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Communication Interface Manual

Insulation Resistance and
Battery Insulation Resistance Tester
TOS73 Series

TOS7300
TOS7300 WITH LAN
TOS7301
TOS7301 WITH LAN

TELONIC
TEST INSTRUMENTS & POWER SUPPLIES
ESTABLISHED OVER 50 YEARS SINCE 1966
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Command List

IEEE 488.2 Common Commands

*CLS

Clears the contents of the status byte (STB) register, the event status register (SESR), the error/event queue, and all EVENt registers. Clears wait-for-completion operations created by *OPC or *OPC? command. *(p.36)*

*ESE

Sets the event status enable (ESE) register bits that are counted by the ESB bit of the status byte (STB) register. *(p.36)*

*ESR?

Queries the event status register (SESR). The SESR is cleared after the query. *(p.37)*

*IDN?

Queries the model name and firmware version of the TOS73 series. *(p.37)*

*OPC

Reports Operation Complete when all operations initiated by other commands have been completed (or none exist). *(p.37)*

*OPT?

Queries whether options or SIGNAL I/O are connected to the TOS73 series. *(p.37)*

*PSC

Sets whether the event status enable (ESE) register and the service request enable (SRE) register are cleared when the power is turned on (power-on status). *(p.38)*

*RCL

Recalls the panel settings saved in the setup memory. All trigger subsystems stop operation and enter the IDLE state, and active protection functions are disabled (if they cannot be disabled, they remain active). FAIL judgment is also cleared. *(p.38)*

*RST

Resets the panel settings.
All trigger subsystems stop operation and enter the IDLE state, and active protection functions are disabled (if they cannot be disabled, they remain active). FAIL judgment is also cleared. OPC bit of the event status register (SESR) (bit 0: operation complete) is cleared. *(p.39)*

*SAV

Saves current panel settings to the setup memory. *(p.39)*

*SRE

Sets the service request enable (SRE) register. *(p.39)*

*STB?

Queries the contents of the status byte (STB) register and the MSS (master summary status) message. *(p.40)*

*TRG

Applies a software trigger to all trigger subsystems. *(p.40)*

*TST?

Executes a self-test. *(p.40)*

*WAI

Prevents the TOS73 series from executing subsequent commands until all operations that are in standby have completed. *(p.40)*

ABORt Command

ABOR

Aborts measurements, tests, and other operations in all trigger subsystems to transition to IDLE state. For the TEST trigger subsystem, both the PROTECTION mode and the FAIL judgment are cleared. *(p.44)*

ABOR:ACQ

Aborts measurements and other operations in ACQ trigger subsystem to transition to IDLE state. *(p.44)*

ABOR:TEST

Aborts tests and other operations in TEST trigger subsystem to transition to IDLE state. Both the PROTECTION mode and the FAIL judgment are cleared. *(p.44)*

CALCulate Command

CALC:SCAL:OFFS:AUTO

Enables or disables the offset auto settings. *(p.45)*

CALC:IR:SCAL

Enables or disables the resistance value offset. *(p.45)*

CALC:IR:SCAL:OFFS

Sets the offset resistance value. *(p.46)*

CALibrate Command

CAL:DATE

Sets the date on which calibration was carried out. *(p.47)*

DATA Command

DATA:BSIZ

Sets the buffer size (maximum number of measurement data recordings) of the data logger. Sending this command clears all existing measurement data, regardless of whether the setting values were changed. *(p.48)*

DATA:FORM

Sets the response format (types and listing order of returned items) to use when measurement data is queried. *(p.49)*

DATA:POIN?

Queries the number of measurement data recorded in the data logger. *(p.49)*

DATA:REM?

Queries multiple pieces of measurement data starting from the oldest data piece recorded in the data logger. Measurement data returned as responses are cleared one after the other. *(p.50)*

DISPlay Command

DISP:IR:RES:PHOL

Enables or disables the display of the measured minimum resistance value (peak value) in the measurement screen of the display. *(p.51)*

DISP:VIEW

Selects the display format of the measurement screen of the display from numeric value or graph. (TOS7301 and TOS7301 WITH LAN only) *(p.51)*

GRAPh Command

GRAP:IR:FORM

Sets the value displayed on the Y-axis in the graph. (TOS7301 and TOS7301 WITH LAN only) *(p.52)*

GRAP:IR:SCAL

For the Y-axis of the graph, sets the scale range of the voltage-axis and resistance-axis to FIX or AUTO all at once. (TOS7301 and TOS7301 WITH LAN only) *(p.53)*

