALe:OFFSet[:REAL]	Offset current (real)	numeric	ACW/DCW
[CURRent:]SWEep:FALL:TIMer	Current fall time	numeric	EC
[CURRent:]SWEep:FALL:TIMer:STATe	Current fall time on and off	boolean	EC
[CURRent:]SWEep[:RISE]:TIMer	Voltage rise time	numeric	EC
[CURRent:]TIMer	Test time	numeric	EC
FUNCtion[:MODE]	Test mode	character	All tests
JUDGment[:CURRent][2]:LOWer	Lower limit	numeric	ACW/DCW/IR
JUDGment[:CURRent]:LOWer:STATe	Lower limit on/off	boolean	ACW/DCW/IR
JUDGment[:CURRent][2][:UPPer]	Upper limit	numeric	ACW/DCW/IR
JUDGment:DELay	Judgment delay	numeric	DCW/IR
JUDGment:DELay:AUTO	Judgment delay auto on/off	boolean	DCW/IR
JUDGment:RESistance:LOWer	Lower limit	numeric	IR/EC
JUDGment:RESistance:LOWer:STATe	Lower limit on/off	boolean	EC
JUDGment:RESistance[:UPPer]	Upper limit	numeric	IR/EC
JUDGment:RESistance[:UPPer]:STATe	Upper limit on/off	boolean	IR
JUDGment:TYPE	Judgment type	character	IR/EC
JUDGment[:VOLTage][2]:LOWer	Lower limit	numeric	EC
JUDGment[:VOLTage]:LOWer:STATe	Lower limit on/off	boolean	EC

<prog-item>	Description	Parameter	Applicable tests[1]
JUDGment[:VOLTage][2][:UPPer]	Upper limit	numeric	EC
SCALe[:STATe]	Offset on/off	boolean	All tests
[RESistance:][2]SCALe:OFFSet[:REAL]	Offset resistance	numeric	IR/EC
[ROUTe:]TERMinal	Channel terminal connection	numeric, character	ACW/DCW/IR
[ROUTe:]TERMinal:CCHeck[:STATe]	Channel continuity check on/off	boolean	ACW/DCW/IR
TERMinal:CCHeck[:STATe]	Contact check	boolean	EC
TERMinal:GROund	Grounding mode	character	ACW/DCW/IR
TERMinal:WIRE	4-terminal/2-terminal measurement	NR1	EC
[VOLTage:]DISCharge:TIMer[:MINimum]	Discharge time	numeric	DCW/IR
[VOLTage:]END:STATe	End voltage on/off	boolean	ACW/DCW
[VOLTage:]FREQuency	Test voltage frequency	numeric	ACW
[VOLTage:][2][LEVel]	Test voltage	numeric	ACW/DCW/IR
VOLTage:MODE	Voltage measurement mode	character	ACW/DCW
[VOLTage:]RANGe	Output voltage range	numeric	IR
[VOLTage:]STARt[:LEVel]	Start voltage	numeric	ACW/DCW/IR
[VOLTage:]STARt:STATe	Start voltage on/off	boolean	ACW/DCW/IR
[VOLTage:]SWEep:FALL:TIMer	Voltage fall time	numeric	ACW/DCW
[VOLTage:]SWEep:FALL:TIMer:STATe	Voltage fall time on/off	boolean	ACW/DCW
[VOLTage:]SWEep[:RISE]:TIMer	Voltage rise time	numeric	ACW/DCW/IR
[VOLTage:]TIMer	Test time	numeric	ACW/DCW/IR

1. ACW: AC withstanding voltage, DCW: DC withstanding voltage, IR: insulation resistance, EC: earth continuity, TC: touch current, PCC: protective conductor current, PAT: patient leakage current
2. Cannot be omitted when sending the command with a unit in the parameter.
3. The abbreviated form [CURRent:LEVel] command is PROG:STEP<n>.

PROG:STEPS:COUN

Sets the number of steps of the selected program.

If the number is increased from the current number of steps, steps with default values are added after the last step. If the number is decreased, steps are deleted in order starting from the last step.

Command

```
PROGram[:SELected]:STEPS:COUNt <NRf>
PROGram[:SELected]:STEPS:COUNt?
```

Parameter

Set value: 1 to 100

Response

NR1

Returns +0 when no program is selected.

Example

```
PROG:STEPS:COUN 10
```

RESult Command

This is a command which test result.

RES?

Queries the previous test result.
A query does not clear the data. Use RES:FORM to specify the item to be queried.

Command

```
RESult[:IMMediate]?
```

Response

Returns the item specified by RES:FORM in a comma-separated format. Returns +0 if no test results exist.

Item	Description		Response
Test number	n/a		NR1
Auto test step number	1 for a single test		NR1
Test mode	ACW	AC withstanding voltage	character
	DCW	DC withstanding voltage	
	IR	Insulation resistance	
	ECAC	Earth continuity (AC)	
	ECDC	Earth continuity (DC)	
Test start time	RFC2822 format		“string”
Test start date (year) Test start date (month) Test start date (day) Test start time (hour) Test start time (minute) Test start time (second)	n/a		NR1
Voltage at the time of judgment Current at the time of judgment Real part of the current at the time of judgment Imaginary part of the current at the time of judgment Resistance at the time of judgment Maximum current during a test Minimum resistance during a test Test time at the time of judgment	n/a		NR3

Item	Description		Response
Judgment result Extended judgment result	PASS	PASS judgment.	character
	U-FAIL	A value exceeding the upper limit was detected resulting in a FAIL judgment.	
	U-FAIL (dV/dt)	The voltage rise rate failed in a DC with-standing voltage test	
	L-FAIL	A value less than the lower limit was detected resulting in a FAIL judgment.	
	L-FAIL (dV/dt)	The voltage rise rate failed in an insulation resistance test	
	C-FAIL[1]	An electrical continuity failed between scanner(s) and the EUT	
	C-FAIL (0xch[2])		
	PROTECT[1]	A protection function was activated, and the test was stopped.	
	PROTECT (factor[3])		
	ABORT	The test was aborted with a STOP signal.	

1. Displayed only when JUDGment is selected by the RES:FORM command.
2. This part is substituted by a value indicating a channel number in hexadecimal notation in the event of a failure in supplying power from the scanner to EUT in that channel. For details, see the 0xch channel information. The channel number is displayed only when EJUDgment is selected by the RES:FORM command.
3. This part is substituted by a message indicating the generating factor of the activation of the protection function. For details, see the factor information. Displayed only when EJUDgment is selected by the RES:FORM command.

0xch channel information

If there is more than one channel encountering an electrical continuity failure, the channel numbers combined will be indicated.

0xCH	Channel
0x0080	CH8(Scanner2-Ch4)
0x0040	CH7(Scanner2-Ch3)
0x0020	CH6(Scanner2-Ch2)
0x0010	CH5(Scanner2-Ch1)
0x0008	CH4(Scanner1-Ch4)
0x0004	CH3(Scanner1-Ch3)
0x0002	CH2(Scanner1-Ch2)
0x0001	CH1(Scanner1-Ch1)
0x8000	CH16(Scanner4-Ch4)
0x4000	CH15(Scanner4-Ch3)
0x2000	CH14(Scanner4-Ch2)
0x1000	CH13(Scanner4-Ch1)
0x0800	CH12(Scanner3-Ch4)
0x0400	CH11(Scanner3-Ch3)
0x0200	CH10(Scanner3-Ch2)
0x0100	CH9(Scanner3-Ch1)

factor information

If multiple factors have contributed to the activation of the protection function, the highest prioritized factor is returned.

Factor	Protection	Generating factor of the activation of the protection function
ILOCK	Interlock	Interlock has been activated.
CAL	Calibration	The preset calibration period is exceeded.
SIF	Scan I/F	While scanning, the interface cable is disconnected. The channel-assigned scanner is not detected.
ORG	Over Range	A value exceeding the maximum value of the measurement range is detected.
EF	Earth Fault	When the grounding mode is set to Guard, abnormal current flows from the high voltage output of this product to ground.
PS	Power Supply	There is an error in the power supply section.
OUTERR	Output Error	An output voltage outside of the specified range is detected.
OL	Over Load	An output power or current outside of the specified range is detected.
OH	Over Heat	The internal temperature of the product is abnormally high.
OR	Over Rating	During a withstanding voltage test, an output current is generated for a length of time that exceeds the output time limit.
RMT	Remote	The REMOTE connector is connected or disconnected.
SIO	Signal I/O	There is a change in the SIGNAL I/O connector's signals.
COMM	Communication	An internal communication error is occurring. There has been no SCPI communication for a specified period of time or longer when the communication monitoring timer is used (SYST:COMM:PROT:WDOG ON).

Response exsample

When both a test start time (month) and a test start time (day) are specified and the extended judgment result is selected, if a test on October 23 resulted in an electrical continuity failure between the scanners (CH1, CH2, and CH5) and EUT,

```
10,23,C-FAIL(0x0013)
```

When both a test start time (month) and a test start time (day) are specified and the extended judgment result is selected, if a test on October 23 terminated due to the activation of the protection function,

```
10,23,PROTECT(ILOCK)
```

RES:FORM

Sets the response format to use when test results are queried.
The response format uses RES? or RES:REM?. The same parameter cannot be specified twice.

Command

```
RESult:FORMat <character>[,<character>[,<character>]...]
RESult:FORMat?
```

Parameter

Describes at least one value, or 24 values at maximum, from the following values in a comma-separated format. (The default value is NUMB,FUNC,YEAR,MONT,DAY,HOUR,MIN,SEC,VOLT,CURR,RES,ETIM,JUDG)

Set value:	NUMBer	Test number[1]
	STEP	Auto test step number
	FUNCtion	Test mode
	DATE	Test start time[2]
	YEAR	Test start date (year)
	MONTh	Test start date (month)
	DAY	Test start date (day)
	HOUR	Test start time (hour)
	MINute	Test start time (minute)
	SECond	Test start time (second)
	VOLTage	Voltage at the time of judgment
	CURRent	Current at the time of judgment
	CREal	Real part of the current at the time of judgment
	CIMaginary	Imaginary part of the current at the time of judgment
	RESistance	Resistance at the time of judgment
	PCURrent	Maximum current during a test
	PRESistance	Minimum resistance during a test
	ETIMe	Maximum electric charge during a test
	JUDGment	Judgment result
	EJUDgment	Extended judgment result[3]

1. Incremented each time a test is performed. Cleared to 0 when the count exceeds 2147483647.
2. RFC2822 format
3. The scanner channel(s) encountering an electrical continuity failure or the details of the protection function are also returned. For details, see the explanation of the RES commands.

Response

```
character,character,...
```

Response example: When the test mode, test start time, and judgment result are set. FUNC,DATE,JUDG is returned.

Example

```
RES:FORM NUMB,DATE,VOLT,CURR,RES,ETIM,JUDG
```

RES:COUN?

Queries the number of test results stored in the product.

Command

```
RESult:COUNt?
```

Response

NR1

RES:NUMB

Set any test number for the next test result.
The test number is going up for each test, starting from the set number.

Command

```
RESult:NUMBer <NR1>
RESult:NUMBer?
```

Parameter

Set value: 0 to 2147483647

Response

Returns the most recent test number saved.

Example

```
RES:NUMB 1
```

RES:REM?

Queries the oldest test result.
The oldest test resurt is cleared when a query is made. Use RES:FORM to specify the item to be queried.

Command

```
RESult:REMove?
```

Response

Response Returns the item specified by RES:FORM in a comma-separated format.
For detail of response, see RES? *(p.84)*.

RES:REM:ALL

Delete all the test results.

Command

```
RESult:REMove:ALL
```

RES:TZON

Sets a test result time in UTC or time in the time zone specified by SYST:TZON.

Command

```
RESult[:DATetime]:TZONe <character>
RESult[:DATetime]:TZONe?
```

Parameter <character>

Set value:	UTC	UTC (Coordinated Universal Time) (default)
	LOCal	Time in the time zone specified by SYST:TZONs

Settings are reset to default when the *RST command is sent.

Response

```
character
```

Example

```
RES:TZON UTC
```

ROUTe Command

Use this function when the TOS9320 high voltage scanner option is connected.

ROUT:ACW:TERM

Sets the connection of each channel of the scanner in AC withstanding voltage tests.
The ACW in the second node can be omitted, but to distinguish it from the DC withstanding voltage test, we recommend that you do not.

Command

```
ROUTe[:ACW]:TERMinal <nrf>,<character>
ROUTe[:ACW]:TERMinal? <NRf>
```

Parameter <NRf>

Set value: 101 to 104, 201 to 204, 301 to 304, 401 to 404
The hundreds digit is the scanner number (1 to 4), and the ones digit is the channel number (1 to 4).

Parameter <character>

Set value:	LOW	Low voltage side
	HIGH	High voltage side
	OPEN	Open (default)

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
ROUT:ACW:TERM 202,LOW
ROUT:ACW:TERM? 202
```

ROUT:ACW:TERM:CCH

Sets the continuity check for the test leads connected to the scanner and the EUT in AC withstanding voltage tests. The ACW in the second node can be omitted, but to distinguish it from the DC withstanding voltage test, we recommend that you do not.

Command

```
ROUTe[:ACW]:TERMinal:CCHeck[:STATe] <boolean>
ROUTe[:ACW]:TERMinal:CCHeck[:STATe]?
```

Parameter

Set value:	ON(1)	Enable.
	OFF(0)	Disable. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
ROUT:ACW:TERM:CCH ON
```

ROUT:CAT?

Queries the available scanner channels.

Command

```
ROUTe:CATalog?
```

Response

```
NR1,NR1,...
```

Response example

When scanner 1 (using channels 1 to 4) is connected
Returns +101,+102,+103,+104.s

ROUT:DCW:TERM

Sets the connection of each channel of the scanner in DC withstanding voltage tests.

Command

```
ROUTe:DCW:TERMinal <nrf>,<character>
ROUTe:DCW:TERMinal? <NRf>
```

Parameter <NRf>

Set value: 101 to 104, 201 to 204, 301 to 304, 401 to 404
The hundreds digit is the scanner number (1 to 4), and the ones digit is the channel number (1 to 4).

Parameter <character>

Set value:	LOW	Low voltage side
	HIGH	High voltage side
	OPEN	Open (default)

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
ROUT:DCW:TERM 202,LOW
ROUT:DCW:TERM? 202
```

ROUT:DCW:TERM:CCH

Sets the continuity check for the test leads connected to the scanner and the EUT in DC withstanding voltage tests.

Command

```
ROUTe:DCW:TERMinal:CCHeck[:STATe] <boolean>
ROUTe:DCW:TERMinal:CCHeck[:STATe]?
```

Parameter

Set value:	ON(1)	Enable.
	OFF(0)	Disable. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
ROUT:DCW:TERM:CCH ON
```

ROUT:IR:TERM

Sets the connection of each channel of the scanner in insulation resistance tests.

Command

```
ROUTe:IR:TERMinal <nrf>,<character>
ROUTe:IR:TERMinal? <NRf>
```

Parameter <NRf>

Set value: 101 to 104, 201 to 204, 301 to 304, 401 to 404
The hundreds digit is the scanner number (1 to 4), and the ones digit is the channel number (1 to 4).

Parameter <character>

Set value:	LOW	Low voltage side
	HIGH	High voltage side
	OPEN	Open (default)

Settings are reset to default when the *RST command is sent.

Response

```
character
```

Example

```
ROUT:IR:TERM 202,LOW
ROUT:IR:TERM? 202
```

ROUT:IR:TERM:CCH

Sets the continuity check for the test leads connected to the scanner and the EUT in insulation resistance tests.

Command

```
ROUTe:IR:TERMinal:CCHeck[:STATe] <boolean>
ROUTe:IR:TERMinal:CCHeck[:STATe]?
```

Parameter

Set value:	ON(1)	Enable.
	OFF(0)	Disable. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
ROUT:IR:TERM:CCH ON
```

ROUT:TERM:CONT:FAIL?

Returns the channel(s) encountering Contact-FAIL.

Command

```
ROUTe:TERMinals:CONTact:FAIL?
```

Response

NR1,NR1,...

If there is no test result or no Contact-FAIL occurring, +0 is returned.

SAMPle Command

Setting conditions for obtaining sample measured value.
The acquisition time varies according to the test mode and frequency setting.

Test mode	Frequency	Acquisition time
AC withstanding voltage Earth continuity (AC)	50 Hz	20 ms (1/50 s)
	60 Hz	16.67 s (1/60 s)
DC withstanding voltage Insulation resistance Earth continuity (DC)	50 Hz/60 Hz	100 ms

SAMP:COUN

Sets the number of measured value samples you want to obtain.

Command

```
SAMPle:COUNt {<numeric>|<character>}
SAMPle:COUNt?
```

Parameter

Set value:	1 to 8192	Specify the sample count
	INFinity	Continue obtaining measurement samples until the test is terminated. (default)

Settings are reset to default when the *RST or MEAS command is sent.
When the local mode is enabled with the LOCAL key or by sending the SYST:COMM:RLST LOC command, the setting is reset to its original default.

Response

NR1 or character

Example

```
SAMP:COUN 10
```

SAMP:TEST:ENAB

Sets whether obtaining samples is limited to the time when the test is performed.

Command

```
SAMPle:TESTing:ENABle <boolean>
SAMPle:TESTing:ENABle?
```

Parameter

Set value:	ON(1)	The acquisition of measurement samples is skipped while a test is not performed. If a test is terminated while measurement samples are being recorded, even if the preset sampling count has not been reached, the remaining sampling will be skipped. (default)
	OFF(0)	The specified number of measurement samples is taken at all times.

Settings are reset to default when the *RST or MEAS command is sent.

When the local mode is enabled with the LOCAL key or by sending the SYST:COMM:RLST LOC command, the setting is reset to its original default.

Response

NR1

Example

```
SAMP:TEST:ENAB ON
```

SAMP:TIM

Sets a sampling interval.

If the preset sampling interval is shorter than the recording time, the acquisition of a new measurement sample starts immediately after the ongoing sampling finishes.

Command

```
SAMPle:TIMer <numeric>
SAMPle:TIMer?
```

Parameter

Set value: 0.0 to 10.0 (0 by default)

Unit: S

Resolution:	100 ms	AC withstanding voltage, DC withstanding voltage, Insulation resistance, Earth continuity

Settings are reset to default when the *RST or MEAS command is sent.

When the local mode is enabled with the LOCAL key or by sending the SYST:COMM:RLST LOC command, the setting is reset to its original default.

Response

NR3

Example

```
SAMP:TIM 0.2S
```

SENSe:ACW Command

Setting the AC withstanding voltage test (ACW) conditions.
The ACW in the second node can be omitted, but to distinguish it from the DC withstanding voltage test, we recommend that you do not.

SENS:ACW:CURR:FILT:HPAS

Sets the high-pass filter for AC withstanding voltage tests.

Command

```
SENSe[:ACW]:CURRent:FILTer:HPASs <character>
SENSe[:ACW]:CURRent:FILTer:HPASs?
```

Parameter

Set value: SLOW (default)

FAST

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:ACW:CURR:FILT:HPAS SLOW
```

Related command

```
SENS:ACW:CURR:FILT:TYPE
```

SENS:ACW:CURR:FILT:LPAS

Sets the low-pass filter for AC withstanding voltage tests.

Command

```
SENSe[:ACW]:CURRent:FILTer:LPASs <character>
SENSe[:ACW]:CURRent:FILTer:LPASs?
```

Parameter

Set value:	SLOW (default)
	MEDium
	FAST

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:ACW:CURR:FILT:LPAS SLOW
```

Related command

SENS:DCW:CURR:FILT:TYPE

SENS:ACW:CURR:FILT:TYPE

Sets the filter type for AC withstanding voltage tests.

Command

```
SENSe[:ACW]:CURRent:FILTer:TYPE <character>
SENSe[:ACW]:CURRent:FILTer:TYPE?
```

Parameter

Set value:	LOW	Low-pass filter (default)
	HIGH	High-pass filter

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:ACW:CURR:FILT:TYPE LOW
```

SENS:ACW:CURR:MODE

Sets the current measurement mode in AC withstanding voltage tests.

Command

```
SENSe[:ACW]:CURRent:MODE <character>
SENSe[:ACW]:CURRent:MODE?
```

Parameter

Set value:	RMS	True rms value (default)
	AVERage	Convert mean-value responses to rms values

Settings are reset to default when the *RST command is sent.

Response

```
character
```

Example

```
SENS:ACW:CURR:MODE RMS
```

SENS:ACW:JUDG

Sets the reference current for upper limit judgment in AC withstanding voltage tests.