GRAP:IR:SCAL:RES

For the Y-axis of the graph, sets the scale range of the resistance-axis to FIX or AUTO. (TOS7301 and TOS7301 WITH LAN only) *(p.54)*

GRAP:IR:SCAL:RES:MAX

For the Y-axis of the graph, sets the maximum value of the resistance-axis. (TOS7301 and TOS7301 WITH LAN only) *(p.54)*

GRAP:IR:SCAL:RES:MIN

For the Y-axis of the graph, sets the minimum value of the resistance-axis. (TOS7301 and TOS7301 WITH LAN only) *(p.55)*

GRAP:IR:SCAL:VOLT

For the Y-axis of the graph, sets the scale range of the voltage-axis to FIX or AUTO. (TOS7301 and TOS7301 WITH LAN only) *(p.55)*

HCOPy Command

HCOP:SDUM:DATA?

Retrieves the screen capture of the current screen display on the TOS73 series. *(p.57)*

INITiate Command

INIT

Transitions all trigger subsystems in IDLE state to INITiated state. Clears all existing measurement data recorded in the data logger. *(p.58)*

INIT:ACQ

Transitions ACQ trigger subsystem in IDLE state to INITiated state. Clears all existing measurement data recorded in the data logger. *(p.58)*

INIT:TEST

Transitions TEST trigger subsystem in IDLE state to INITiated state. *(p.58)*

MEASure/READ/FETCh Command

MEAS?/READ?/FETC?

Queries the measurement data based on the response format specified in DATA:FORM.
All existing measurement data is cleared if MEAS? or READ? is sent. *(p.60)*

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

Queries the current value.
All existing measurement data is cleared if MEAS:CURR? or READ:CURR? is sent. *(p.60)*

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

Queries the elapsed test time.
All existing measurement data is cleared if MEAS:ETIM? or READ:ETIM? is sent. *(p.60)*

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

Queries the resistance value.
All existing measurement data is cleared if MEAS:RES? or READ:RES? is sent. *(p.61)*

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

Queries the voltage value.
All existing measurement data is cleared if MEAS:VOLT? or READ:VOLT? is sent. *(p.61)*

RESult Command

RES?

Queries the previous test result. A query does not clear the test results. *(p.62)*

RES:FORM

Sets the response format (types and listing order of returned items) to use when test results are queried. *(p.64)*

RES:COUN?

Queries the number of test results saved in the TOS73 series. *(p.65)*

RES:NUMB?

Queries the latest test number for the saved test results. *(p.65)*

RES:NUMB:ARB

Set any test number for the next test result. *(p.65)*

RES:REM?

Queries the oldest test result saved in the TOS73 series. Test results returned as responses are cleared one after the other. *(p.66)*

RES:REM:ALL

Clears all test results saved in the TOS73 series. *(p.66)*

RES:TZON

Sets the time of the test results to Coordinated Universal Time (UTC) or the time in the time zone set by SYST:TZON. *(p.66)*

SAMPle Command

SAMP:COUN

Sets the count of sample acquisition (i.e., sample count) that the ACQ trigger subsystem records per trigger action. *(p.67)*

SAMP:TEST:ENAB

Sets whether obtaining samples is limited to the time when the test is performed. *(p.68)*

SAMP:TIM

Sets a sampling interval. *(p.68)*

SENSe:IR Command

SENS:IR:APER

Sets the aperture time.
Changing the set value of this command may also change the setting ranges for other commands. *(p.69)*

SENS:IR:FILT:DIG:STAT

For insulation resistance tests, enables or disables the digital filter function, which detects poor contact with the EUT or broken test leads. *(p.70)*

SENS:IR:JUDG

For insulation resistance tests, sets the reference resistance value for upper limit judgment (i.e., upper limit). *(p.70)*

SENS:IR:JUDG:STAT

For insulation resistance tests, sets whether to perform an upper limit judgment based on the resistance upper limit. *(p.71)*

SENS:IR:JUDG:DEL

For insulation resistance tests, sets the time before starting the lower limit judgment and/or dV judgment (judgment delay). *(p.71)*

SENS:IR:JUDG:DVOL

For insulation resistance tests, sets the delta voltage for dV judgment in percentage (%) of the test voltage. (TOS7301 and TOS7301 WITH LAN only) *(p.72)*

SENS:IR:JUDG:DVOL:COUN

For insulation resistance tests, sets the number of consecutive detections as the dV judgment criterion. (TOS7301 and TOS7301 WITH LAN only) *(p.72)*

SENS:IR:JUDG:DVOL:STAT

For insulation resistance tests, enables or disables the dV judgment function. (TOS7301 and TOS7301 WITH LAN only) *(p.73)*

SENS:IR:JUDG:LOW

For insulation resistance tests, sets the reference resistance value for lower limit judgment (i.e., lower limit). *(p.73)*

SENS:IR:JUDG:LOW:STAT

For insulation resistance tests, sets whether to enable or disable the judgment based on the lower limit reference value (i.e., lower limit judgment). *(p.74)*

SENS:IR:JUDG:SCD:STAT

For insulation resistance tests, enables or disables the short-circuit detection function, which detects short circuits between the HIGH and LOW terminals. *(p.74)*

SENS:IR:TERM:CCH

For insulation resistance tests, enables or disables the contact check function, which detects poor contact with the EUT or broken test leads. *(p.75)*

[SOURce:]IR Command

IR:VOLT

For insulation resistance tests, sets the test voltage. *(p.76)*

IR:VOLT:PROT

For insulation resistance tests, sets the limit voltage. *(p.76)*

IR:VOLT:STAR

For insulation resistance tests, sets the start voltage as a percentage (%) of IR:VOLT (test voltage). *(p.77)*

IR:VOLT:STAR:STAT

For insulation resistance tests, enables or disables the start voltage. *(p.77)*

IR:VOLT:SWE:TIM

For insulation resistance tests, sets the number of seconds for the voltage rise time. *(p.78)*

IR:VOLT:SWE:TIM:STAT

For insulation resistance tests, enables or disables the voltage rise time. *(p.78)*

IR:VOLT:TIM

For insulation resistance tests, sets the number of seconds for the test time. *(p.79)*

IR:VOLT:TIM:STAT

For insulation resistance tests, enables or disables the test time.
Changing the set value of this command may also change the set value of SENS:IR:APER (aperture time). *(p.79)*

STATus Command

STAT:OPER?

Queries the bits set to true (1) in the EVENt register of the OPERation status register.
Upon query, all bits in the EVENt register are reset to false (0). *(p.85)*

STAT:OPER:<bit-item>?

Queries whether the specified bit in the EVENt register of the OPERation status register is set to true (1). Upon query, all bits in the EVENt register are reset to false (0). *(p.85)*

STAT:OPER:COND?

Queries the bits set to true (1) in the CONDition register of the OPERation status register. *(p.85)*

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

Queries whether the specified bit in the CONDition register of the OPERation status register is set to true (1). *(p.86)*

STAT:OPER:ENAB

Sets the ENABle register for the OPERation status register. *(p.86)*

STAT:OPER:ENAB:<bit-item>

Sets the specified bit in the ENABle register for the OPERation status register. *(p.86)*

STAT:OPER:NTR

Sets the NTRansition filter for the OPERation status register. *(p.87)*

STAT:OPER:NTR:<bit-item>

Sets the specified bit in the NTRansition filter for the OPERation status register. *(p.87)*

STAT:OPER:PTR

Sets the PTRansition filter for the OPERation status register. *(p.88)*

STAT:OPER:PTR:<bit-item>

Sets the specified bit in the PTRansition filter for the OPERation status register. *(p.88)*

STAT:OPER:PROT?

Queries the bits set to true (1) in the EVENt register of the OPERation:PROTecting status register. Upon query, all bits in the EVENt register are reset to false (0). *(p.89)*

STAT:OPER:PROT:COND?

Queries the bits set to true (1) in the CONDition register of the OPERation:PROTecting status register. *(p.89)*

STAT:OPER:PROT:ENAB

Sets the ENABle register for the OPERation:PROTecting status register. *(p.90)*

STAT:OPER:PROT:NTR

Sets the NTRansition filter for the OPERation:PROTecting status register. *(p.90)*

STAT:OPER:PROT:PTR

Sets the PTRansition filter for the OPERation:PROTecting status register. *(p.90)*

STAT:OPER:TEST?

Queries the bits set to true (1) in the EVENt register of the OPERation:TESTing status register. Upon query, all bits in the EVENt register are reset to false (0). *(p.91)*

STAT:OPER:TEST:COND?

Queries the bits set to true (1) in the CONDition register of the OPERation:TESTing status register. *(p.91)*

STAT:OPER:TEST:ENAB

Sets the ENABle register for the OPERation:TESTing status register. *(p.92)*

STAT:OPER:TEST:NTR

Sets the NTRansition filter for the OPERation:TESTing status register. *(p.92)*

STAT:OPER:TEST:PTR

Sets the PTRansition filter for the OPERation:TESTing status register. *(p.92)*

STAT:QUES?

Queries the bits set to true (1) in the EVENt register of the QUEStionable status register. Upon query, all bits in the EVENt register are reset to false (0). *(p.93)*

STAT:QUES:COND?