Command

```
SENSe[:ACW]:JUDGment[:CURRent][:UPPer] <numeric>
SENSe[:ACW]:JUDGment[:CURRent][:UPPer]?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (0.01 mA)

Response

NR3

Example

```
SENS:ACW:JUDG 0.00002
```

SENS:ACW:JUDG:LOW

Sets the reference current for the lower limit judgment in AC withstanding voltage tests.
This setting is enabled when SENS:ACW:JUDG:LOW:STAT is set to ON.

Command

```
SENSe[:ACW]:JUDGment[:CURRent]:LOWer <numeric>
SENSe[:ACW]:JUDGment[:CURRent]:LOWer?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent.

Response

NR3

Example

```
SENS:ACW:JUDG:LOW 10UA
```

SENS:ACW:JUDG:LOW:STAT

Sets whether to judge with the lower limit in AC withstanding voltage tests.
Use SENS:ACW:JUDG:LOW to set the lower limit.

Command

```
SENSe[:ACW]:JUDGment[:CURRent]:LOWer:STATe <boolean>
SENSe[:ACW]:JUDGment[:CURRent]:LOWer:STATe?
```

Parameter

Set value:	ON(1)	Judge
	OFF(0)	Not judge (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:ACW:JUDG:LOW:STAT ON
```

SENS:ACW:TERM:GRO

Sets whether to measure by including or excluding the current running through the stray capacitance in AC withstanding voltage tests.

Command

```
SENSe[:ACW]:TERMinal:GROund <character>
SENSe[:ACW]:TERMinal:GROund?
```

Parameter

Set value:	LOW	Measure including the current running through the stray capacitance (default)
	GUARd	Measure excluding the current running through the stray capacitance

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:ACW:TERM:GRO LOW
```

SENS:ACW:VOLT:MODE

Sets the voltage measurement mode in AC withstanding voltage tests.

Command

```
SENSe[:ACW]:VOLTage:MODE <character>
SENSe[:ACW]:VOLTage:MODE?
```

Parameter

Set value:	RMS	True rms value (default)
	PEAK	Peak value

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:ACW:VOLT:MODE PEAK
```

SENSe:DCW Command

Setting the DC withstanding voltage test (DCW) conditions.

SENS:DCW:CURR:FILT:HPAS

Sets the high-pass filter for DC withstanding voltage tests.

Command

```
SENSe:DCW:CURRent:FILTer:HPASs <character>
SENSe:DCW:CURRent:FILTer:HPASs?
```

Parameter

Set value: SLOW (default)

FAST

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:DCW:CURR:FILT:HPAS SLOW
```

Related command

SENS:DCW:CURR:FILT:TYPE

SENS:DCW:CURR:FILT:LPAS

Sets the low-pass filter for DC withstanding voltage tests.

Command

```
SENSe:DCW:CURRent:FILTer:LPASs <character>
SENSe:DCW:CURRent:FILTer:LPASs?
```

Parameter

Set value:	SLOW (default)	
	MEDium	
	FAST	

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:DCW:CURR:FILT:LPAS SLOW
```

Related command

SENS:DCW:CURR:FILT:TYPE

SENS:DCW:CURR:FILT:TYPE

Sets the filter type for DC withstanding voltage tests.

Command

```
SENSe:DCW:CURRent:FILTer:TYPE <character>
SENSe:DCW:CURRent:FILTer:TYPE?
```

Parameter

Set value:	LOW	Low-pass filter (default)
	HIGH	High-pass filter

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:DCW:CURR:FILT:TYPE LOW
```

SENS:DCW:JUDG

Sets the reference current for upper limit judgment in DC withstanding voltage tests.

Command

```
SENSe:DCW:JUDGment[:CURRent][:UPPer] <numeric>
SENSe:DCW:JUDGment[:CURRent][:UPPer]?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (0.01 MA)

Response

NR3

Example

```
SENS:DCW:JUDG 0.00002
```

SENS:DCW:JUDG:DEL

Sets the delay time until starting upper limit judgment in DC withstanding voltage tests.
This setting is enabled when SENS:DCW:JUDG:DEL:AUTO is set to OFF.

Command

```
SENSe:DCW:JUDGment:DELay <numeric>
SENSe:DCW:JUDGment:DELay?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.1 S)

Response

NR3

Example

```
SENS:DCW:JUDG:DEL 500MS
```

SENS:DCW:JUDG:DEL:AUTO

Sets whether to make the judgment delay automatic in DC withstanding voltage tests.
If you do not set it to automatic, set the time until starting judgment with SENS:DCW:JUDG:DEL.

Command

```
SENSe:DCW:JUDGment:DELay:AUTO <boolean>
SENSe:DCW:JUDGment:DELay:AUTO?
```

Parameter

Set value:	ON(1)	Set it to automatic
	OFF(0)	Not set it to automatic (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:DCW:JUDG:DEL:AUTO ON
```

SENS:DCW:JUDG:LOW

Sets the reference current for the lower limit judgment in DC withstanding voltagetests.
This setting is enabled when SENS:DCW:JUDG:LOW:STAT is set to ON.

Command

```
SENSe:DCW:JUDGment[:CURRent]:LOWer <numeric>
SENSe:DCW:JUDGment[:CURRent]:LOWer?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (0 A)

Response

NR3

Example

```
SENS:DCW:JUDG:LOW 10UA
```

SENS:DCW:JUDG:LOW:STAT

Sets whether to judge with the lower limit in DC withstanding voltage tests.
Use SENS:DCW:JUDG:LOW to set the lower limit.

Command

```
SENSe:DCW:JUDGment[:CURRent]:LOWer:STATe <boolean>
SENSe:DCW:JUDGment[:CURRent]:LOWer:STATe?
```

Parameter

Set value:	ON(1)	Judge
	OFF(0)	Not judge (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:DCW:JUDG:LOW:STAT OFF
```

SENS:DCW:TERM:GRO

Sets whether to measure by including or excluding the current running through the stray capacitance in DC withstanding voltage tests.

Command

```
SENSe:DCW:TERMinal:GROund <character>
SENSe:DCW:TERMinal:GROund?
```

Parameter

Set value:	LOW	Measure including the current running through the stray capacitance (default)
	GUARd	Measure excluding the current running through the stray capacitance

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:DCW:TERM:GRO GUAR
```

SENS:DCW:VOLT:MODE

Sets the voltage measurement mode in DC withstanding voltage tests.

Command

```
SENSe:DCW:VOLTage:MODE <character>
SENSe:DCW:VOLTage:MODE?
```

Parameter

Set value:	PEAK	Peak value
	AVERage	Mean value (default)

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:DCW:VOLT:MODE PEAK
```

SENSe:EC Command

Setting the earth continuity test (EC) conditions.

SENS:EC[:AC] Command

Sets the test condition for AC earth continuity test.

SENS:EC:JUDG

Sets the reference resistance for upper limit judgment in earth continuity tests (AC).
This setting is enabled when SENS:EC:JUDG:STAT is set to ON.

Command

```
SENSe:EC[:AC]:JUDGment[:RESistance][:UPPer] <numeric>
SENSe:EC[:AC]:JUDGment[:RESistance][:UPPer]?
```

Parameter

Unit: OHM

Settings are reset to default when the *RST command is sent. (0.0001 OHM)

Response

NR3

Example

```
SENS:EC:JUDG 0.0002
```

SENS:EC:JUDG:STAT

Sets whether to judge with the upper resistance limit in earth continuity tests (AC).
This setting is enabled when SENS:EC:JUDG:TYPE is set to RES. Use SENS:EC:JUDG to set the upper limit.

Command

```
SENSe:EC[:AC]:JUDGment[:RESistance][:UPPer]:STATe <boolean>
SENSe:EC[:AC]:JUDGment[:RESistance][:UPPer]:STATe?
```

Parameter

Set value:	ON(1)	Judge (default)
	OFF(0)	Not judge

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:EC:JUDG:STAT ON
```

SENS:EC:JUDG:LOW

Sets the reference resistance for lower limit judgment in earth continuity tests (AC).
This setting is enabled when SENS:EC:JUDG:LOW:STAT is set to ON.

Command

```
SENSe:EC[:AC]:JUDGment[:RESistance]:LOWer <numeric>
SENSe:EC[:AC]:JUDGment[:RESistance]:LOWer?
```

Parameter

Unit: OHM

Settings are reset to default when the *RST command is sent. (0 OHM)

Response

NR3

Example

```
SENS:EC:JUDG:LOW 1
```

SENS:EC:JUDG:LOW:STAT

Sets whether to judge with the lower resistance limit in earth continuity tests (AC).
This setting is enabled when SENS:EC:JUDG:TYPE is set to RES. Use SENS:EC:JUDG:LOW to set the lower limit.

Command

```
SENSe:EC[:AC]:JUDGment[:RESistance]:LOWer:STATe <boolean>
SENSe:EC[:AC]:JUDGment[:RESistance]:LOWer:STATe?
```

Parameter

Set value:	ON(1)	Judge (default)
	OFF(0)	Not judge

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:EC:JUDG:LOW:STAT ON
```

SENS:EC:JUDG:TYPE

Sets whether to use resistance or voltage to make upper limit judgment and lower limit judgment in earth continuity tests (AC).

Command

```
SENSe:EC[:AC]:JUDGment:TYPE <character>
SENSe:EC[:AC]:JUDGment:TYPE?
```

Parameter

Set value:	RESistance	Judge using resistance (default)
	VOLTage	Judge using voltage

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:EC:JUDG:TYPE RES
```

SENS:EC:JUDG:VOLT

Sets the reference voltage for upper limit judgment in earth continuity tests (AC).
This setting is enabled when SENS:EC:JUDG:VOLT:STAT is set to ON.

Command

```
SENSe:EC[:AC]:JUDGment:VOLTage[:UPPer] <numeric>
SENSe:EC[:AC]:JUDGment:VOLTage[:UPPer]?
```

Parameter

Unit: V

Settings are reset to default when the *RST command is sent. (2.5 V)

Response

NR3

Example

```
SENS:EC:JUDG:VOLT 0.002
```

SENS:EC:JUDG:VOLT:STAT

Sets whether to judge with the upper voltage limit in earth continuity tests (AC).
This setting is enabled when SENS:EC:JUDG:TYPE is set to VOLT. Use SENS:EC:JUDG:VOLT to set the upper limit.

Command

```
SENSe:EC[:AC]:JUDGment:VOLTage[:UPPer]:STATe <boolean>
SENSe:EC[:AC]:JUDGment:VOLTage[:UPPer]:STATe?
```

Parameter

Set value:	ON(1)	Judge (default)
	OFF(0)	Not judge

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:EC:JUDG:VOLT:STAT ON
```

SENS:EC:JUDG:VOLT:LOW

Sets the reference voltage for lower limit judgment in earth continuity tests (AC).
This setting is enabled when SENS:EC:JUDG:VOLT:LOW:STAT is set to ON.

Command

```
SENSe:EC[:AC]:JUDGment:VOLTage:LOWer <numeric>
SENSe:EC[:AC]:JUDGment:VOLTage:LOWer?
```

Parameter

Unit: V

Settings are reset to default when the *RST command is sent. (0 V)

Response

NR3

Example

```
SENS:EC:JUDG:VOLT:LOW 1V
```

SENS:EC:JUDG:VOLT:LOW:STAT

Sets whether to judge with the lower voltage limit in earth continuity tests (AC).
This setting is enabled when SENS:EC:JUDG:TYPE is set to VOLT. Use SENS:EC:JUDG:VOLT:LOW to set the lower limit.

Command

```
SENSe:EC[:AC]:JUDGment:VOLTage:LOWer:STATe <boolean>
SENSe:EC[:AC]:JUDGment:VOLTage:LOWer:STATe?
```

Parameter

Set value:	ON(1)	Judge (default)
	OFF(0)	Not judge

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:EC:JUDG:VOLT:LOW:STAT ON
```

SENS:EC:TERM:CCH

Sets the contact check for the test leads and the EUT in earth continuity tests (AC).

Command

```
SENSe:EC[:AC]:TERMinal:CCHeck[:STATe] <boolean>
SENSe:EC[:AC]:TERMinal:CCHeck[:STATe]?
```

Parameter

Set value:	ON(1)	Check is performed.
	OFF(0)	Check is not performed. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:EC:TERM:CCH ON
```

SENS:EC:TERM:WIRE

Sets the test lead wiring method in earth continuity tests (AC).

Command

```
SENSe:EC[:AC]:TERMinal:WIRE {4|2}
SENSe:EC[:AC]:TERMinal:WIRE?
```

Parameter

Set value:	4	Four-terminal wiring (default)
	2	Two-terminal wiring

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:EC:TERM:WIRE 2
```

SENS:EC:DC Command

Sets the test condition for DC earth continuity test.

SENS:EC:DC:JUDG

Sets the reference resistance for upper limit judgment in earth continuity tests (DC).
This setting is enabled when SENS:EC:DC:JUDG:STAT is set to ON.

Command

```
SENSe:EC:DC:JUDGment[:RESistance][:UPPer] <numeric>
SENSe:EC:DC:JUDGment[:RESistance][:UPPer]?
```

Parameter

Unit: OHM

Settings are reset to default when the *RST command is sent. (0.0001 OHM)

Response

NR3

Example

```
SENS:EC:DC:JUDG 0.00002
```

SENS:EC:DC:JUDG:STAT

Sets whether to judge with the upper resistance limit in earth continuity tests (DC).
This setting is enabled when SENS:EC:DC:JUDG:TYPE is set to RES. Use SENS:EC:DC:JUDG to set the upper limit.

Command

```
SENSe:EC:DC:JUDGment[:RESistance][:UPPer]:STATe <boolean>
SENSe:EC:DC:JUDGment[:RESistance][:UPPer]:STATe?
```

Parameter

Set value:	ON(1)	Judge (default)
	OFF(0)	Not judge

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:EC:DC:JUDG:STAT ON
```

SENS:EC:DC:JUDG:LOW

Sets the reference resistance for lower limit judgment in earth continuity tests (DC).
This setting is enabled when SENS:EC:DC:JUDG:LOW:STAT is set to ON.

Command

```
SENSe:EC:DC:JUDGment[:RESistance]:LOWer <numeric>
SENSe:EC:DC:JUDGment[:RESistance]:LOWer?
```

Parameter

Unit: OHM

Settings are reset to default when the *RST command is sent. (0 OHM)

Response

NR3

Example

```
SENS:EC:DC:JUDG:LOW 10
```

SENS:EC:DC:JUDG:LOW:STAT

Sets whether to judge with the lower resistance limit in earth continuity tests (DC).
This setting is enabled when SENS:EC:DC:JUDG:TYPE is set to RES. Use SENS:EC:DC:JUDG:LOW to set the lower limit.

Command

```
SENSe:EC:DC:JUDGment[:RESistance]:LOWer:STATe <boolean>
SENSe:EC:DC:JUDGment[:RESistance]:LOWer:STATe?
```

Parameter

Set value:	ON(1)	Judge
	OFF(0)	Not judge (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:EC:DC:JUDG:LOW:STAT ON
```

SENS:EC:DC:JUDG:TYPE

Sets whether to use resistance or voltage to make upper limit judgment and lower limit judgment in earth continuity tests (DC).

Command

```
SENSe:EC:DC:JUDGment:TYPE <character>
SENSe:EC:DC:JUDGment:TYPE?
```

Parameter

Set value:	RESistance	Judge using resistance (default)
	VOLTage	Judge using voltage

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:EC:DC:JUDG:TYPE RES
```

SENS:EC:DC:JUDG:VOLT

Sets the reference voltage for upper limit judgment in earth continuity tests (DC).
This setting is enabled when SENS:EC:DC:JUDG:VOLT:STAT is set to ON.

Command

```
SENSe:EC:DC:JUDGment:VOLTage[:UPPer] <numeric>
SENSe:EC:DC:JUDGment:VOLTage[:UPPer]?
```

Parameter

Unit: V

Settings are reset to default when the *RST command is sent. (2.5 V)

Response

NR3

Example

```
SENS:EC:DC:JUDG:VOLT 0.002
```

SENS:EC:DC:JUDG:VOLT:STAT

Sets whether to judge with the upper voltage limit in earth continuity tests (DC).
This setting is enabled when SENS:EC:DC:JUDG:TYPE is set to VOLT. Use SENS:EC:DC:JUDG:VOLT to set the upper limit.

Command

```
SENSe:EC:DC:JUDGment:VOLTage[:UPPer]:STATe <boolean>
SENSe:EC:DC:JUDGment:VOLTage[:UPPer]:STATe?
```

Parameter

Set value:	ON(1)	Judge (default)
	OFF(0)	Not judge

Settings are reset to default when the *RST command is sent.Response: NR1

Example

```
SENS:EC:DC:JUDG:VOLT:STAT ON
```

SENS:EC:DC:JUDG:VOLT:LOW

Sets the reference voltage for lower limit judgment in earth continuity tests (DC).
This setting is enabled when SENS:EC:DC:JUDG:VOLT:LOW:STAT is set to ON.

Command

```
SENSe:EC:DC:JUDGment:VOLTage:LOWer <numeric>
SENSe:EC:DC:JUDGment:VOLTage:LOWer?
```

Parameter

Unit: V

Settings are reset to default when the *RST command is sent. (0 V)

Response

NR3

Example

```
SENS:EC:DC:JUDG:VOLT:LOW 1V
```

SENS:EC:DC:JUDG:VOLT:LOW:STAT

Sets whether to judge with the lower voltage limit in earth continuity tests (DC).
This setting is enabled when SENS:EC:DC:JUDG:TYPE is set to VOLT. Use SENS:EC:DC:JUDG:VOLT:LOW to set the lower limit.

Command

```
SENSe:EC:DC:JUDGment:VOLTage:LOWer:STATe <boolean>
SENSe:EC:DC:JUDGment:VOLTage:LOWer:STATe?
```

Parameter

Set value:	ON(1)	Judge
	OFF(0)	Not judge (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:EC:DC:JUDG:VOLT:LOW:STAT ON
```

SENS:EC:DC:TERM:CCH

Sets the continuity check for the test leads and the EUT in earth continuity tests (DC).

Command

```
SENSe:EC:DC:TERMinal:CCHeck[:STATe] <boolean>
SENSe:EC:DC:TERMinal:CCHeck[:STATe]?
```

Parameter

Set value:	ON(1)	Check is performed.
	OFF(0)	Check is not performed. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:EC:DC:TERM:CCH ON
```

SENS:EC:DC:TERM:WIRE

Sets the test lead wiring method in earth continuity tests (DC).

Command

```
SENSe:EC:DC:TERMinal:WIRE {4|2}
SENSe:EC:DC:TERMinal:WIRE?
```

Parameter

Set value:	4	Four-terminal wiring (default)
	2	Two-terminal wiring

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:EC:DC:TERM:WIRE 2
```

SENSe:IR Command

Setting the insulation resistance test (IR) conditions.

SENS:IR:CURR:FILT:LPAS:STAT

Enables or disables the low-pass filter for insulation resistance tests.

Command

```
SENSe:IR:CURRent:FILTer:LPASs:STATe <boolean>
SENSe:IR:CURRent:FILTer:LPASs:STATe?
```

Parameter

Set value:	ON(1)	The low-pass filter is enabled.
	OFF(0)	The low-pass filter is disabled. (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:IR:CURR:FILT:LPAS:STAT ON
```

SENS:IR:JUDG

Sets the reference resistance for upper limit judgment in insulation resistance tests.
This setting is enabled when SENS:IR:JUDG:STAT is set to ON.

Command

```
SENSe:IR:JUDGment[:RESistance][:UPPer] <numeric>
SENSe:IR:JUDGment[:RESistance][:UPPer]?
```

Parameter

Unit: OHM

Settings are reset to default when the *RST command is sent. (100 MOHM)

Response

NR3

Example

```
SENS:IR:JUDG 100MOHM
```

SENS:IR:JUDG:STAT

Sets whether to judge with the upper resistance limit in insulation resistance tests.
This setting is enabled when SENS:IR:JUDG:TYPE is set to RES. Use SENS:IR:JUDG to set the upper limit.

Command

```
SENSe:IR:JUDGment[:RESistance][:UPPer]:STATe <boolean>
SENSe:IR:JUDGment[:RESistance][:UPPer]:STATe?
```

Parameter

Set value:	ON(1)	Judge
	OFF(0)	Not judge (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:IR:JUDG:STAT ON
```

SENS:IR:JUDG:CURR

Sets the reference current for upper limit judgment in insulation resistance tests.
This setting is enabled when SENS:IR:JUDG:CURR:STAT is set to ON.

Command

```
SENSe:IR:JUDGment:CURRent[:UPPer] <numeric>
SENSe:IR:JUDGment:CURRent[:UPPer]?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (0.0001 MA)

Response

NR3

Example

```
SENS:IR:JUDG:CURR 1MA
```

SENS:IR:JUDG:CURR:STAT

Sets whether to judge with the upper current limit in insulation resistance tests.
This setting is enabled when SENS:IR:JUDG:TYPE is set to CURR. Use SENS:IR:JUDG:CURR to set the upper limit.

Command

```
SENSe:IR:JUDGment:CURRent[:UPPer]:STATe <boolean>
SENSe:IR:JUDGment:CURRent[:UPPer]:STATe?
```

Parameter

Set value:	ON(1)	Judge (default)
	OFF(0)	Not judge

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:IR:JUDG:CURR:STAT ON
```

SENS:IR:JUDG:CURR:LOW

Sets the reference current for lower limit judgment in insulation resistance tests.
This setting is enabled when SENS:IR:JUDG:CURR:LOW:STAT is set to ON.

Command

```
SENSe:IR:JUDGment:CURRent:LOWer <numeric>
SENSe:IR:JUDGment:CURRent:LOWer?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (0 A)

Response

NR3

Example

```
SENS:IR:JUDG:CURR:LOW 1MA
```

SENS:IR:JUDG:CURR:LOW:STAT

Sets whether to judge with the lower current limit in insulation resistance tests.
This setting is enabled when SENS:IR:JUDG:TYPE is set to CURR. Use SENS:IR:JUDG:CURR:LOW to set the lower limit.

Command

```
SENSe:IR:JUDGment:CURRent:LOWer:STATe <boolean>
SENSe:IR:JUDGment:CURRent:LOWer:STATe?
```

Parameter

Set value:	ON(1)	Judge
	OFF(0)	Not judge (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:IR:JUDG:CURR:LOW:STAT ON
```

SENS:IR:JUDG:DEL

Sets the time until starting upper limit judgment.
This setting is enabled when SENS:IR:JUDG:DEL:AUTO is set to OFF.

Command

```
SENSe:IR:JUDGment:DELay <numeric>
SENSe:IR:JUDGment:DELay?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.1 S)

Response

NR3

Example

```
SENS:IR:JUDG:DEL 2
```

SENS:IR:JUDG:DEL:AUTO

Sets whether to make the judgment delay automatic.
If you do not set it to automatic, set the time until starting judgment with SENS:IR:JUDG:DEL.

Command

```
SENSe:IR:JUDGment:DELay:AUTO <boolean>
SENSe:IR:JUDGment:DELay:AUTO?
```

Parameter

Set value:	ON(1)	Set it to automatic
	OFF(0)	Not set it to automatic (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:IR:JUDG:DEL:AUTO ON
```

SENS:IR:JUDG:LOW

Sets the reference resistance for lower limit judgment in insulation resistance tests.
This setting is enabled when SENS:IR:JUDG:LOW:STAT is set to ON.

Command

```
SENSe:IR:JUDGment[:RESistance]:LOWer <numeric>
SENSe:IR:JUDGment[:RESistance]:LOWer?
```

Parameter

Unit: OHM

Settings are reset to default when the *RST command is sent. (1 MOHM)

Response

NR3

Example

```
SENS:IR:JUDG:LOW 1000000
```

SENS:IR:JUDG:LOW:STAT

Sets whether to judge with the lower resistance limit in insulation resistance tests.
This setting is enabled when SENS:IR:JUDG:TYPE is set to RES. Use SENS:IR:JUDG:LOW to set the lower limit.

Command

```
SENSe:IR:JUDGment[:RESistance]:LOWer:STATe <boolean>
SENSe:IR:JUDGment[:RESistance]:LOWer:STATe?
```

Parameter

Set value:	ON(1)	Judge (default)
	OFF(0)	Not judge

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
SENS:IR:JUDG:LOW:STAT ON
```

SENS:IR:JUDG:TYPE

Sets whether to use resistance or current to make upper limit judgment and lower limit judgment in insulation resistance tests.

Command

```
SENSe:IR:JUDGment:TYPE <character>
SENSe:IR:JUDGment:TYPE?
```

Parameter

Set value:	RESistance	Judge using resistance (default)
	CURRent	Judge using current

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:IR:JUDG:TYPE RES
```

SENS:IR:TERM:GRO

Sets whether to measure by including or excluding the current running through the stray capacitance in insulation resistance tests.

Command

```
SENSe:IR:TERMinal:GROund <character>
SENSe:IR:TERMinal:GROund?
```

Parameter

Set value:	LOW	Measure including the current running through the stray capacitance (default)
	GUARd	Measure excluding the current running through the stray capacitance

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
SENS:IR:TERM:GRO GUAR
```

[SOURce:] Command

Set the test mode.

FUNC

Set the test mode.
You can only set the test mode to one of the test modes that is available on your model.

Command

```
[SOURce:]FUNCtion[:MODE] <character>
[SOURce:]FUNCtion[:MODE]?
```

Parameter

Set value:	ACW	AC withstanding voltage (default)
	DCW	DC withstanding voltage
	IR	Insulation resistance
	ECac	Earth continuity (AC)
	ECDC	Earth continuity (DC)
	PROGram	Auto test

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
FUNC ACW
```

[SOURce:]ACW Command

Set the test conditions for AC withstanding voltage tests (ACW).
The ACW in the second node can be omitted, but to distinguish it from the DC withstanding voltage test, we recommend that you do not.

ACW:VOLT

Sets the test voltage for AC withstanding voltage tests.

Command

```
[SOURce:][ACW:]VOLTage[:LEVel][:IMMediate][:AMPLitude] <numeric>
[SOURce:][ACW:]VOLTage[:LEVel][:IMMediate][:AMPLitude]?
```

Parameter

Unit: V

Settings are reset to default when the *RST command is sent. (0 V)

Response

NR3

Example

```
ACW:VOLT 1000V
```

ACW:VOLT:END:STAT

For AC withstanding voltage tests, enable or disable the end voltage.
To enable it, set the voltage fall time to ON (ACW:VOLT:SWE:FALL:TIM:STAT ON).

Command

```
[SOURce][:ACW]:VOLTage:END:STATe <boolean>
[SOURce][:ACW]:VOLTage:END:STATe?
```

Parameter

Set value:	ON(1)	On
	OFF(0)	Off (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
ACW:VOLT:END:STAT ON
```

ACW:VOLT:FREQ

Sets the test voltage frequency for AC withstanding voltage tests.

Command

```
[SOURce:][ACW:]VOLTage:FREQuency <numeric>
[SOURce:][ACW:]VOLTage:FREQuency?
```

Parameter

Unit: HZ

Settings are reset to default when the *RST command is sent. (50 HZ)

Response

NR3

Example

```
ACW:VOLT:FREQ 50HZ
```

ACW:VOLT:PROT

Sets the limit voltage for AC withstanding voltage tests.

Command

```
[SOURce:][ACW:]VOLTage:PROTection[:LEVel][:UPPer] <numeric>
[SOURce:][ACW:]VOLTage:PROTection[:LEVel][:UPPer]?
```

Parameter

Unit: V

Settings are reset to default when the *RST command is sent. (5500 V, only TOS9311 is 10500 V)

Response

NR3

Example

```
ACW:VOLT:PROT 1.5KV
```

ACW:VOLT:STAR

Sets the start voltage as a percentage for AC withstanding voltage tests.
This setting is enabled when ACW:VOLT:STAR:STAT is set to ON.

Command

```
[SOURce:][ACW:]VOLTage:STARt[:LEVel] <numeric>
[SOURce:][ACW:]VOLTage:STARt[:LEVel]?
```

Parameter

Unit: PCT

Settings are reset to default when the *RST command is sent. (50 PCT)

Response

NR3

Example

```
ACW:VOLT:STAR 50PCT
```

ACW:VOLT:STAR:STAT

Sets whether to set the start voltage for AC withstanding voltage tests.
Use ACW:VOLT:STAR to set the start voltage.

Command

```
[SOURce:][ACW:]VOLTage:STARt:STATe <boolean>
[SOURce:][ACW:]VOLTage:STARt:STATe?
```

Parameter

Set value:	ON(1)	Set
	OFF(0)	Not set (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
ACW:VOLT:STAR:STAT ON
```

ACW:VOLT:SWE:FALL:TIM

Sets the voltage fall time for AC withstanding voltage tests.
This setting is enabled when ACW:VOLT:SWE:FALL:TIM:STAT is set to ON.

Command

```
[SOURce:][ACW:]VOLTage:SWEep:FALL:TIMer <numeric>
[SOURce:][ACW:]VOLTage:SWEep:FALL:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.1 S)

Response

NR3

Example

```
ACW:VOLT:SWE:FALL:TIM 0.1S
```

ACW:VOLT:SWE:FALL:TIM:STAT

Sets whether to set the voltage fall time for AC withstanding voltage tests.
Use ACW:VOLT:SWE:FALL:TIM to set the voltage fall time.

Command

```
[SOURce:][ACW:]VOLTage:SWEep:FALL:TIMer:STATe <boolean>
[SOURce:][ACW:]VOLTage:SWEep:FALL:TIMer:STATe?
```

Parameter

Set value:	ON(1)	Set
	OFF(0)	Not set (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
ACW:VOLT:SWE:FALL:TIM:STAT ON
```

ACW:VOLT:SWE:TIM

Sets the voltage rise time for AC withstanding voltage tests.

Command

```
[SOURce:][ACW:]VOLTage:SWEep[:RISE]:TIMer <numeric>
[SOURce:][ACW:]VOLTage:SWEep[:RISE]:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.1 S)

Response

NR3

Example

```
ACW:VOLT:SWE:TIM 1S
```

ACW:VOLT:TIM

Sets the test time for AC withstanding voltage tests.
This setting is enabled when ACW:VOLT:TIM:STAT is set to ON.

Command

```
[SOURce:][ACW:]VOLTage:TIMer <numeric>
[SOURce:][ACW:]VOLTage:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.2 S)

Response

NR3

Example

```
ACW:VOLT:TIM 60S
```

ACW:VOLT:TIM:STAT

Sets whether to set the test time for AC withstanding voltage tests.
Use ACW:VOLT:TIM to set the test time.

Command

```
[SOURce:][ACW:]VOLTage:TIMer:STATe <boolean>
[SOURce:][ACW:]VOLTage:TIMer:STATe?
```

Parameter

Set value:	ON(1)	Set (default)
	OFF(0)	Not set

Settings are reset to default when the *RST command is sent.
If the offset setting is set to ON (CALC:SCAL:OFFS:AUTO ON), the ACW:VOLT:TIM:STAT setting turns OFF when a test is performed.

Response

NR1

Example

```
ACW:VOLT:TIM:STAT ON
```

[SOURce:]DCW Command

Sets the test conditions for DC withstanding voltage tests (DCW).

DCW:VOLT

Sets the test voltage for DC withstanding voltage tests.

Command

```
[SOURce:]DCW:VOLTage[:LEVel][:IMMediate][:AMPLitude] <numeric>
[SOURce:]DCW:VOLTage[:LEVel][:IMMediate][:AMPLitude]?
```

Parameter

Unit: V

Settings are reset to default when the *RST command is sent. (0 V)

Response

NR3

Example

```
DCW:VOLT 750V
```

DCW:VOLT:DISC:INT:STAT

Sets whether to discharge when interlock is activated in DC withstanding voltage tests.

Command

```
[SOURce:]DCW:VOLTage:DISCharge:INTerlock:STATe <boolean>
[SOURce:]DCW:VOLTage:DISCharge:INTerlock:STATe?
```

Parameter

Set value:	ON(1)	Discharge (default)
	OFF(0)	Not discharge

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DCW:VOLT:DISC:INT:STAT ON
```

DCW:VOLT:DISC:TIM

Sets the discharge time for DC withstanding voltage tests.

Command

```
[SOURce:]DCW:VOLTage:DISCharge:TIMer[:MINimum] <numeric>
[SOURce:]DCW:VOLTage:DISCharge:TIMer[:MINimum]?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0 S)

Response

NR3

Example

```
DCW:VOLT:DISC:TIM 10S
```

DCW:VOLT:END:STAT

Sets the terminating voltage for DC withstanding voltage tests.
This is valid when the voltage fall time (DCW:VOLT:SWE:FALL:TIM:STAT ON) is enabled.

Command

```
[SOURce]:DCW:VOLTage:END:STATe <boolean>
[SOURce]:DCW:VOLTage:END:STATe?
```

Parameter

Set value:	ON(1)	On
	OFF(0)	Off (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DCW:VOLT:END:STAT ON
```

DCW:VOLT:PROT

Sets the limit voltage for DC withstanding voltage tests.

Command

```
[SOURce:]DCW:VOLTage:PROTection[:LEVel][:UPPer] <numeric>
[SOURce:]DCW:VOLTage:PROTection[:LEVel][:UPPer]?
```

Parameter

Unit: V

Settings are reset to default when the *RST command is sent. (7500 V, only TOS9311 is 10500 V)

Response

NR3

Example

```
DCW:VOLT:PROT 1500V
```

DCW:VOLT:STAR

Sets the start voltage as a percentage for DC withstanding voltage tests.
This setting is enabled when DCW:VOLT:STAR:STAT is set to ON.

Command

```
[SOURce:]DCW:VOLTage:STARt[:LEVel] <numeric>
[SOURce:]DCW:VOLTage:STARt[:LEVel]?
```

Parameter

Unit: PCT

Settings are reset to default when the *RST command is sent. (50 PCT)

Response

NR3

Example

```
DCW:VOLT:STAR 50PCT
```

DCW:VOLT:STAR:STAT

Sets whether to set the start voltage for DC withstanding voltage tests.
Use DCW:VOLT:STAR to set the start voltage.

Command

```
[SOURce:]DCW:VOLTage:STARt:STATe <boolean>
[SOURce:]DCW:VOLTage:STARt:STATe?
```

Parameter

Set value:	ON(1)	Set
	OFF(0)	Not set (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DCW:VOLT:STAR:STAT ON
```

DCW:VOLT:SWE:FALL:TIM

Sets the voltage fall time for DC withstanding voltage tests.
This setting is enabled when DCW:VOLT:SWE:FALL:TIM:STAT is set to ON.

Command

```
[SOURce:]DCW:VOLTage:SWEep:FALL:TIMer <numeric>
[SOURce:]DCW:VOLTage:SWEep:FALL:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.1 S)

Response

NR3

Example

```
DCW:VOLT:SWE:FALL:TIM 0.1S
```

DCW:VOLT:SWE:FALL:TIM:STAT

Sets whether to set the voltage fall time for DC withstanding voltage tests.
Use DCW:VOLT:SWE:FALL:TIM to set the voltage fall time.

Command

```
[SOURce:]DCW:VOLTage:SWEep:FALL:TIMer:STATe <boolean>
[SOURce:]DCW:VOLTage:SWEep:FALL:TIMer:STATe?
```

Parameter

Set value:	ON(1)	Set
	OFF(0)	Not set (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
DCW:VOLT:SWE:FALL:TIM:STAT ON
```

DCW:VOLT:SWE:TIM

Sets the voltage rise time for DC withstanding voltage tests.

Command

```
[SOURce:]DCW:VOLTage:SWEep[:RISE]:TIMer <numeric>
[SOURce:]DCW:VOLTage:SWEep[:RISE]:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.1 S)

Response

NR3

Example

```
DCW:VOLT:SWE:TIM 0.1
```

DCW:VOLT:TIM

Sets the test time for DC withstanding voltage tests.
This setting is enabled when DCW:VOLT:TIM:STAT is set to ON.

Command

```
[SOURce:]DCW:VOLTage:TIMer <numeric>
[SOURce:]DCW:VOLTage:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.2 S)

Response

NR3

Example

```
DCW:VOLT:TIM 500MS
```

DCW:VOLT:TIM:STAT

Sets whether to set the test time for DC withstanding voltage tests.
Use DCW:VOLT:TIM to set the test time.

Command

```
[SOURce:]DCW:VOLTage:TIMer:STATe <boolean>
[SOURce:]DCW:VOLTage:TIMer:STATe?
```

Parameter

Set value:	ON(1)	Set (default)
	OFF(0)	Not set

Settings are reset to default when the *RST command is sent.
If the offset setting is set to ON (CALC:SCAL:OFFS:AUTO ON), the DCW:VOLT:TIM:STAT setting turns OFF when a test is performed.

Response

NR1

Example

```
DCW:VOLT:TIM:STAT ON
```

[SOURce:]EC Command

Sets the test condition for earth continuity tests (EC).

EC:AC:CURR

Sets the test current for earth continuity tests (AC).

Command

```
[SOURce:]EC:AC:CURRent[:LEVel][:IMMediate][:AMPLitude] <numeric>
[SOURce:]EC:AC:CURRent[:LEVel][:IMMediate][:AMPLitude]?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (3 A)

Response

NR3

Example

```
EC:AC:CURR 5
```

EC:AC:CURR:FREQ

Sets the test current frequency for earth continuity tests (AC).

Command

```
[SOURce:]EC:AC:CURRent:FREQuency <numeric>
[SOURce:]EC:AC:CURRent:FREQuency?
```

Parameter

Unit: HZ

Settings are reset to default when the *RST command is sent. (50 HZ)

Response

NR3

Example

```
EC:CURR:FREQ 50HZ
```

EC:AC:CURR:PROT

Sets the limit current for earth continuity tests (AC).

Command

```
[SOURce:]EC:AC:CURRent:PROTection[:LEVel][:UPPer] <numeric>
[SOURce:]EC:AC:CURRent:PROTection[:LEVel][:UPPer]?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (42 A)

Response

NR3

Example

```
EC:AC:CURR:PROT 40
```

EC:AC:CURR:SWE:FALL:TIM

Sets the current fall time for earth continuity tests (AC).
This setting is enabled when EC:AC:CURR:SWE:FALL:TIM:STAT is set to ON.

Command

```
[SOURce:]EC:AC:CURRent:SWEep:FALL:TIMer <numeric>
[SOURce:]EC:AC:CURRent:SWEep:FALL:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.1 S)

Response

NR3

Example

```
EC:AC:CURR:SWE:FALL:TIM 0.1S
```

EC:AC:CURR:SWE:FALL:TIM:STAT

Sets whether to set the current fall time for earth continuity tests (AC).
EC:AC:CURR:SWE:FALL:TIM to set the current fall time.

Command

```
[SOURce:]EC:AC:CURRent:SWEep:FALL:TIMer:STATe <boolean>
[SOURce:]EC:AC:CURRent:SWEep:FALL:TIMer:STATe?
```

Parameter

Set value:	ON(1)	Set
	OFF(0)	Not set (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
EC:AC:CURR:SWE:FALL:TIM:STAT ON
```

EC:AC:CURR:SWE:TIM

Sets the current rise time for earth continuity tests (AC).

Command

```
[SOURce:]EC:AC:CURRent:SWEep[:RISE]:TIMer <numeric>
[SOURce:]EC:AC:CURRent:SWEep[:RISE]:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.1 S)

Response

NR3

Example

```
EC:AC:CURR:SWE:TIM 1
```

EC:AC:CURR:TIM

Sets the test time for earth continuity tests (AC).
This setting is enabled when EC:AC:CURR:TIM:STAT is set to ON.

Command

```
[SOURce:]EC:AC:CURRent:TIMer <numeric>
[SOURce:]EC:AC:CURRent:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.2 S)

Response

NR3

Example

```
EC:AC:CURR:TIM 5
```

EC:AC:CURR:TIM:STAT

Sets whether to set the test time for earth continuity tests (AC).
Use EC:AC:CURR:TIM to set the test time.

Command

```
[SOURce:]EC:AC:CURRent:TIMer:STATe <boolean>
[SOURce:]EC:AC:CURRent:TIMer:STATe?
```

Parameter

Set value:	ON(1)	Set (default)
	OFF(0)	Not set

Settings are reset to default when the *RST command is sent.
If the offset setting is set to ON (CALC:SCAL:OFFS:AUTO ON), the EC:AC:CURR:TIM:STAT setting turns OFF when a test is performed.

Response

NR1

Example

```
EC:AC:CURR:TIM:STAT ON
```

EC:DC:CURR

Sets the test current for earth continuity tests (DC).

Command

```
[SOURce:]EC:DC:CURRent[:LEVel][:IMMediate][:AMPLitude] <numeric>
[SOURce:]EC:DC:CURRent[:LEVel][:IMMediate][:AMPLitude]?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (3 A)

Response

NR3

Example

```
EC:DC:CURR 40
```

EC:DC:CURR:PROT

Sets the limit current for earth continuity tests (DC).

Command

```
[SOURce:]EC:DC:CURRent:PROTection[:LEVel][:UPPer] <numeric>
[SOURce:]EC:DC:CURRent:PROTection[:LEVel][:UPPer]?
```

Parameter

Unit: A

Settings are reset to default when the *RST command is sent. (42 A)

Response

NR3

Example

```
EC:DC:CURR:PROT 40
```

EC:DC:CURR:SWE:FALL:TIM

Sets the current fall time for earth continuity tests (DC).
This setting is enabled when EC:DC:CURR:SWE:FALL:TIM:STAT is set to ON.

Command

```
[SOURce:]EC:DC:CURRent:SWEep:FALL:TIMer <numeric>
[SOURce:]EC:DC:CURRent:SWEep:FALL:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.1 S)

Response

NR3

Example

```
EC:DC:CURR:SWE:FALL:TIM 0.1S
```

EC:DC:CURR:SWE:FALL:TIM:STAT

Sets whether to set the current fall time for earth continuity tests (DC).
EC:DC:CURR:SWE:FALL:TIM to set the current fall time.

Command

```
[SOURce:]EC:DC:CURRent:SWEep:FALL:TIMer:STATe <boolean>
[SOURce:]EC:DC:CURRent:SWEep:FALL:TIMer:STATe?
```

Parameter

Set value:	ON(1)	Set
	OFF(0)	Not set (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
EC:DC:CURR:SWE:FALL:TIM:STAT ON
```

EC:DC:CURR:SWE:TIM

Sets the current rise time for earth continuity tests (DC).

Command

```
[SOURce:]EC:DC:CURRent:SWEep[:RISE]:TIMer <numeric>
[SOURce:]EC:DC:CURRent:SWEep[:RISE]:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.1 S)

Response

NR3

Example

```
EC:DC:CURR:SWE:TIM 1
```

EC:DC:CURR:TIM

Sets the test time for earth continuity tests (DC).
This setting is enabled when EC:AC:CURR:TIM:STAT is set to ON.

Command

```
[SOURce:]EC:DC:CURRent:TIMer <numeric>
[SOURce:]EC:DC:CURRent:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.2 S)

Response

NR3

Example

```
EC:DC:CURR:TIM 500S
```

EC:DC:CURR:TIM:STAT

Sets whether to set the test time for earth continuity tests (DC).
Use EC:AC:CURR:TIM to set the test time.

Command

```
[SOURce:]EC:DC:CURRent:TIMer:STATe <boolean>
[SOURce:]EC:DC:CURRent:TIMer:STATe?
```

Parameter

Set value:	ON(1)	Set (default)
	OFF(0)	Not set

Settings are reset to default when the *RST command is sent.
If the offset setting is set to ON (CALC:SCAL:OFFS:AUTO ON), the EC:DC:CURR:TIM:STAT setting turns OFF when a test is performed.

Response

NR1

Example

```
EC:DC:CURR:TIM:STAT ON
```

[SOURce:]IR Command

Sets the test condition for insulation resistance tests (IR).

IR:TERM:POL?

Queries the polarity of the power supplied to the output terminals in insulation resistance tests.

Command

```
[SOURce:]IR:TERMinal:POLarity?
```

Response

character
NORM: Supplies power with normal phase
REV: Supplies power with reversed phase

Example

```
IR:TERM:POL?
```

Related command

```
IR:VOLT:RANG
```

IR:VOLT

Sets the test voltage for insulation resistance tests.

Command

```
[SOURce:]IR:VOLTage[:LEVel][:IMMediate][:AMPLitude] <numeric>
[SOURce:]IR:VOLTage[:LEVel][:IMMediate][:AMPLitude]?
```

Parameter

Unit: V
Settings are reset to default when the *RST command is sent. (0 V)

Response

NR3

Example

```
IR:VOLT 500
```

IR:VOLT:DISC:INT:STAT

Sets whether to discharge when interlock is activated in insulation resistance tests.

Command

```
[SOURce:]IR:VOLTage:DISCharge:INTerlock:STATe <boolean>
[SOURce:]IR:VOLTage:DISCharge:INTerlock:STATe?
```

Parameter

Set value:	ON(1)	Discharge (default)
	OFF(0)	Not discharge

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
IR:VOLT:DISC:INT:STAT ON
```

IR:VOLT:DISC:TIM

Sets the discharge time for insulation resistance tests.

Command

```
[SOURce:]IR:VOLTage:DISCharge:TIMer[:MINimum] <numeric>
[SOURce:]IR:VOLTage:DISCharge:TIMer[:MINimum]?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0 S)

Response

NR3

Example

```
IR:VOLT:DISC:TIM 10S
```

IR:VOLT:PROT

Sets the limit voltage for insulation resistance tests.

Command

```
[SOURce:]IR:VOLTage:PROTection[:LEVel][:UPPer] <numeric>
[SOURce:]IR:VOLTage:PROTection[:LEVel][:UPPer]?
```

Parameter

Unit: V

Settings are reset to default when the *RST command is sent. (1020 V)

Response

NR3

Example

```
IR:VOLT:PROT 500
```

IR:VOLT:RANG

Sets the output voltage range for insulation resistance tests.

The power supply line polarity is set to normal when other than the 1000 V range is specified and reverse when the 1000 V range is specified. On the TOS9300 andTOS9302, the range is fixed to 1000 V (reverse polarity).

Command

```
[SOURce:]IR:VOLTage:RANGe <numeric>
[SOURce:]IR:VOLTage:RANGe?
```

Parameter (Except TOS9311)

Set value:	7200	Normal polarity (NORMal)
	1000	Reverse polarity (REVerse) (default)

Unit: V

Settings are reset to default when the *RST command is sent.

Parameter (TOS9311 only)

Set value:	10000	Normal polarity (NORMal)
	1000	Reverse polarity (REVerse) (default)

Unit: V

Settings are reset to default when the *RST command is sent.

Response

NR3

Example

```
IR:VOLT:RANG 1000
```

Related command

```
IR:TERM:POL?
```

IR:VOLT:STAR

Sets the start voltage as a percentage for insulation resistance tests.
This setting is enabled when IR:VOLT:STAR:STAT is set to ON.

Command

```
[SOURce:]IR:VOLTage:STARt[:LEVel] <numeric>
[SOURce:]IR:VOLTage:STARt[:LEVel]?
```

Parameter

Unit: PCT

Settings are reset to default when the *RST command is sent. (50 PCT)

Response

NR3

Example

```
IR:VOLT:STAR 50PCT
```

IR:VOLT:STAR:STAT

Sets whether to set the start voltage for insulation resistance tests.
Use IR:VOLT:STAR to set the start voltage.

Command

```
[SOURce:]IR:VOLTage:STARt:STATe <boolean>
[SOURce:]IR:VOLTage:STARt:STATe?
```

Parameter

Set value:	ON(1)	Set
	OFF(0)	Not set (default)

Settings are reset to default when the *RST command is sent.

Response

NR1

Example

```
IR:VOLT:STAR:STAT ON
```

IR:VOLT:SWE:TIM

Sets the voltage rise time for insulation resistance tests.

Command

```
[SOURce:]IR:VOLTage:SWEep[:RISE]:TIMer <numeric>
[SOURce:]IR:VOLTage:SWEep[:RISE]:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.1 S)

Response

NR3

Example

```
IR:VOLT:SWE:TIM 1
```

IR:VOLT:TIM

Sets the test time for insulation resistance tests.
This setting is enabled when IR:VOLT:TIM:STAT is set to ON.

Command

```
[SOURce:]IR:VOLTage:TIMer <numeric>
[SOURce:]IR:VOLTage:TIMer?
```

Parameter

Unit: S

Settings are reset to default when the *RST command is sent. (0.2 S)

Response

NR3

Example

```
IR:VOLT:TIM 5
```

IR:VOLT:TIM:STAT

Sets whether to set the test time for insulation resistance tests.
Use IR:VOLT:TIM to set the test time.

Command

```
[SOURce:]IR:VOLTage:TIMer:STATe <boolean>
[SOURce:]IR:VOLTage:TIMer:STATe?
```

Parameter

Set value:	ON(1)	Set (default)
	OFF(0)	Not set

Settings are reset to default when the *RST command is sent.
If the offset setting is set to ON (CALC:SCAL:OFFS:AUTO ON), the IR:VOLT:TIM:STAT setting turns OFF when a test is performed.

Response

NR1

Example

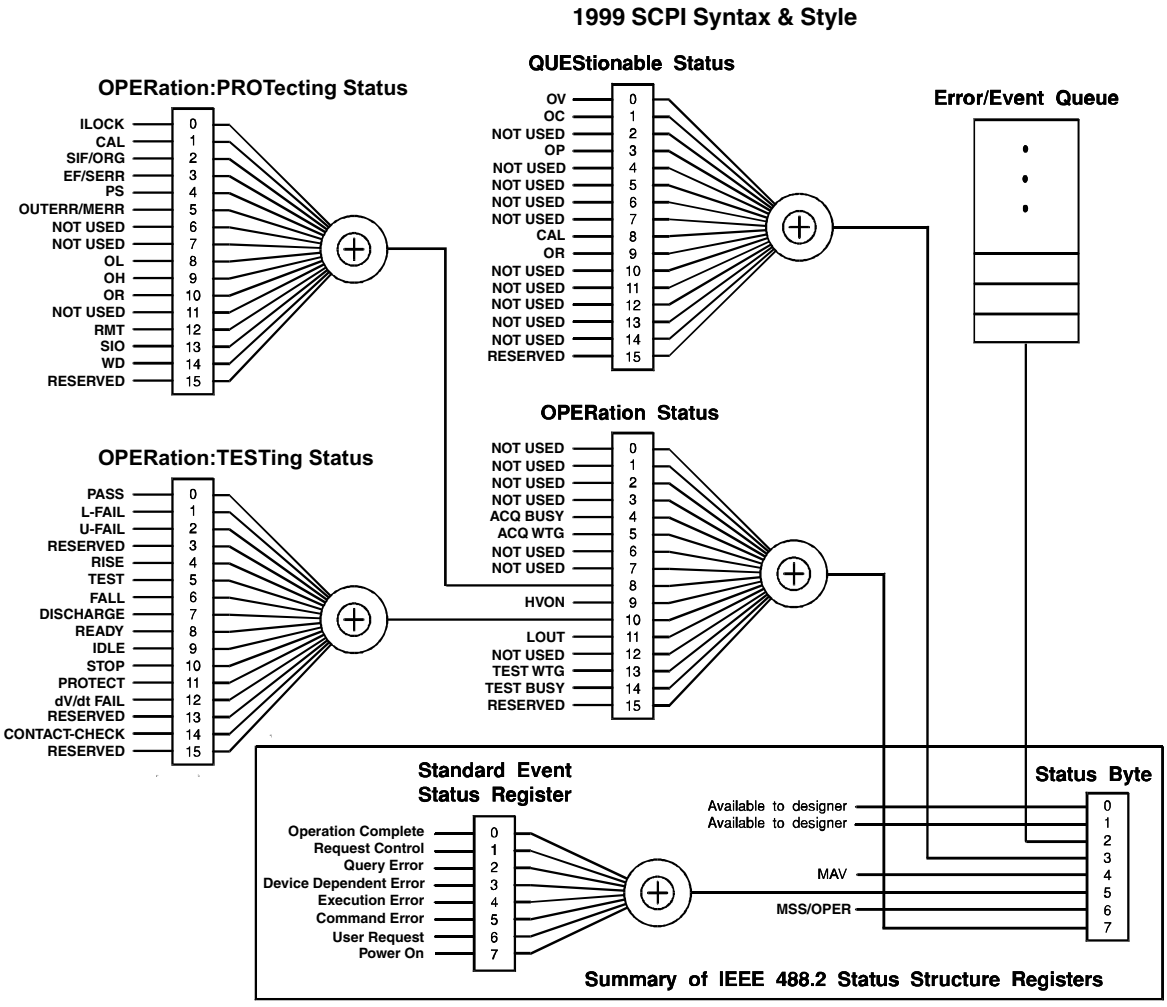
```
IR:VOLT:TIM:STAT ON
```

STATus Command

Relates to TOS93 series operating status.

Status Report Structure

A “+” represents the logical OR of the register bits.



Standard Architecture

IEEE 488.2 and SCPI registers are used for status reports.

In each SCPI status register, there are the following sub registers: the CONDition register, the EVENt register, the ENABle register, the PTRansition filter, and the NTRansition filter.

->"Withstanding Voltage and Insulation Resistance Test Settings" (*p.196*)

CONDition register

Transitions of the CONDition register are automatic and reflect the condition of this product in real time. Reading this register does not affect its contents.

EVENt register

The EVENt register bits are automatically set according to the changes in the CONDition register. The rule for setting the bits varies depending on the positive and negative transition registers (PTRansition and NTRansition). The EVENt register is reset when it is read.

ENABle register

The ENABle register enables reports to the summary bit or status bit of the event bits.

Transition filters

Use the PTRansition (positive transition) filter to report events when the condition changes from false to true.

Use the NTRansition (negative transition) filter to report events when the condition changes from true to false.

If both the positive filter and negative filter are set to true, events can be reported each time the status changes. If both filters are cleared, event reporting is disabled.

Status Byte Register

The status byte register stores STB and RQS (MSS) messages as defined by the IEEE 488.1 standard. The status byte register can be read by using IEEE 488.1 serial polling or the IEEE 488.2 common command *STB?.

When the controller executes serial polling, bit 6 responds with request service (RQS). The status byte value is not changed by serial polling.

*STB? makes the device transmit the contents of the status byte register and the master status summary (MSS) message. *STB? does not change the status byte, MSS, and RQS.

Bit	Bit weight	Bit name	Description
0	1	Reserved	Reserved for future use by IEEE 488. The bit value is notified as zero.
1	2	Reserved	
2	4	Error/Event Queue	If data exists in the error or event queue, this bit is set to true.
3	8	Questionable Status Register (QUES)	This bit is set to true when a bit is set in the QUEStionable event status register and the corresponding bit in the QUEStionable status enable register is true.
4	16	Message Available (MAV)	This bit is set to true when a request is received from the digital programming interface and this product is ready to generate the data byte.
5	32	Standard Event Status Bit Summary (ESB)	This bit is set to true when a bit is set in the event status register.
6	64	Request Service (RQS)	This bit is set to true when a bit is set in the service request enable register and the corresponding bit exists in the status byte. The SRQ line of the GPIB is set.
		Master Status Summary (MSS)	This bit is set when any bit in the status byte register is set to 1, and the corresponding bit in the service request enable register is set to 1.
7	128	Operation Status Register (OPER)	This bit is set to true when a bit is set in the OPERation event status register and the corresponding bit in the OPERation status enable register is set.
8 to 15	n/a	Not Used	Not used

Event Status Register

The event status register bits are set when certain events occur during product operation. All the event status register bits are set by the error event queue.

This register is defined by the IEEE 488.2 standard and is controlled using the IEEE 488.2 common commands *ESE, *ESE?, and *ESR?.

You can check the error content with SYST:ERR?.

Bit	Bit weight	Bit name	Description	Error number
0	1	Operation Complete (OPC)	Set when an *OPC command is received and all operations in standby have been completed.	-800 to -899
1	2	Request Control (RQC)	Not used	None
2	4	Query Error (QYE)	Set when an attempt is made to read data from the output queue when there is no data or when the output queue is not in the wait state. This indicates that there is no data in the output queue.	-400 to -499
3	8	Device Dependent Error (DDE)	Set when there is a device-specific error.	-300 to -399 100 to 999
4	16	Execution Error (EXE)	Set when this product evaluates that the program data after the header is outside the formal input range or does not match the specifications of this product. This indicates that a valid SCPI command may not be executed correctly depending on the state of this product.	-200 to 299
5	32	Command Error (CME)	Set when an IEEE 488.2 syntax error is detected by the parser, when an unidentifiable header is received, or when a group execution trigger enters the internal IEEE 488.2 SCPI command input buffer.	-100 to -199
6	64	User Request (URQ)	Not used	None
7	128	Power On (PON)	Not used	None
8 to 15	n/a	Reserved	Not used	None

OPERation Status Register

The OPERation status register is a 16-bit register that contains information about the normal operating status of this product.

Bit	Bit weight	Bit name	Description
0	1	NOT USED	Not used
1	2	NOT USED	Not used
2	4	NOT USED	Not used
3	8	NOT USED	Not used
4	16	MEASuring (ACQ BUSY)	Measurement is in progress.
5	32	ACQuire Waiting for TRIGger (ACQ WTG)	The product is waiting for a measurement trigger.
6	64	NOT USED	Not used
7	128	NOT USED	Not used
8	256	RROTecting (PROT)	The PROTecting status register bit is set.
9	512	Voltage ON (HVON)	Test in progress or voltage remaining across the output terminals.
10	1024	TESTing (TEST)	The TESTing status register bit is set.
11	2048	NOT USED	Not used
12	4096	NOT USED	Not used
13	8192	READY (TEST WTG)	The product is waiting for a test trigger.
14	16384	TEST is running (TEST BUSY)	Waiting for test execution or test in progress.
15	32768	RESERVED	Always 0.

<bit-item>

The STAT:OPER? command provides <bit-item> nodes. Refer to the table below to replace a <bit-item> with a necessary bit.

<bit-item>	Bit	Bit name
ABUS	4	MEASuring (ACQ BUSY)
AWTG	5	ACQuire Waiting for TRIGger (ACQ WTG)
HVON	9	Voltage ON (HVON)
LOUT	11	Line Output (LOUT)
TWTG	13	READY (TEST WTG)
TBUS	14	TEST is running (TEST BUSY)

STAT:OPER?

Queries the event of the OPERation status register.
A query clears the contents of the register.

Command

```
STATus:OPERation[:EVENt]?
```

Response

NR1

STAT:OPER:<bit-item>?

Queries the event of the specified bit in the OPERation status register bits.
A query clears the contents of the register. For detail of <bit-item>, see "<bit-item>" *(p.158)*.

Command

```
STATus:OPERation[:EVENt][:BIT]:<bit-item>?
```

Example

```
STAT:OPER:ABUS?
```

Response

NR1

1	Set
0	Not set

STAT:OPER:COND?

Queries the condition of the OPERation status register.
A query does not clear the contents of the register.

Command

```
STATus:OPERation:CONDition?
```

Response

NR1

STAT:OPER:COND:<bit-item>?

Queries the status of the specified bit in the OPERation status register bits.
A query does not clear the contents of the register. For detail of <bit-item>, see "<bit-item>" *(p.158)*.

Command

```
STATus:OPERation:CONDition[:BIT]:<bit-item>?
```

Example

```
STAT:OPER:COND:AWTG?
```

Response

NR1

1	Set
0	Not set

STAT:OPER:ENAB

Sets the enable register of the OPERation status register.

Command

```
STATus:OPERation:ENABle <NRf>
STATus:OPERation:ENABle?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:ENAB:<bit-item>

Sets the enable register of the specified bit in the OPERation status register.
For detail of <bit-item>, see "<bit-item>" *(p.158)*.

Command

```
STATus:OPERation:ENABle[:BIT]:<bit-item> <boolean>
STATus:OPERation:ENABle[:BIT]:<bit-item>?
```

Parameter

Set value:	ON(1)	Set
	OFF(0)	Not set (default)

Example

```
STAT:OPER:ENAB:HVON ON
```

Response

NR1

STAT:OPER:NTR

Sets the negative transition filter of the OPERation status register.

Command

```
STATus:OPERation:NTRansition <NRf>
STATus:OPERation:NTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:NTR:<bit-item>

Sets the negative transition filter of the specified bit in the OPERation status register.
For detail of <bit-item>, see "<bit-item>" *(p.158)*.

Command

```
STATus:OPERation:NTRansition[:BIT]:<bit-item> <boolean>
STATus:OPERation:NTRansition[:BIT]:<bit-item>?
```

Parameter

Set value:	ON(1)	Set
	OFF(0)	Not set (default)

Example

```
STAT:OPER:NTR:LOUT ON
```

Response

NR1

STAT:OPER:PTR

Sets the positive transition filter of the OPERation status register.

Command

```
STATus:OPERation:PTRansition <NRf>
STATus:OPERation:PTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:PTR:<bit-item>

Sets the positive transition filter of the specified bit in the OPERation status register.
For detail of <bit-item>, see "<bit-item>" *(p.158)*.

Command

```
STATus:OPERation:PTRansition[:BIT]:<bit-item> <boolean>
STATus:OPERation:PTRansition[:BIT]:<bit-item>?
```

Parameter

Set value:	ON(1)	Set (default)
	OFF(0)	Not set

Example

```
STAT:OPER:PTR:TWTG ON
```

Response

NR1

OPERation:PROTecting Status Register

The OPERation:PROTecting status register is a 16-bit register that contains information about the status of the product's protection functions.

Bit	Bit weight	Bit name	Description
0	1	Interlock(ILOCK)	Interlock signal input detected.
1	2	Calibration(CAL)	The set calibration date has passed.
2	4	SCAN IF(SIF)	Scanner cable disconnection/connection detected.
3	8	Earth Fault(EF)	Ground current error detected.
4	16	Power Supply(PS)	Power supply problem detected.
5	32	Output Error(OUTERR)	The output voltage exceeded the rated limits.
6	64	NOT USED	Not used
7	128	NOT USED	Not used
8	256	Over Load(OL)	The output power exceeded the output limit.
9	512	Over Heat(OH)	The internal temperature of the product has become abnormally high.
10	1024	Over Rating(OR)	An output current was generated for a length of time that exceeds the rated time.
11	2048	NOT USED	Not used
12	4096	Remote(RMT)	A connection or disconnection of the remote control connector was detected.
13	8192	SIGNAL I/O(SIO)	A change in the SIGNAL I/O connector's ENABLE signal was detected.
14	16384	Watchdog(WD)	Watchdog protection function was detected. Internal communication error detected.
15	32768	RESERVED	Always 0.

STAT:OPER:PROT?

Queries the event of the OPERation:PROTecting status register.
A query clears the contents of the register.

Command

```
STATus:OPERation:PROTecting[:EVENt]?
```

Response

NR1

STAT:OPER:PROT:COND?

Queries the condition of the OPERation:PROTecting status register.
A query does not clear the contents of the register.

Command

```
STATus:OPERation:PROTecting:CONDition?
```

Response

NR1

STAT:OPER:PROT:ENAB

Sets the enable register of the OPERation:PROTecting status register.

Command

```
STATus:OPERation:PROTecting:ENABle <NRf>
STATus:OPERation:PROTecting:ENABle?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:PROT:NTR

Sets the negative transition filter of the OPERation:PROTecting status register.

Command

```
STATus:OPERation:PROTecting:NTRansition <NRf>
STATus:OPERation:PROTecting:NTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:PROT:PTR

Sets the positive transition filter of the OPERation:PROTecting status register.

Command

```
STATus:OPERation:PROTecting:PTRansition <NRf>
STATus:OPERation:PROTecting:PTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

OPERation:TESTing Status Register

The OPERation:TESTing status register is a 16-bit register that contains information about the status of tests on the product.

Bit	Bit weight	Bit name	Description
0	1	PASS	PASS judgment
1	2	L-FAIL	L-FAIL judgment, C-FAIL judgment[1], dV/dt FAIL judgment[2]
2	4	U-FAIL	U-FAIL judgment, C-FAIL judgment[1], dV/dt FAIL judgment[3]
3	8	RESERVED	Used for internal processing
4	16	RISE	Voltage rising
5	32	TEST	Testing
6	64	FALL	Voltage falling
7	128	DISCHARGE	Discharging
8	256	READY	Waiting for testing to start
9	512	IDLE	Standby
10	1024	STOP	Stopping testing
11	2048	PROTECT	Protection activated
12	4096	dV/dt	dV/dt FAIL judgment[2 3]
13	8192	NOT USED	Not used
14	16384	CONTACT-CHECK / Precalibration	Checking contact
15	32768	RESERVED	Always 0

1. When a judgment result is CONTACT-FAIL/Calibration-FAIL, bit 1 and bit 2 are set.
2. When a judgment result is dV/dt FAIL in insulation resistance tests, bit 12 and bit 1 are set.
3. When a judgment result is dV/dt FAIL in AC withstanding voltage tests, bit 12 and bit 2 are set.

STAT:OPER:TEST?

Queries the event of the OPERation:TESTing status register.
A query clears the contents of the register.

Command

```
STATus:OPERation:TESTing[:EVENt]?
```

Response

NR1

STAT:OPER:TEST:COND?

Queries the condition of the OPERation:TESTing status register.
A query does not clear the contents of the register.

Command

```
STATus:OPERation:TESTing:CONDition?
```

Response

NR1

STAT:OPER:TEST:ENAB

Sets the enable register of the OPERation:TESTing status register.

Command

```
STATus:OPERation:TESTing:ENABle <NRf>
STATus:OPERation:TESTing:ENABle?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:TEST:NTR

Sets the negative transition filter of the OPERation:TESTing status register.

Command

```
STATus:OPERation:TESTing:NTRansition <NRf>
STATus:OPERation:TESTing:NTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:TEST:PTR

Sets the positive transition filter of the OPERation:TESTing status register.

Command

```
STATus:OPERation:TESTing:PTRansition <NRf>
STATus:OPERation:TESTing:PTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

QUEStionable Status Register

The QUEStionable status register is a 16-bit register that stores information related to the product's status and the questionable events that occur during product operation. The QUEStionable status register bits may indicate that there are problems with the product's measured data.

Bit	Bit weight	Bit name	Description
0	1	Over Voltage(OV)	Voltage measurement over-range.
1	2	Over Current(OC)	Current measurement over-range.
2	4	NOT USED	Not used
3	8	Over Power(OP)	Power measurement over-range.
4	16	NOT USED	Not used
5	32	NOT USED	Not used
6	64	NOT USED	Not used
7	128	NOT USED	Not used
8	256	CALibration(CAL)	The calibration date has passed.
9	512	Over Resistance(OR)	Resistance measurement over-range.
10	1024	NOT USED	Not used
11	2048	NOT USED	Not used
12	4096	NOT USED	Not used
13	8192	NOT USED	Not used
14	16384	NOT USED	Not used
15	32768	RESERVED	Always 0

STAT:QUES?

Queries the event of the QUEStionable status register.
A query clears the contents of the register.

Command

```
STATus:QUEStionable[:EVENt]?
```

Response

NR1

STAT:QUES:COND?

Queries the condition of the QUEStionable status register.
A query does not clear the contents of the register.

Command

```
STATus:QUEStionable:CONDition?
```

Response

NR1

STAT:QUES:ENAB

Sets the enable register of the QUEStionable status register.

Command

```
STATus:QUEStionable:ENABle <NRf>
STATus:QUEStionable:ENABle?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:QUES:NTR

Sets the negative transition filter of the QUEStionable status register.

Command

```
STATus:QUEStionable:NTRansition <NRf>
STATus:QUEStionable:NTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:QUES:PTR

Sets the positive transition filter of the QUEStionable status register.

Command

```
STATus:QUEStionable:PTRansition <NRf>
STATus:QUEStionable:PTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

Preset Status

STAT:PRES

Resets the ENABle, PTRansition, and NTRansition filter registers of all status registers (including sub registers) to their default values.

Default values

STATus:ENABle = 0x0000
STATus:PTRansition = 0x7FFF
STATus:NTRansition = 0x0000

Command

```
STATus:PRESet
```

SYSTem Command

Relates to system settings.

SYST:BEEP

Turns all buzzers on and off.

Command

```
SYSTem:BEEPer[:ALL][:STATe] <boolean>
SYSTem:BEEPer[:ALL][:STATe]?
```

Parameter

Set value:	ON (1)	Buzzer on (default)
	OFF (0)	Buzzer off

The setting may change when a SYST:BEEP:KEY, SYST:BEEP:PROT, or SYST:BEEP:SCPI is sent.

Response

NR1

Returns 1 when any buzzer is on when an invalid operation is executed, a protection function is activated, or an SCPI error occurs. Returns 0 when all settings are off.

Example

```
SYST:BEEP OFF
```

SYST:BEEP:KEY

Turns on or off the buzzer that sounds when an invalid key is pressed.

Command

```
SYSTem:BEEPer:KEY[:STATe] <boolean>
SYSTem:BEEPer:KEY[:STATe]?
```

Parameter

Set value:	ON (1)	Buzzer on (default)
	OFF (0)	Buzzer off

The setting may change when a SYST:BEEP is sent.

Response

NR1

Example

```
SYST:BEEP:KEY ON
```

SYST:BEEP:PROT

Turns on or off the buzzer that sounds when a protection function is activated.

Command

```
SYSTem:BEEPer:PROTection[:STATe] <boolean>
SYSTem:BEEPer:PROTection[:STATe]?
```

Parameter

Set value:	ON (1)	Buzzer on (default)
	OFF (0)	Buzzer off

The setting may change when a SYST:BEEP is sent

Response

NR1

Example

```
SYST:BEEP:PROT ON
```

SYST:BEEP:SCPI

Turns on or off the buzzer that sounds when an SCPI error occurs.

Command

```
SYSTem:BEEPer:SCPI[:STATe] <boolean>
SYSTem:BEEPer:SCPI[:STATe]?
```

Parameter

Set value:	ON (1)	Buzzer on (default)
	OFF (0)	Buzzer off

The setting may change when a SYST:BEEP is sent

Response

NR1

Example

```
SYST:BEEP:SCPI ON
```

SYST:COMM:PROT:WDOG

Enables or disables the communication monitoring (WATCHDOG) timer.
Use SYST:COMM:PROT:WDOG:DEL to set the delay time of the communication monitoring (WATCHDOG) timer.

Command

```
SYSTem:COMMunicate:PROTection:WDOG[:STATe] <boolean>
SYSTem:COMMunicate:PROTection:WDOG[:STATe]?
```

Parameter

Set value:	ON (1)	Enable
	OFF (0)	Disable (default)

Response

NR1

Example

```
SYST:COMM:PROT:WDOG ON
```

SYST:COMM:PROT:WDOG:DEL

Sets the delay time of the communication monitoring (WATCHDOG) timer.
This command is valid when the communication monitoring timer is enabled (SYST:COMM:PROT:WDOG ON)

Command

```
SYSTem:COMMunicate:PROTection:WDOG:DELay <numeric>
SYSTem:COMMunicate:PROTection:WDOG:DELay?
```

Parameter

Set value: 1 to 3600 (60 by default)
Unit: S

Response

NR3

Example

```
SYST:COMM:PROT:WDOG:DEL 1S
```

SYST:COMM:RLST

Switches the TOS93 series to local or remote mode.

Command

```
SYSTem:COMMunicate:RLSTate <character>
SYSTem:COMMunicate:RLSTate?
```

Parameter

Set value:	LOCal	Sets the product to local mode (Remote Disable; the RMT turns off). This enables both panel operations and commands. This is a substitute command for IEEE488.1 ren FALSE (Remote Disable). Resets the SAMPLE and TRIG:ACQ subsystems to their original defaults.
	REMote	Switches the product to remote mode. All panel operations, except those of the LOCAL key, the START switch and the STOP switch, are locked. This is a substitute command for IEEE 488.1 ren (Remote Enable). This is also the substitute command for address specification.
	RWLock	Switches the product to remote mode. All panel controls are locked except the START switch and the STOP switch. This is a substitute command for IEEE 488.1 llo (Local Lock Out).

Response

character

Example

```
SYST:COMM:RLST REM
```

SYST:CONF:BEEP:VOL

Sets the volume level of the buzzer that is sounded when a FAIL judgment occurs.

Command

```
SYSTem:CONFigure:BEEPer:VOLume[:FAIL] <NRf>
SYSTem:CONFigure:BEEPer:VOLume[:FAIL]?
```

Parameter

Set value: 0 to 10 (5 by default)

Response

NR1

Example

```
SYST:CONF:BEEP:VOL 5
```

SYST:CONF:BEEP:VOL:PASS

Sets the volume level of the buzzer that is sounded when a PASS judgment occurs.

Command

```
SYSTem:CONFigure:BEEPer:VOLume:PASS <NRf>
SYSTem:CONFigure:BEEPer:VOLume:PASS?
```

Parameter

Set value: 0 to 10 (3 by default)

Response

NR1

Example

```
SYST:CONF:BEEP:VOL:PASS 5
```

SYST:CONF:CAL:DUE:CONT

Sets the calibration period.

Command

```
SYSTem:CONFigure:CALibration:DUE:CONTrol <NRf>
SYSTem:CONFigure:CALibration:DUE:CONTrol?
```

Parameter

Set value: 0 to 24 (Calibration period is not monitored when 0 is specified.) (12 by default)
Unit: Month

Response

NR1

Example

```
SYST:CONF:CAL:DUE:CONT 5
```

SYST:CONF:CAL:PROT:STAT

Sets whether to activate the protection function and switch to protection mode when the calibration period is expired.
Use SYST:CONF:CAL:DUE:CONT to set the calibration period.

Command

```
SYSTem:CONFigure:CALibration:PROTection:STATe <boolean>
SYSTem:CONFigure:CALibration:PROTection:STATe?
```

Parameter

Set value:	ON (1)	The product switches to protection mode.
	OFF (0)	The product does not switch to protection mode. (default)

Response

NR1

Example

```
SYST:CONF:CAL:PROT:STAT ON
```

SYST:CONF:DACT:STAT

Enables or disables the double action function.
When the double action function is enabled, tests can be started only when the START switch is pressed within 0.5 seconds after releasing the pressed STOP switch.

Command

```
SYSTem:CONFigure:DACTion:STATe <boolean>
SYSTem:CONFigure:DACTion:STATe?
```

Parameter

Set value:	ON (1)	Enable
	OFF (0)	Disable (default)

Response

NR1

Example

```
SYST:CONF:DACT:STAT ON
```

SYST:CONF:FMOD:STAT

Enables or disables the fail mode.
When the fail mode is enabled, the FAIL judgment results and PROTECTION mode cannot be cleared from a device connected to the SIGNAL I/O connector and REMOTE connector.

Command

```
SYSTem:CONFigure:FMODe:STATe <boolean>
SYSTem:CONFigure:FMODe:STATe?
```

Parameter

Set value:	ON (1)	Enable
	OFF (0)	Disable (default)

Response

NR1

Example

```
SYST:CONF:FMOD:STAT ON
```

SYST:CONF:MOM:STAT

Enables/disables momentary.
When the momentary is enabled, tests can be performed only while the START switch is being pressed.

Command

```
SYSTem:CONFigure:MOMentary:STATe <boolean>
SYSTem:CONFigure:MOMentary:STATe?
```

Parameter

Set value:	ON (1)	Enable
	OFF (0)	Disable (default)

Response

NR1

Example

```
SYST:CONF:MOM:STAT ON
```

SYST:CONF:PHOL

Sets the length of time that a PASS judgment result will be held.

Command

```
SYSTem:CONFigure:PHOLd {<NRf>|<character>}
SYSTem:CONFigure:PHOLd?
```

Parameter

Set value:	0.05 to 10	Hold time (0.2 by default)
	INFinity	Pass judgment results are displayed until you press STOP.

Unit: S

Response

NR3 or character

Example

```
SYST:CONF:PHOL INF
```

SYST:CONF:PON:STAT

Sets the condition panel setting state when the POWER switch is turned on.

Command

```
SYSTem:CONFigure:PON:STATe <character>
SYSTem:CONFigure:PON:STATe?
```

Parameter

Set value:	RST	Reset the panel settings
	RCL0	Settings stored in memory 0 (00.info)
	AUTO	The previous state before the POWER switch was turned off. (default)

Response

character

Example

```
SYST:CONF:PON:STAT AUTO
```

SYST:CONF:SIO:JUDG:STAT

Turns on or off the judgment result output at STEP END of the SIGNAL I/O connector.

Command

```
SYSTem:CONFigure:SIO[:SEND]:JUDGment:STATe <boolean>
SYSTem:CONFigure:SIO[:SEND]:JUDGment:STATe?
```

Parameter

Set value:	ON(1)	Output
	OFF(0)	Not output (default)

Response

NR1

Example

```
SYST:CONF:SIO:JUDG:STAT ON
```

SYST:CONF:SLPR:STAT

Enables/disables the start long function.
When the start long function is enabled, tests can be started only when the START switch is pressed for one second or more.

Command

```
SYSTem:CONFigure:SLPRess:STATe <boolean>
SYSTem:CONFigure:SLPRess:STATe?
```

Parameter

Set value:	ON (1)	Enable
	OFF (0)	Disable (default)

Response

NR1

Example

```
SYST:CONF:SLPR:STAT ON
```

SYST:CONF:SOUT:FAIL:LOW:STAT

Sets whether to output a signal from the STATUS OUT connector during “L-FAIL.”

Command

```
SYSTem:CONFigure:SOUTput:FAIL:LOWer:STATe <boolean>
SYSTem:CONFigure:SOUTput:FAIL:LOWer:STATe?
```

Parameter

Set value:	ON(1)	Output
	OFF(0)	Not output (default)

Response

NR1

Example

```
SYST:CONF:SOUT:FAIL:LOW:STAT ON
```

SYST:CONF:SOUT:FAIL:UPP:STAT

Sets whether to output a signal from the STATUS OUT connector during “U-FAIL.”

Command

```
SYSTem:CONFigure:SOUTput:FAIL:UPPer:STATe <boolean>
SYSTem:CONFigure:SOUTput:FAIL:UPPer:STATe?
```

Parameter

Set value:	ON(1)	Output
	OFF(0)	Not output (default)

Response

NR1

Example

```
SYST:CONF:SOUT:FAIL:UPP:STAT ON
```

SYST:CONF:SOUT:HVON:STAT

Sets whether to output a signal from the STATUS OUT connector while voltage is residing or while a test is in progress.

Command

```
SYSTem:CONFigure:SOUTput:HVON:STATe <boolean>
SYSTem:CONFigure:SOUTput:HVON:STATe?
```

Parameter

Set value:	ON(1)	Output
	OFF(0)	Not output (default)

Response

NR1

Example

```
SYST:CONF:SOUT:HVON:STAT ON
```

SYST:CONF:SOUT:PASS:STAT

Sets whether to output a signal from the STATUS OUT connector during “PASS.”

Command

```
SYSTem:CONFigure:SOUTput:PASS:STATe <boolean>
SYSTem:CONFigure:SOUTput:PASS:STATe?
```

Parameter

Set value:	ON(1)	Output
	OFF(0)	Not output (default)

Response

NR1

Example

```
SYST:CONF:SOUT:PASS:STAT ON
```

SYST:CONF:SOUT:PON:STAT

Sets whether to output a signal from the STATUS OUT connector while the POWER switch is turned on.

Command

```
SYSTem:CONFigure:SOUTput:PON:STATe <boolean>
SYSTem:CONFigure:SOUTput:PON:STATe?
```

Parameter

Set value:	ON(1)	Output
	OFF(0)	Not output (default)

Response

NR1

Example

```
SYST:CONF:SOUT:PON:STAT ON
```

SYST:CONF:SOUT:PROT:STAT

Sets whether to output a signal from the STATUS OUT connector during protection mode.

Command

```
SYSTem:CONFigure:SOUTput:PROTection:STATe <boolean>
SYSTem:CONFigure:SOUTput:PROTection:STATe?
```

Parameter

Set value:	ON(1)	Output
	OFF(0)	Not output (default)

Response

NR1

Example

```
SYST:CONF:SOUT:PROT:STAT ON
```

SYST:CONF:SOUT:READ:STAT

Sets whether to output a signal from the STATUS OUT connector during “READY.”

Command

```
SYSTem:CONFigure:SOUTput:READy:STATe <boolean>
SYSTem:CONFigure:SOUTput:READy:STATe?
```

Parameter

Set value:	ON(1)	Output
	OFF(0)	Not output (default)

Response

NR1

Example

```
SYST:CONF:SOUT:READ:STAT ON
```

SYST:CONF:SOUT:TEST:STAT

Sets whether to output a signal from the STATUS OUT connector while the test voltage is at the set value.

Command

```
SYSTem:CONFigure:SOUTput:TEST:STAT <boolean>
SYSTem:CONFigure:SOUTput:TEST:STAT?
```

Parameter

Set value:	ON(1)	Output
	OFF(0)	Not output (default)

Response

NR1

Example

```
SYST:CONF:SOUT:TEST:STAT ON
```

SYST:DATE

Sets the date.
Also set the time (SYST:TIME). If you specify a day that does not exist (for example, February 30), the settings are changed to the first day of the following month.

Command

```
SYSTem:DATE <year_NR1>,<month_NR1>,<day_NR1>
SYSTem:DATE?
```

Parameter <year_NR1>

Set value: 2016 to 2037 Year

Parameter <month_NR1>

Set value: 1 to 12 Month

Parameter <day_NR1>

Set value: 1 to 31 Day

Response

Returns the year, month, and day in a comma-separated NR1 format.

Example

```
SYST:DATE 2023,4,14
```

SYST:ERR?

Reads the oldest error information or event information from the error queue.
The error/event queue can hold up to 16 errors.-> "Error Checking" *(p.219)*
The error queue is cleared if a *CLS command is sent.

Command

```
SYSTem:ERRor[:NEXT]?
```

Response

Returns the oldest error or event from the error/event queue in the following format.
Example: If there is no error or event
This command returns +0 "No error."
Example: If a command that cannot be executed in the present operating state is received
This command returns -221, “Settings conflict.”

SYST:ERR:COUN?

Returns the number of unread errors in the error queue.

Command

```
SYSTem:ERRor:COUNt?
```

Response

NR1

SYST:KLOC

Sets or releases panel control lock.
Invalid in remote mode (RMT lit).

Command

```
SYSTem:KLOCk <boolean>
SYSTem:KLOCk?
```

Parameter

Set value:	ON (1)	Set the panel control lock
	OFF (0)	Release the panel control lock

Response

NR1

Example

```
SYSTem:KLOC ON
```

SYST:KLOC:LEV

Sets the panel control lock level.
Invalid in remote mode (RMT lit).

Command

```
SYSTem:KLOCk:LEVel <NRf>
SYSTem:KLOCk:LEVel?
```

Parameter

Set value:	1	Low: Permits only START switch, STOP switch, memory recall, and HOME key.
	2	Medium: Permits only START switch and STOP switch.
	3	High (default): Permits only STOP switch.

Response

NR1

Example

```
SYST:KLOC:LEV 3
```

SYST:KLOC:PASS:NEW

Sets a password to unlock panel operations.
The password is valid when SYST:KLOC:PASS:STAT *(p.187)* is set to ON. The password is reset to the factory default password by SYST:SEC:IMM *(p.189)*.

Command

```
SYSTem:KLOCk:PASSword:NEW "<string_exist>","<string_new>"
```

Parameter

<string_exist>: existing password, "<string_new>": new password
Settable characters: Numbers (0 to 9)
Number of characters: 4 to 15
Factory default password: ”0000”

Example

```
SYST:KLOC:PASS:NEW “14351242”,”69811447”
```

SYST:KLOC:PASS:STAT

Enables/disables the password function to unlock panel operations.

Command

```
SYSTem:KLOCk:PASSword:STATe <boolean>"
```

Parameter

Set value:	ON (1)	Enable
	OFF (0)	Disable (default)

Response

boolean

Example

```
SYST:KLOC:PASS:STAT ON
```

SYST:PASS

Enables a password-protected command.

Command

```
SYSTem:PASSword[:CENable] "<string>"
SYSTem:PASSword[:CENable]?
```

Parameter

Set value: The password set by SYST:PASS:NEW

Response

string

Example

```
SYST:PASS "password"
```

SYST:PASS:CDIS

Disables the password-protected command.

Command

```
SYSTem:PASSword:CDISable "<string>"
```

Parameter

Set value: The password set by SYST:PASS:NEW

Example

```
SYST:PASS:CDIS "password"
```

SYST:PASS:NEW

Sets the password.

Command

```
SYSTem:PASSword:NEW "<string_exist>","<string_new>"
```

Parameter

“<string_exist>": existing password, "<string_new>": new password
Naming convention: alphanumeric characters (A-Z, a-z, 0-9), underscore, hyphen
Number of characters: 4 to 15
The factory default password is “”.

Example

```
SYST:PASS:NEW "existing password", "new password"
SYST:PASS:NEW "", "new password"
```

SYST:PASS:STAT?

Queries the enabled/disabled state of the password-protected command.

Command

```
SYSTem:PASSword[:CENable]:STATe?
```

Response

NR1

Example

```
SYST:PASS:STAT?
```

SYST:LOC/ SYST:REM/ SYST:RWL

This is an old style command.
Use SYST:COMM:RLST when creating new programs.

Command

```
SYSTem:LOCal
SYSTem:REMote
SYSTem:RWLock
```

SYST:SEC:IMM

Sanitizes all contents stored in memory and initializes the panel settings to their factory default conditions.
This command can be executed when password protection (SYST:PASS) is set.

Command

```
SYSTem:SECurity:IMMediate
```

SYST:SSAV

Enables or disables the screen saver.
Use SYST:SSAV:DEL to set the time until the screen saver starts.

Command

```
SYSTem:SSAVer[:STATe] <boolean>
SYSTem:SSAVer[:STATe]?
```

Parameter

Set value:	ON (1)	Enable
	OFF (0)	Disable (default)

Response

NR1

Example

```
SYST:SSAV ON
```

SYST:SSAV:DEL

Sets the time until the screen saver starts.
This command is valid when SYST:SSAV is set to ON.

Command

```
SYSTem:SSAVer:DELay <numeric>
SYSTem:SSAVer:DELay?
```

Parameter

Set value: 60 to 59940 (60 by default)
Unit: S

Response

NR3

Example

```
SYST:SSAV:DEL 3600S
```

SYST:TIME

Sets the time.
Also set the date (using SYST:DATE).

Command

```
SYSTem:TIME <hour_NR1>,<min_NR1>,<sec_NR1>
SYSTem:TIME?
```

Parameter <hour_NR1>

Set value: 0 to 23 Hour

Parameter <min_NR1>

Set value: 0 to 59 Minutes

Parameter <sec_NR1>

Set value: 0 to 59 second

Response

Returns the hour, minute, and second in NR1 format.

Example

```
SYST:TIME 23,0,0
```

SYST:TIME:ADJ

Automatically synchronizes the system clock using the NTP server on the network.

Command

```
SYSTem:TIME:ADJust
```

SYST:TZON

Sets the time zone of the system clock.
Use SYST:TZON:CAT? to check the time zone ID.

Command

```
SYSTem:TZONe "<string>"
SYSTem:TZONe?
```

Parameter

Set value: Time zone ID or UTC (“UTC” by default)

Response

"string"

Example

```
SYST:TZON "Asia/Tokyo"
```

SYST:TZON:CAT?

Queries the time zone IDs that can be used.

Command

```
SYSTem:TZONe:CATalog?
```

Response

Comma-separated character string

SYST:VERS?

Queries the version of the SCPI specifications that the product complies with.

Command

```
SYSTem:VERSion?
```

Response

Returns 1999.0.

TRIGger Command

Relates to trigger.

TRIG:ACQ

Executes a software trigger on the ACQ trigger subsystem.

Command

```
TRIGger:ACQuire[:IMMediate]
```

TRIG:ACQ:COUN

Sets the trigger count of the ACQ trigger subsystem.

Command

```
TRIGger:ACQuire:COUNt {<numeric>|<character>}
TRIGger:ACQuire:COUNt?
```

Parameter

Set value:	1 to 100	Specify the sample count (1 by default)
	INFinity	Continues obtaining samples until the test is terminated.

Settings is reset to default when the *RST or MEAS command is sent.
When the local mode is enabled with the LOCAL key or by sending the SYST:COMM:RLST LOC command, the setting is reset to its original default.

Response

NR1, character

Example

```
TRIG:ACQ:COUN 10
```

TRIG:ACQ:DEL

Sets the delay time from trigger application of the ACQ trigger subsystem until measured value recording.

Command

```
TRIGger:ACQuire:DELay <numeric>
TRIGger:ACQuire:DELay?
```

Parameter

Set value: 0.0 to 100.0 (0.0 by default)

Unit: S

Resolution:	100 ms	AC withstanding voltage, DC withstanding voltage, Insulation resistance, Earth continuity

Settings is reset to default when the *RST or MEAS command is sent.

When the local mode is enabled with the LOCAL key or by sending the SYST:COMM:RLST LOC command, the setting is reset to its original default.

Response

NR3

Example

```
TRIG:ACQ:DEL 0S
```

TRIG:ACQ:SOUR

Sets the condition (trigger source) for actually starting the measurement after the ACQ trigger subsystem receives an INIT:ACQ.

Command

```
TRIGger:ACQuire:SOURce <character>
TRIGger:ACQuire:SOURce?
```

Parameter

Set value:	IMMediate	Immediately start the measurement.
	BUS	Execute the measurement when a software trigger (TRIG:ACQ) is received.
	TSTart	Measurement starts simultaneously with the start of a test. (default)

Settings are reset to default when the *RST command is sent.

Setting changes to IMM when the MEAS command is sent.

When the local mode is enabled with the LOCAL key or by sending the SYST:COMM:RLST LOC command, the setting is reset to its original default.

Response

character

Example

```
TRIG:ACQ:SOUR IMM
```

TRIG:TEST

Executes a software trigger on the TEST trigger subsystem.

Command

```
TRIGger:TEST[:IMMediate]
```

TRIG:TEST:SOUR

Sets the condition (trigger source) for actually starting the test after the TEST trigger subsystem receives an INIT:TEST

Command

```
TRIGger:TEST:SOURce <character>
TRIGger:TEST:SOURce?
```

Parameter

Set value:	IMMediate	Immediately start the auto test. (default)
	BUS	Execute the auto test when a software trigger (TRIG:TEST) is received. In the case of FUNC PROG, the test pauses when a step is completed and resumes when a software trigger is received.
	EXTernal	Execute the auto test with a start operation on the TOS93 series. Pauses when a step is completed and resumes when a start operation is performed.
	ONCE	Execute the auto test with a start operation on the TOS93 series.

Settings are reset to default when the *RST command is sent.

Response

character

Example

```
TRIG:TEST:SOUR BUS
```

Withstanding Voltage and Insulation Resistance Test Settings

Test condition setting commands for AC withstanding voltage tests (ACW)

Test condition	Command	Default
Test voltage	ACW:VOLT	0V
Limit voltage	ACW:VOLT:PROT	5500V
Start voltage	ACW:VOLT:STAR:STAT	OFF
	ACW:VOLT:STAR	50PCT
End voltage	ACW:VOLT:END:STAT	OFF
Frequency	ACW:VOLT:FREQ	50HZ
Upper limit	SENS:ACW:JUDG	0.01MA
Lower limit	SENS:ACW:JUDG:LOW:STAT	OFF
	SENS:ACW:JUDG:LOW	0A
Test time	ACW:VOLT:TIM:STAT	ON
	ACW:VOLT:TIM	0.2S
Voltage rise time	ACW:VOLT:SWE:TIM	0.1S
Voltage fall time	ACW:VOLT:SWE:FALL:TIM:STAT	OFF
	ACW:VOLT:SWE:FALL:TIM	0.1S
Current detection response speed	SENS:ACW:CURR:FILT:TYPE	LOW
	SENS:ACW:CURR:FILT:LPAS	SLOW
	SENS:ACW:CURR:FILT:HPAS	SLOW
Grounding mode	SENS:ACW:TERM:GRO	LOW
Current measurement mode	SENS:ACW:CURR:MODE	RMS
Voltage measurement mode	SENS:ACW:VOLT:MODE	RMS
Offset	CALC:ACW:SCAL	OFF
	CALC:ACW:SCAL:OFFS	0A
	CALC:ACW:SCAL:OFFS:IMAG	0A
Scanner setting	ROUT:ACW:TERM	OPEN

Test condition setting commands for DC withstanding voltage tests (DCW)

Test condition	Command	Default
Test voltage	DCW:VOLT	0V
Limit voltage	DCW:VOLT:PROT	7500V
Start voltage	DCW:VOLT:STAR:STAT	OFF
	DCW:VOLT:STAR	50PCT
End voltage	DCW:VOLT:END:STAT	OFF
Upper limit	SENS:DCW:JUDG	0.01MA
Lower limit	SENS:DCW:JUDG:LOW:STAT	OFF
	SENS:DCW:JUDG:LOW	0A
Auto setting of the judgment delay	SENS:DCW:JUDG:DEL:AUTO	OFF
	SENS:DCW:JUDG:DEL	0.1S
Test time	DCW:VOLT:TIM:STAT	ON
	DCW:VOLT:TIM	0.2S
Voltage rise time	DCW:VOLT:SWE:TIM	0.1S
Voltage fall time	DCW:VOLT:SWE:FALL:TIM:STAT	OFF
	DCW:VOLT:SWE:FALL:TIM	0.1S
Discharge time	DCW:VOLT:DISC:TIM	0S
Discharge when interlock is activated	DCW:VOLT:DISC:INT:STAT	ON
Current detection response speed	SENS:DCW:CURR:FILT:TYPE	LOW
	SENS:DCW:CURR:FILT:LPAS	SLOW
	SENS:DCW:CURR:FILT:HPAS	SLOW
Grounding mode	SENS:DCW:TERM:GRO	LOW
Voltage measurement mode	SENS:DCW:VOLT:MODE	AVER
Offset	CALC:DCW:SCAL	OFF
	CALC:DCW:SCAL:OFFS	0A
Scanner setting	ROUT:DCW:TERM	OPEN

Test condition setting commands for insulation resistance tests (IR)

Test condition	Command	Default
Test voltage	IR:VOLT	0V
Limit voltage	IR:VOLT:PROT	1020V
Start voltage	IR:VOLT:STAR:STAT	OFF
	IR:VOLT:STAR	50PCT
Upper limit	SENS:IR:JUDG:TYPE	RES
	SENS:IR:JUDG:STAT	OFF
	SENS:IR:JUDG	100MOHM
	SENS:IR:JUDG:CURR:STAT	ON
	SENS:IR:JUDG:CURR	0.0001MA
Lower limit	SENS:IR:JUDG:TYPE	RES
	SENS:IR:JUDG:LOW:STAT	ON
	SENS:IR:JUDG:LOW	1MOHM
	SENS:IR:JUDG:CURR:LOW:STAT	OFF
	SENS:IR:JUDG:CURR:LOW	0A
Auto setting of the judgment delay	SENS:IR:JUDG:DEL:AUTO	OFF
	SENS:IR:JUDG:DEL	0.1S
Test time	IR:VOLT:TIM:STAT	ON
	IR:VOLT:TIM	0.2S
Voltage rise time	IR:VOLT:SWE:TIM	0.1S
Discharge time	IR:VOLT:DISC:TIM	0S
Discharge when interlock is activated	IR:VOLT:DISC:INT:STAT	ON
Grounding mode	SENS:IR:TERM:GRO	LOW
Low-pass filter use	SENS:IR:CURR:FILT:LPAS:STAT	OFF
Offset	CALC:IR:SCAL	OFF
	CALC:IR:SCAL:OFFS	100MOHM
Scanner setting	ROUT:IR:TERM	OPEN

Set test conditions

First, switch to remote mode.

```
SYST:COMM:RLST REM
```

Reset the settings. When you reset the settings, the set values are reset to the default values.

```
*RST
```

Next, select the test mode. AC withstanding voltage test

```
FUNC ACW
```

The DC withstanding voltage test parameter is DCW, and the insulation resistance test parameter is IR.

Next, set the AC withstanding voltage test conditions.

- Test voltage: 1500 V
- Upper limit: 10 mA
- Test time: 60 s
- Voltage rise time: 5 s
- The rest of the settings set to default

Sets the settings for the tests performed under the above condition.

```
ACW:VOLT 1500
SENS:ACW:JUDG 10MA
ACW:VOLT:TIM 60
ACW:VOLT:SWE:TIM 5
```

The test time can be set to off. When set to off, the test continues until you pressSTOP or send ABOR.

```
ACW:VOLT:TIM:STAT OFF
```

When set to off, the test time set with ACW:VOLT:TIM is invalid. If you want to set the test time again, set it to on.

```
ACW:VOLT:TIM:STAT ON
```

In an AC withstanding voltage test, the default start voltage, lower limit, voltage fall time, and offset are off.

In a DC withstanding voltage test, the default start voltage, lower limit, auto setting of the judgment delay, voltage fall time, and offset are off.

In an insulation resistance test, the default start voltage, upper limit, auto setting of the judgment delay, and offset are off.

If you want to set them, set them to on and then set the values. Start voltage in an AC withstanding voltage test

```
ACW:VOLT:STAR:STAT ON
ACW:VOLT:STAR 50PCT
```

In an AC withstanding voltage test or DC withstanding voltage test, the current detection response speed can be set. The default value is LPF slow. Select whether to use the LPF or HPF, and then set the speed. When using HPF fast in an AC withstanding voltage test

```
SENS:ACW:CURR:FILT:TYPE HIGH
SENS:ACW:CURR:FILT:HPAS FAST
```

In an insulation resistance test, you can set the upper limit and lower limit using a resistance or current. The default settings is resistance with the upper limit set to off and lower limit set to on. When judging based on current

```
SENS:IR:JUDG:TYPE CURR
SENS:IR:JUDG:CURR:STAT ON
SENS:IR:JUDG:CURR 0.01MA
SENS:IR:JUDG:CURR:LOW 0.001MA
```

You can set the lower limit to off.

```
SENS:IR:JUDG:CURR:LOW:STAT OFF
```

If an optional high voltage scanner is connected, set the connection of each channel of the scanner.

You can query the available scanner channels.

```
ROUT:CAT?
```

Returns the available scanner channel in <NR1>,<NR1>... format. If scanner 1 (channels 1 to 4) is connected, +101,+102,+103,+104 is returned.

Specify the scanner channel, and then set the connection.
When setting scanner 1 channel 2 to LOW (DC withstanding voltage test)

```
ROUT:DCW:TERM 102,LOW
```

When you are done with the settings, start the test.

Earth Continuity Test (EC) Settings

Test condition setting commands for earth continuity (AC) tests

Test condition	Command	Default
Test current	EC:AC:CURR	3A
Limit current	EC:AC:CURR:PROT	42A
Frequency	EC:DC:CURR	50
Upper limit	SENS:EC:JUDG:TYPE	RES
	SENS:EC:JUDG:STAT	ON
	SENS:EC:JUDG	0.0001OHM
	SENS:EC:JUDG:VOLT:STAT	ON
	SENS:EC:JUDG:VOLT	2.5V
Lower limit	SENS:EC:JUDG:TYPE	RES
	SENS:EC:JUDG:VOLT:STAT	OFF
	SENS:EC:JUDG:LOW	0OHM
	SENS:EC:JUDG:VOLT:LOW:STAT	OFF
	SENS:EC:JUDG:VOLT:LOW	0V
Test time	EC:AC:CURR:TIM:STAT	ON
	EC:AC:CURR:TIM	0.2S
Current rise time	EC:AC:CURR:SWE:TIM	0.1S
Current fall time	EC:AC:CURR:SWE:FALL:TIM:STAT	OFF
	EC:AC:CURR:SWE:FALL:TIM	0.1S
Terminal wiring method	SENS:EC:TERM:WIRE	4
Offset	CALC:EC:DC:SCAL	OFF
	CALC:EC:SCAL:OFFS	0OHM
Contact check	SENS:EC:TERM:CCH	OFF

Test condition setting commands for earth continuity (DC) tests

Test condition	Command	Default
Test current	EC:DC:CURR	3A
Limit current	EC:DC:CURR:PROT	42A
Upper limit	SENS:EC:DC:JUDG:TYPE	RES
	SENS:EC:DC:JUDG:STAT	ON
	SENS:EC:DC:JUDG	0.0001OHM
	SENS:EC:DC:JUDG:VOLT:STAT	ON
	SENS:EC:DC:JUDG:VOLT	2.5V
Lower limit	SENS:EC:DC:JUDG:TYPE	RES
	SENS:EC:DC:JUDG:LOW:STAT	OFF
	SENS:EC:DC:JUDG:LOW	0OHM
	SENS:EC:DC:JUDG:VOLT:LOW:STAT	OFF
	SENS:EC:DC:JUDG:VOLT:LOW	0V
Test time	EC:DC:CURR:TIM:STAT	ON
	EC:DC:CURR:TIM	0.2S
Current rise time	EC:DC:CURR:SWE:TIM	0.1S
Current fall time	EC:DC:CURR:SWE:FALL:TIM:STAT	OFF
	EC:DC:CURR:SWE:FALL:TIM	0.1S
Terminal wiring method	SENS:EC:DC:TERM:WIRE	4
Offset	CALC:EC:DC:SCAL	OFF
	CALC:EC:DC:SCAL:OFFS	0OHM
Contact check	SENS:EC:DC:TERM:CCH	OFF

Set test conditions

First, switch to remote mode and reset the settings. When you reset the settings, the set values are reset to the default values.

```
SYST:COMM:RLST REM
*RST
```

Next, select the test mode. The AC test parameter is EC, and the DC test parameter is ECDC.

```
FUNC EC
```

Next, set the test conditions.

- Test voltage: 25 A
- Upper limit: 0.1 Ω
- Test time: 60 s
- The rest of the settings set to default

Sets the settings for the AC tests performed under the above condition. In the case of DC tests, replace AC in the node to DC.

```
EC:AC:CURR 25
SENS:EC:AC:JUDG 0.1
EC:AC:CURR:TIM 60
```

The test time can be set to off. When set to off, the test continues until you press STOP or send ABOR.

```
EC:AC:CURR:TIM:STAT OFF
```

When set to off, the test time set with EC:AC:CURR:TIM is invalid. If you want to set the test time again, set it to on.

```
EC:AC:CURR:TIM:STAT ON
```

The default lower limit, current fall time, and offset are off.

If you want to set them, set them to on and then set the values. For the current fall time, set as follows.

```
EC:AC:CURR:SWE:FALL:TIM:STAT ON
EC:AC:CURR:SWE:FALL:TIM 0.1
```

You can set the upper limit and lower limit using a resistance or voltage.

The default settings is resistance with the upper limit set to on and lower limit set to off. When judging based on voltage, set as follows.

```
SENS:EC:AC:JUDG:TYPE VOLT
SENS:EC:AC:JUDG:VOLT:STAT ON
SENS:EC:AC:JUDG:VOLT 2.5V
SENS:EC:AC:JUDG:VOLT:LOW 0.1V
```

You can set the upper limit to off.

```
SENS:EC:AC:JUDG:VOLT:STAT OFF
```

When you are done with the settings, start the test.

Trigger Subsystem

Types of trigger subsystems

This product has two different trigger subsystems.

- TEST
  Executes a test/ auto test.
- ACQuire
  Measures the voltage, current, resistance, and elapsed test time.

States of trigger subsystems

The trigger subsystems have three states (IDLE state, INITiated state, WTG state).

IDLE state

When the product is turned on, all trigger subsystems are in the IDLE state. In this state, the trigger subsystem ignores all triggers. If you send any of the following commands, the trigger subsystem is switched to the IDLE state, regardless of its current state.

- ABORt
- *RST
- *RCL
- IEEE488.1 sdc (Selected Device Clear) or dcl (Device Clear)

INITiated state

When you send the INIT command while the product is in the IDLE state, the trigger function begins operating, and the tester switches to the INITiated state. If the trigger source is set to IMMediate, the test, the auto test, or the measurement immediately.

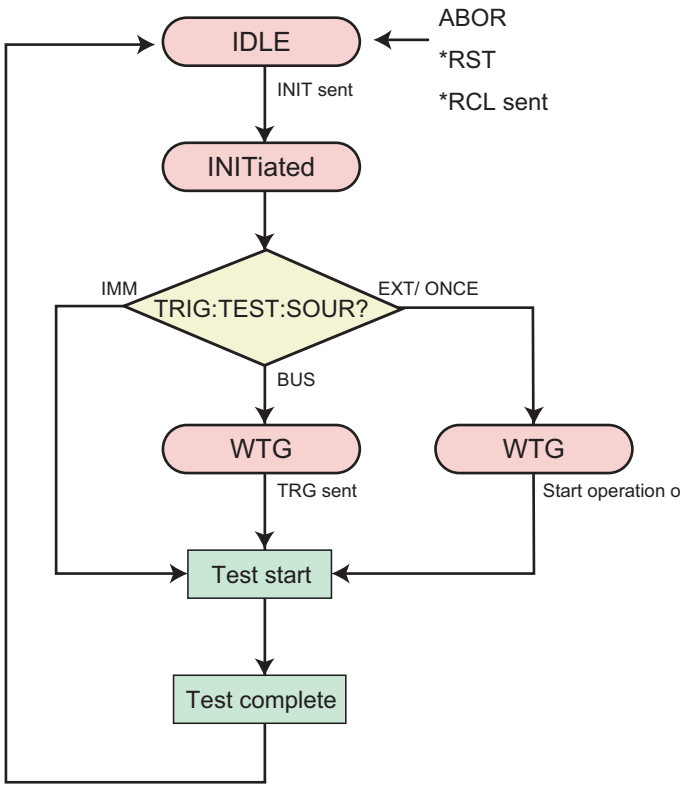
If the trigger source is set to BUS, the product switches to the WTG (Waiting for Trigger) state. If the trigger source is set to EXT/ ONCE, the product switches to WTG (Waiting for Trigger) state, which causes the product to wait for a start operation to take place on the TOS.

WTG (Waiting for Trigger) state

When you send a trigger or perform a start operation on the TOS93 in the WTG state, test, auto test, or measurement starts.

Executing Tests

Tests use the TEST trigger subsystem.
For your information, the operation of the TEST trigger subsystem to perform a test is illustrated.



Before starting a test

In a withstanding voltage test or insulation resistance test, you can check the continuity between the test leads connected to the scanner and the EUT.

AC withstanding voltage test

```
ROUT:ACW:TERM:CCH ON
```

DC withstanding voltage test

```
ROUT:DCW:TERM:CCH ON
```

Insulation resistance test

```
ROUT:IR:TERM:CCH ON
```

Starting a test

To start a test immediately

Set the trigger source to IMM, and then use the INIT command.

```
TRIG:TEST:SOUR IMM
INIT:TEST
```

To start a test using the software trigger

Change the trigger source to BUS.

When you send INIT:TEST, the trigger subsystem switches to the WTG (Waiting For Trigger) state.

When a software trigger is received through TRIG:TEST or *TRG, the test starts.

```
TRIG:TEST:SOUR BUS
INIT:TEST
TRIG:TEST
```

TRIG:TEST applies a software trigger only to the TEST trigger subsystem.

You can also use the *TRG command or the IEEE488.1 get (Group Execute Trigger) command for the same purpose. This command applies a software trigger to all trigger subsystems, if there are other trigger subsystems in the initiated state, their trigger operations will also be executed at the same time.

To start the test using the internal start operation of the product

Change the trigger source to EXT. When you send INIT:TEST, the trigger subsystem switches to the WTG (Waiting For Trigger) state.

When you send INIT:TEST, the trigger subsystem switches to the WTG (Waiting For Trigger) state.

The test shall start when you perform the start operation in the WTG state.

```
TRIG:TEST:SOUR EXT
INIT:TEST
```

Configuring and executing auto tests

Auto tests use the TEST trigger subsystem.

Setting the step and program conditions

First, switch to remote mode and reset the settings. When you reset the settings, the set values are reset to the default values.

```
SYST:COMM:RLST REM
*RST
```

Next, set the test mode to auto test.

```
FUNC PROG
```

Creating a program

To create a new program, specify a program name. If you are using a program in program memory, you do not need to create a program.

Include “/BASIC/” before the program name.

```
PROG:CRE "/BASIC/MY TEST"
```

After creating the program, specify the program to set the steps. Specifying the aforementioned program

```
PROG "/BASIC/MY TEST"
```

When specifying a program in program memory, include “/SIGNAL IO/BASIC/” before the program name. When specifying 51

```
PROG "/SIGNAL IO/BASIC/51"
```

Set the number of steps of the specified program.

```
PROG:STEPS:COUN 2
```

Use this command also to change the number of steps. If the number is increased from the current number of steps, steps with default values are added after the last step. If the number is decreased, steps are deleted in order starting from the last step.

Setting steps

Set the steps as the following example of conditions.

Step 1: AC withstanding voltage test, test voltage 1500 V, current upper limit 10 mA, current lower limit 1 mA, test time 60 s, rest of the settings at default.

Step 2: DC withstanding voltage test, test voltage 1800 V, current upper limit 1 mA, current lower limit 0.1 mA, test time 60 s, rest of the settings at default.

```
PROG:STEP1:FUNC ACW
PROG:STEP1 1500
PROG:STEP1:JUDG:CURR 10MA
PROG:STEP1:JUDG:CURR:LOW 1MA
PROG:STEP1:JUDG:LOW:STAT ON
PROG:STEP1:TIM 60
PROG:STEP2:FUNC DCW
PROG:STEP2 1800
PROG:STEP2:JUDG:CURR 1MA
PROG:STEP2:JUDG:CURR:LOW 0.1MA
PROG:STEP2:JUDG:LOW:STAT ON
PROG:STEP2:TIM 60
```

For the following commands, CURRent, VOLTage, or RESistance cannot be omitted when a unit is used in the parameter.

```
PROGram[:SELected]:STEP<n>:[CURRent:][LEVel]
PROGram[:SELected]:STEP<n>:[CURRent:]SCALe:OFFSet:IMAGinary
PROGram[:SELected]:STEP<n>:[CURRent:]SCALe:OFFSet[:REAL]
PROGram[:SELected]:STEP<n>:JUDGment[:CURRent]:LOWer
PROGram[:SELected]:STEP<n>:JUDGment[:CURRent][:UPPer]
PROGram[:SELected]:STEP<n>:JUDGment[:VOLTage]:LOWer
PROGram[:SELected]:STEP<n>:JUDGment[:VOLTage][:UPPer]
PROGram[:SELected]:STEP<n>:[RESistance:]SCALe:OFFSet[:REAL]
```

```
PROGram[:SELected]:STEP<n>:[VOLTage:][LEVel]
```

Example when a unit is used

```
PROG:STEP1:JUDG:CURR 10MA
```

Example when a unit is not used

```
PROG:STEP1:JUDG 0.01
```

For details on step setting commands, see -> "PROG:STEP<n>:<prog_item>" *(p.81)*.

Setting the program

Set the step interval time to 10 s.

```
PROG:INT:TIM 10
```

Set the operation to be executed when a fail judgment occurs.

To end the step in execution when a FAIL occurs, start the next step after the step interval elapses, and produce a FAIL judgment when all steps are completed

```
PROG:FAIL:CONT ON
```

To end the auto test when a FAIL occurs and produce a FAIL judgment

```
PROG:FAIL:CONT OFF
```

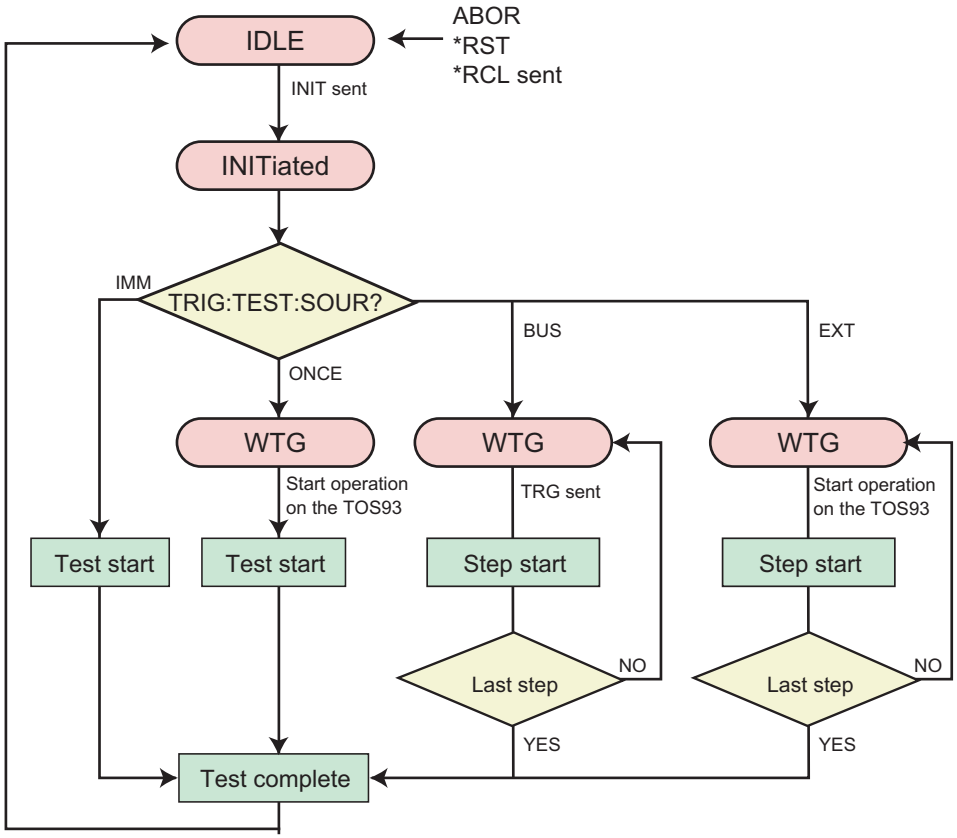
Save the program.

```
PROG:SAVE
```

You can start the auto test without saving the program, but the program will be erased if you turn off the POWER switch. When you are done with the settings, start the auto test.

Starting an auto test

The TEST trigger subsystem has three states: IDLE, INITiated, and WTG.



First, reset the TEST trigger subsystem.

```
ABOR:TEST
```

To start a sequence operation immediately, set the trigger source to IMM, and then use the INIT command.

```
TRIG:TEST:SOUR IMM
INIT:TEST
```

To start an auto test with a software trigger, change the trigger source to BUS.

When you send INIT:TEST, the trigger subsystem switches to the WTG (Waiting For Trigger) state. When a software trigger is received through TRIG:TEST or *TRG, the test starts. When a step is completed, the product pauses and switches to the WTG (Waiting For Trigger) state. When a software trigger is received through TRIG:TEST or *TRG, the test resumes, and the next step starts.

```
TRIG:TEST:SOUR BUS
INIT:TEST
TRIG:TEST
```

TRIG:TEST applies a software trigger only to the TEST trigger subsystem.

You can also use the *TRG command or the IEEE488.1 get (Group Execute Trigger)command for the same purpose. This command applies a software trigger to all trigger subsystems, if there are other trigger subsystems in the initiated state, their trigger operations will also be executed at the same time.

To start an auto test from the TOS93 series, change the trigger source to EXT or ONCE. With ONCE, when an auto test is started once on the TOS93 series, all steps are executed. With EXT, when a step is completed, the product pauses and switches to the WTG (Waiting For Trigger) state. When you start an auto test on the TOS93 series again, the next step starts.

When you send INIT:TEST, the trigger subsystem switches to the WTG (Waiting For Trigger) state. The test starts when you perform a start operation on the unit.

```
TRIG:TEST:SOUR EXT
INIT:TEST
```

After the test completion

When the auto test finishes, the trigger subsystem returns to the IDLE state again. If the ABOR command or an equivalent command is received in the WTG state or when an auto test is being executed, the test is canceled, and the trigger subsystem returns to the IDLE state.

When *RST command is sent, all parameters of the test condition shall be reset.

Querying Measured Values

The TOS93 series have functions for returning the measured voltage, current, resistance, and elapsed test time. Use the ACQ subsystem to query the measured values.

There are measurement types as follows.

- Simple measurement (MEASure) *(p.211)*
  Partially changes the TRIGger and SAMPle subsystem settings, starts a new measurement, and then queries the measurement data.
- Normal measurement (READ) *(p.212)*
  Queries the measurement data after starting a new measurement without changing the test condition.
- Advanced measurement (FETCh) *(p.213)*
  Queries the data already measured.

Simple measurement (MEASure)

The easiest measurement method is using the MEAS command.

MEAS changes the TRIGger and SAMPle subsystem settings to the values shown below, makes a new measurement, and then queries the measurement data.

Command	Value
TRIG:ACQ:COUN	1
TRIG:ACQ:DEL	0.0
TRIG:ACQ:SOUR	IMM
SAMP:COUN	1
SAMP:TEST:ENAB	OFF
SAMP:TIM	0.0

Voltage query

```
MEAS:VOLT?
```

Current query

```
MEAS:CURR?
```

Resistance query

```
MEAS:RES?
```

Elapsed test time query

```
MEAS:ETIM?
```

Use DATA:FORM to select and specify the items to be queried. The items specified by DATA:FORM are returned in a sequence in response to

MEAS?. You can specify up to eight parameters for DATA:FORM.

```
DATA:FORM CURR,VOLT,RES,ETIM
MEAS?
```

Sending multiple MEAS queries will cause measurement data queries to take a long time and lose concurrency.

If you send the MEAS query multiple times, data acquisition will take a long time. If you want to acquire the data of multiple items, perform measurement in the method described in "Advanced measurement (FETCh)" *(p.213)*, or specify the items you want to query by DATA:FORM and query them by using MEAS?.

Normal measurement (READ)

Because "measurement condition settings" and "starting measurements to acquire data" can be separately set in normal measurements, you can specify measurement conditions in detail. After setting measurement conditions, use READ? to start measurements.

You cannot change the test condition during the measurement. To set the test condition, wait until the measurement is completed, or abort the measurement.

When setting the sampling interval to one second

```
SAMP:TIM 1
```

Current query

```
READ:CURR?
```

Use DATA:FORM to select and specify the items to be queried. The items specified by DATA:FORM are returned in a sequence in response to READ?. You can specify up to eight parameters for DATA:FORM.

```
DATA:FORM CURR,VOLT,RES,ETIM
READ?
```

Sending multiple READ queries will cause data queries to take a long time and lose concurrency.

If you want to acquire the data of multiple items, measure in the method described in "Advanced measurement (FETCh)" *(p.213)*, or specify the items you want to query by using DATA:FORM and query them by using READ?. The READ command does not return specific commands to the default when performing measurement unlike the MEAS command. Performs new measurement with the same settings as when the MEAS command was sent.

Advanced measurement (FETCh)

In Advanced measurement, you can separately control measurement start and data queries by using FETC command that performs data acquisition only.

Unlike MEAS (or READ) command, FETC command does not perform new measurement, so a command to start measurement must be sent separately.

To start a new measurement, use the INIT command.

```
INIT:ACQ
```

When you send INIT:ACQ, measurement data already acquired is invalidated.

When the measurement finishes, you can use the FETC query to retrieve the measured data.

```
FETC:VOLT?
FETC:CURR?
FETC:RES?
FETC:ETIM?
```

Use DATA:FORM to select and specify the items to be queried. The items specified by DATA:FORM are returned in a sequence in response to FETC? . You can specify up to eight parameters for DATA:FORM.

```
DATA:FORM CURR,VOLT,RES,ETIM
FETC?
```

If you send a FETC command before the measurement is complete, correct measurement data will not be returned.

Use the *OPC command to send a FETC command after the completion of measurement. The use of *OPC command for Advanced measurement cases is explained here. See "Waiting for Operation Complete" (*p.216*) for details.

```
INIT:ACQ;*OPC;FETC?
```

Use ABOR command or IEEE488.1 sdc/dcl command to cancel the measurement operation currently in progress without waiting for the measurement to complete. However, this has no function to invalidate the measured data.

Use *RST or *RCL if you want to cancel the measurement operation and invalidate the measured data at once. Sending FETC? after using *RST or *RCL shall result in an error because no measured data exist.

Querying Test Results

The product holds the 1000 latest test results. The data is cleared when the power is turned off.

Specify the items to be queried

First, set the items to be queried in the parameter of RES:FORM command (minimum 1, maximum 25 items). See RES:FORM *(p.87)* for details on items that can be queried.

Here is an example of setting the items to be queried as the test start time, voltage value, current value, resistance, test time, and judgment result.

```
RES:FORM DATE,VOLT,CURR,RES,ETIM,JUDG
```

Query the test results

Next, query the test results. You can use two commands for querying.

RES?	Queries the latest test result. This query does not delete the test result.
RES:REM?	Queries the oldest test result. After the query, the oldest result is deleted.

See RES? *(p.84)* for the Responses to RES? and RES:REM?.

Here is an example of the responses to queries about the test start year, test start month, test start date, voltage value, resistance, the elapsed time from the test start to judgment, and judgment result.

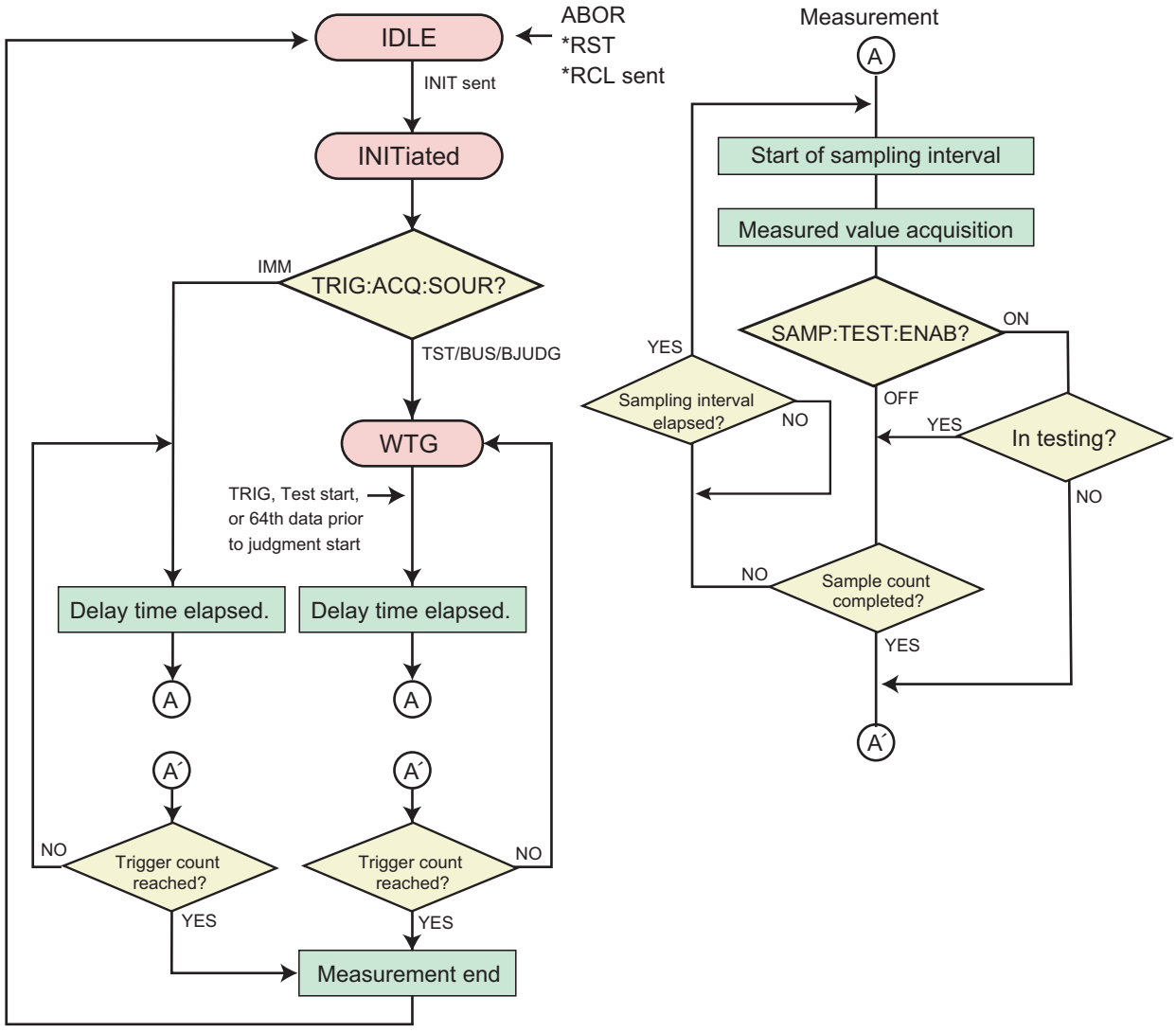
```
2022,5,10,+5.00000E+02,+1.50000E+08,PASS
```

From the above response, we can read that the test date is May 10, 2022, the voltage value and the resistance at the time of judgment are 500 V and 150 MΩ respectively, and the test result is PASS.

Multi-point Measurement with Specified Trig-ger Counts

The TOS93 series can perform up to 100 times of measurement with a single measurement start action (MEAS?/READ?/INIT). You can specify the number of times you want to perform measurement by setting a value to the trigger count.

For your information, the operation of multiple measurement is illustrated.



When starting measurement by MEAS?/READ?/INIT, this product successively repeats measurement for the number of times specified by the trigger count. When the measurement has finished, it becomes possible to acquire the measurement data.

If you specify IMM (immediate) for the trigger source, the product will start measurement immediately after receiving MEAS?/READ?/INIT and automatically repeat measurement for the specified number of times.

If you specify BUS for the trigger source, you need to send software triggers (* TRIG commands or IEEE488.1 get messages) for the number of times specified by the trigger count after MEAS?/READ?/INIT.

If a test terminated due to the activation of the interlock with the extended judgment result, selected, the response would be as follows:

```
PROTECT(ILOCK)
```

Waiting for Operation Complete

The *OPC command has a function for waiting for operations to complete. Operation complete means that there are no operations that are waiting for a response from the TOS93 series.

When an *OPC command is received, the product transitions to the Operation Complete Command Active State (OCAS). If a measurement is completed and there are no operations standing by, the product returns to the Operation Complete Command Idle State (OCIS) and sets the OPC bit (bit 0) of the event status register to TRUE (1). This information can be determined by checking the OPC bit (bit 0) of the *ESR? query.

Next, we will show an example that starts a new measurement and sends an *OPC command. Because the event status enable register and service request enable register are configured to generate a service request (SRQ) in response to an operation complete event, an SRQ is generated when a measurement is completed.

The SRQ function cannot be used if you are using the RS232 interface. To generate a service request after the measurement is completed, enter the letters as below.

```
*ESE 1;*SRE 32;*CLS;:INIT:ACQ;*OPC
```

If you use the *OPC? query command in place of the *OPC command, the product transitions to the Operation Complete Query Active State (OQAS). If a measurement is completed and there are no operations standing by, the product returns to the Operation Complete Query Idle State (OQIS) and sets response data “1” (in NR1 format) in the output queue. To read the response after the measurement is completed, enter the letters as below.

```
INIT:ACQ;*OPC?
```

At power-on, if you send an IEEE488 sdc/dcl, *RST, or *RCL, this product switches to the OCIS and OQIS states.

Status Monitoring

The product has two mandatory SCPI standard registers, STATus:OPERation and STATus:QUEStionable, in addition to the IEEE488.2 standard registers.

Register basics

All SCPI registers have a standard architecture that uses events/filters. CONDition, EVENt, and ENABle and optionally PTRansition and NTRansition can be used. CONDition and EVENt are read-only registers working as status indicators. ENABle, PTRansition and NTRansition are read-write registers working as event and summary filters.

STATus:OPERation

The OPERation Status register is used to record events and notifications that occur during normal operations.

To check whether a test is in process, check the MEASuring bit (bit 4) of the STATus:OPERation register.

```
STAT:OPER?
```

To check the MEASuring bit directly, use ABUS in <bit-item>.

```
STAT:OPER:ABUS?
```

STATus:QUEStionable

The QUEStionable Status register is used to record events and notifications that occur during abnormal operations.

To check the voltage measurement for overrange, check the OV bit (bit 0) of the STATus: QUEStionable register.

```
STAT:QUES?
```

PON (Power ON) bit

The PON bit (bit 7) of the event status register is always set when the product is turned on. To generate a power-on SRQ to track power failures and power supply line errors, use PON as follows.

1. **Set *PSC (Power-on Status Clear) to 0 (or OFF).**
   Enable the backup functions for event status enable register and service request enable register settings. (*PSC 0)

2. **Set the PON bit (bit 7) of the event status enable register.**
   This enables the transmission of power-on events to the higher layer. (*ESE 128)

3. **Set the ESB bit (bit 5) of the status byte enable register.**
   This enables the generation of SRQs based on standard events. (*SRE 32)

The command to perform the above procedure is as follows.

```
*PSC 0;*ESE 128;*SRE 32
```

When you use the RS232C interface, the PON bit cannot be assigned to a service request because SRQs are not generated.

Error Checking

Error/event queue

The SCPI specifications define a standard error reporting scheme, Error/Event Queue This is a FIFO (First In First Out) queue, which records errors and events. The maximum number of errors/events that the product can record is 16. Each error/event can be read with the SYSTem:ERRor query.

```
SYSTem:ERRor?
```

The response to this query contains a numeric part (error/event number) and a textual description, such as:

```
-222,"Data out of range"
```

The error/event queue becomes empty when the *CLS common command is sent, when the last item in the queue is read, and when the product is turned on. When the error/event queue is empty, the query returns the following:

```
0,"No error"
```

When Using Commands on a PLC (sequencer, controller)

These are notes for when using commands on a PLC (sequencer, controller).

- Append a delimiter (ASCII 0x0A) to each command.
- Match the protocol with the sequencer setting.
- Return values vary in length. Because exponential (NR3) queries are also available, processing using functions is necessary on the sequencer side.

Appendix

List of Errors

Standard SCPI errors

Command error

An error in the range [-199, -100] indicates that an IEEE 488.2 syntax error has been detected by the instrument's parser. The occurrence of any error in this class causes the Command Error bit (bit 5) in the event status register to be set.

Error code		Error message description
-100	Command error	Command error. Generic syntax error.
-101	Invalid character	An invalid character exists. A data element different than those allowed was recognized.
-102	Syntax error	Syntax error. An unrecognized command or data type was encountered.
-103	Invalid separator	Invalid separator The parser was expecting a separator and encountered an illegal character.
-104	Data type error	Invalid separator The parser was expecting a separator and encountered an illegal character.
-105	GET not allowed	Data type error. The parser recognized a data element different than one allowed.
-108	Parameter not allowed	Get not allowed. A Group Execute Trigger was received in a program message.
-109	Missing parameter	Missing parameter Fewer parameters were received than required for the header.
-110	Command header error	Command header error. An error was detected in the header.
-112	Program mnemonic too long	Mnemonic too long. The number of characters in the command header exceeds 12 characters.
-113	Undefined header	Undefined header. Inappropriate for the product.
-114	Header suffix out of range	Invalid suffix exists in the header.
-115	Unexpected number of parameters	Unexpected parameters were received in the header.
-120	Numeric data error	Numeric data error. Generated when parsing a data element which appears to be numeric, including the nondecimal numeric types.
-128	Numeric data not allowed	Numeric data is not allowed.
-130	Suffix error	Suffix error. Generated when parsing a suffix.
-131	Invalid suffix	A suffix is invalid. The suffix does not follow the syntax, or the suffix is inappropriate for the product.
-134	Suffix too long	Suffix too long. The suffix contains too many characters.
-138	Suffix not allowed	A suffix was encountered after a numeric parameter that does not allow suffixes.
-140	Character data error	Character data error. Generated when parsing a character data element.
-141	Invalid character data	Either the character data element contains an invalid character, or the element is not valid.
-144	Character data too Long	Character data too long. The character data element contains too many characters.
-148	Character data not allowed	Character data is not allowed.

Error code		Error message description
-150	String data error	String data error. Generated when parsing a string data element.
-151	Invalid string data	Invalid string data.
-158	String data not allowed	String data is not allowed.
-160	Block data error	Block data error. Generated when parsing a block data element.
-170	Expression error	Expression error. Generated when parsing an expression data element.
-180	Macro error	Generated when defining a macro or executing a macro.

Execution errors

An error in the range [-299, -200] indicates that an error has been detected by the instrument's execution control block. The occurrence of any error in this class causes the Execution Error bit (bit 4) in the event status register to be set.

Error code		Error message description
-200	Execution error (generic)	Execution error. A generic product error.
-203	Command protected	Password protected program or query command cannot be executed.
-210	Trigger error	Trigger error.
-211	Trigger ignored	A trigger was received but ignored.
-213	Init ignored	A measurement initiate operation was ignored because measurement is in progress.
-214	Trigger deadlock	A deadlock occurred because a query was received before the software trigger.
-220	Parameter error	Invalid parameter.
-221	Settings conflict	A command was received that the product cannot execute in its present condition.
-222	Data out of range	Parameter was out of range.
-223	Too much data	Too many parameters were received for the requirements.
-224	Illegal parameter value	Received invalid parameter data.
-230	Data corrupt or stale	Received a data query before the measurement completed.
-241	Hardware missing	Cannot be executed because the optional hardware is not installed.

Device-specific errors

An error in the range [-399, -300] indicates that an error other than command error, query error, or execution error was detected. The occurrence of any error in this class causes the Device Dependent Error bit (bit 3) in the event status register to be set.

Error code		Error message description
-309	Internal Communication error	Internal communication error
-310	System error	System error
-311	Memory error	Memory error. Physical damage to the device memory.
-313	Calibration memory lost	Calibration memory lost.* Damage to nonvolatile calibration data by CAL?.
-314	Save/recall memory lost	Memory data lost.* Damage to nonvolatile data by SAV?.
-315	Configuration memory lost	Configuration data lost. Damage to nonvolatile panel settings.
-316	Calibration Memory error	Uncalibrated error
-330	Self-test failed	Self-test failed.
-350	Queue overflow	Queue overflow.
-360	Communication error	Communication error that occurs when flow control is off.
-362	Framing error in program message	Framing error.
-363	Input buffer overrun	Buffer overflow error.

Error code		Error message description
-365	Time out error	Time out error.

Query error

An error number in the range [-499, -400] indicates that the output queue control of the instrument has detected a problem with the message exchange protocol described in IEEE 488.2, chapter 6. The occurrence of any error in this class causes the Query Error bit (bit 2) in the event status register to be set.

Error code		Error message description
-400	Query error (generic)	Query error. A generic product error.
-410	Query INTERRUPTED	Received a new command after the query was received and before the response was read.
-420	Query UNTERMINATED	The controller attempted to read the response after the device received an unsupported query or did not received a query. The “-100 COMMAND ERROR” and this error are stored in the error queue. The controller will time out.
-430	Query DEADLOCKED	The error queue, input buffer, and output buffer are full when sending large binary data as a response, and the transmission timing is off.
-440	Query UNTERMINATED after indefinite response	Received a separate query in semicolon-delimited format after a query that returns a response in an indefinite form. (Example: A compound command such as *IDN?;SYST:ERR?)

Operation complete event errors

An error in the range [-899, -800] is used when the product wants to report an IEEE 488.2 operation complete event. This event occurs when the instrument’s synchronization protocol, having been enabled by an *OPC command, completes all selected pending operations.

The occurrence of any error in this class causes the Operation Complete bit (bit 0) in the event status register to be set.

Error code		Error message description
-800	Operation complete	Protocol have completed.

Product-dependent errors

The occurrence of any error in this class causes the Device Dependent Error bit (bit 3) in the event status register to be set.

Configuration conflict errors and configuration change rejection errors

These errors occur when the specified configuration changes cannot be permitted.

Error code	
+101	Setting conflicts due to PROTection state
+102	Setting conflicts while TEST is running
+106	Setting conflicts due to invalid FUNCtion:MODE
+108	Wrong password given
+109	Illegal password format
+112	Setting conflicts while MEASure is in progress
+113	Setting conflicts due to RISE state
+115	Setting conflicts when the state of the upper resistance is OFF or the judge type is current judgement [A].

Out of range setting errors

Error code	
+201	Illegal buffers size due to not in 2^N
+202	Same items is specified more than once
+203	NONE is invalid in multiple item settings
+204	IMMediate is invalid in multiple item settings
+205	BUS is invalid in multiple item settings

Auto test execution and trigger function execution errors

Error code	
301	Illegal PROGram name
302	PROGram name already exists
303	PROGram not found
304	PROGram not selected
305	Selected PROGram cannot be deleted
306	Recursive PROGram specified
307	STEP number out of range
308	Execution error due to non-existing PROGrtam specified
309	Illegal PROGram file
310	TRANsient not operating
311	TRANsient not suspending

Command Processing Time

A certain amount of time is required before the commands shown in the following table are received by the product.
The processing times shown here are standard values, not guaranteed values.The processing times vary depending on the settings and the measurement conditions.
The values shown below do not include hardware response times

Command	Processing time(ms)			
	LAN[1] (VXI-11)	LAN[1] (HiSLIP)	USB	RS232C[2]
FUNC ACW	1.5	0.03	1.4	1.7
ACW:VOLT 1KV	1.5	0.03	1.5	1.2
ACW:VOLT:TIM 1S	1.0	0.03	1.7	1.5
SENS:ACW:JUDG 5MA	1.0	0.03	1.5	1.6
MEAS:VOLT?	203	203	203	203
STAT:OPER:TEST:COND?	2.8	1.4	2.7	16

1. 100BASE-TX Ethernet
2. Bitrate setting: 115200 bps

Legacy Commands

This product also runs on legacy commands used in the TOS9200 series. When creating a new program, use the new commands.

For details on the settings and responses of legacy commands, see the TOS9200 series GPIB/RS-232C interface operation manual. Basic operation of legacy commands has been verified on the TOS9200 series, no guarantee is provided for complete operation of the TOS9200 series.

Legacy command	Corresponding commands by the TOS93 series	Description
FUN	FUNC	Sets the test mode Only FUN is valid, not FUNCTION. Only parameters 0 to 3 are valid. Anything other than ACW, DCW, or IR returns -1.
Acw:TEStv	ACW:VOLT	Test voltage (ACW)
Acw:FREQuency	ACW:VOLT:FREQ	Test voltage frequency (ACW)
Acw:GND	SENS:ACW:TERM:GRO	Setting related to measurement of current running through the stray capacitance (ACW)
Acw:TIMer	ACW:VOLT:TIM ACW:VOLT:TIM:STAT	Test time (ACW)
Acw:RECall	*RCL	Recalling Setup Memory Entries
Acw:RiseTIMe	ACW:VOLT:SWE:TIM	Voltage rise time (ACW)
Acw:STORe	*SAV	Saving to the setup memory
Acw:UPPer	SENS:ACW:JUDG	Upper limit judgment current (ACW)
Acw:LOWer	SENS:ACW:JUDG:LOW SENS:ACW:JUDG:LOW:STAT	Lower limit judgment current (ACW)
Dcw:GND	SENS:DCW:TERM:GRO	Setting related to measurement of current running through the stray capacitance (DCW)
Dcw:TEStv	DCW:VOLT	Test voltage (DCW)
Dcw:TIMer	ACW:VOLT:TIM ACW:VOLT:TIM:STAT	Test time (DCW)
Dcw:RECall	*RCL	Recalling Setup Memory Entries
Dcw:RiseTIMe	DCW:VOLT:SWE:TIM	Voltage rise time (DCW)
Dcw:STORe	*SAV	Saving to the setup memory
Dcw:UPPer	SENS:DCW:JUDG	Upper limit judgment current (DCW)
Dcw:LOWer	SENS:DCW:JUDG:LOW SENS:DCW:JUDG:LOW:STAT	Lower limit judgment current (DCW)
Ir:GND	SENS:IR:TERM:GRO	Setting related to measurement of current running through the stray capacitance (IR)
Ir:TEStv	IR:VOLT	Test voltage (IR)
Ir:TIMer	IR:VOLT:TIM IR:VOLT:TIM:STAT	Test time (IR)
Ir:RECall	*RCL	Recalling Setup Memory Entries
Ir:RiseTIMe	IR:VOLT:SWE:TIM	Voltage rise time (IR)
Ir:STORe	*SAV	Saving to the setup memory

Legacy command	Corresponding commands by the TOS93 series	Description
Ir:WaitTIMe	SENS:IR:JUDG:DEL	Time until starting upper limit judgment (IR)
Ir:UPPer	SENS:IR:JUDG SENS:IR:JUDG:STAT	Upper limit judgment resistance (IR)
Ir:LOWer	SENS:IR:JUDG:LOW SENS:IR:JUDG:LOW:STAT	Lower limit judgment resistance (IR)
STARt	TRIG:TEST:SOUR IMM INIT:TEST	Starts a test
STOP	ABOR:TEST	Stops a test
LOCAL	SYST:COMM:RLST LOC	Switches to local mode
REMote	SYST:COMM:RLST REM	Switches to remote mode
MeasMODe	n/a	Sets the display mode for measured currents and resistances
MON?	MEAS?	Queries the measurement data
IDAT?	MEAS:CURR?	Queries the measured current
RDAT?	MEAS:RES?	Queries the measured resistance
DSE[1]	STAT:OPER:ENAB STAT:OPER:TEST:ENAB	Sets/resets each bit of the device status enable register, or queries the content of the register
DSR?[2]	STAT:OPER:TEST:COND? STAT:OPER:COND?	Queries the content of the device status register

1. Sets, resets, or queries the OPER:ENAB and OPER:TEST:ENAB status registers of the TOS93 series and returns the bits of the device status enable register of the TOS9200 series.
2. DSR? checks the OPER status register and the OPER:TEST status register of the TOS93 series and returns the content in terms of the device status register bits of the TOS9200 series.

Every effort has been made to ensure the accuracy of this manual. However, if you have any questions or find any errors or omissions, please contact your Kikusui agent or distributor.

After you have finished reading this manual, store it so that you can use it for reference at any time.

KIKUSUI ELECTRONICS CORP.

1-1-3 Higashiyamata, Tsuzuki-ku, Yokohama,
224-0023, Japan

Phone: +81-45-482-6353
Facsimile: +81-45-482-6261

global.kikusui.co.jp