Queries the bits set to true (1) in the CONDition register of the QUEStionable status register. *(p.93)*

STAT:QUES:ENAB

Sets the ENABle register for the QUEStionable status register. *(p.94)*

STAT:QUES:NTR

Sets the NTRansition filter for the QUEStionable status register. *(p.94)*

STAT:QUES:PTR

Sets the PTRansition filter for the QUEStionable status register. *(p.94)*

STAT:PRES

Resets the writable sub-registers (ENABle register, PTRansition filter, and NTRansition filter) of all SCPI status registers (including TOS73 series specific registers) to their default settings. *(p.95)*

SYSTem Command

SYST:BEEP

Enables or disables all configurable beep sounds collectively. *(p.96)*

SYST:BEEP:KEY

Enables or disables the beep sound generated when an invalid key operation is performed. This command and SYST:BEEP may interact to change each other's settings. *(p.97)*

SYST:BEEP:PROT

Enables or disables the beep sounds generated when a protection function is activated. This command and SYST:BEEP may interact to change each other's settings. *(p.97)*

SYST:BEEP:SCPI

Enables or disables the beep sounds generated when an SCPI error occurs. This command and SYST:BEEP may interact to change each other's settings. *(p.97)*

SYST:COMM:PROT:WDOG

Enables or disables Watchdog. *(p.98)*

SYST:COMM:PROT:WDOG:DEL

Sets the time until the PROTECTION mode starts after the last SCPI communication if the Watchdog is enabled. *(p.98)*

SYST:COMM:RLST

Sets the operating method (local mode/remote mode) of the TOS73 series. *(p.99)*

SYST:CONF:BEEP:STAT

Enables or disables the beep sound generated when a FAIL judgment occurs. This command and SYST:BEEP may interact to change each other's settings. *(p.99)*

SYST:CONF:BEEP:PASS:STAT

Enables or disables the beep sound generated when a PASS judgment occurs. This command and SYST:BEEP may interact to change each other's settings. *(p.100)*

SYST:CONF:CAL:DUE:CONT

Sets the calibration period. *(p.100)*

SYST:CONF:CAL:PROT:STAT

Sets whether to activate the protection function and switch to PROTECTION mode when the calibration period is expired. *(p.101)*

SYST:CONF:DACT:STAT

Enables or disables Double Action for the test start operation.
When this command is enabled, the Start Long (SYST:CONF:SLPR:STAT) is disabled. *(p.101)*

SYST:CONF:FMOD:STAT

Enables or disables the fail mode. *(p.102)*

SYST:CONF:MOM:STAT

Enables or disables Momentary for the test start operation. *(p.102)*

SYST:CONF:PHOL

Sets the duration for retain displaying the judgment result on the display of the TOS73 series when the PASS judgment is made (Pass Hold). *(p.103)*

SYST:CONF:FHOL

Sets whether to continue displaying the judgment result on the display of the TOS73 series when the FAIL judgment is made (Fail Hold). *(p.103)*

SYST:CONF:DANG:VOLT

Sets the threshold voltage at which the DANGER LED turns on/off. *(p.104)*

SYST:CONF:PON:STAT

Sets the panel setting status when the power is turned on. *(p.104)*

SYST:CONF:SAV

Saves the current CONFIG settings applied to the TOS73 series. *(p.105)*

SYST:CONF:SIO:INT:STAT

Enables or disables interlock. *(p.105)*

SYST:CONF:SLPR:STAT

Enables or disables Start Long for the test start operation.
When this command is enabled, the Double Action (SYST:CONF:DACT:STAT) will be disabled. *(p.105)*

SYST:DATE

Sets the date of the system clock for the TOS73 series. *(p.106)*

SYST:ERR?

Reads the oldest error information or event information from the error/event queue. *(p.106)*

SYST:ERR:COUN?

Returns the number of unread errors in the error/event queue. *(p.107)*

SYST:KLOC

Enable or disables the key lock for panel operations of the TOS73 series. *(p.107)*

SYST:KLOC:LEV

Sets the key lock level to be applied when the panel key operations of the TOS73 series are locked. *(p.108)*

SYST:KLOC:PASS:NEW

Sets the password for unlocking the panel key lock. *(p.108)*

SYST:KLOC:PASS:STAT

Sets whether password input is required when unlocking the key lock. *(p.109)*

SYST:PASS

Enables the use of password-protected commands. *(p.109)*

SYST:PASS:CDIS

Disables the use of password-protected commands. *(p.110)*

SYST:PASS:NEW

Sets a password to enable/disable the use of password-protected commands. *(p.110)*

SYST:PASS:STAT?

Queries the state of the password-protection (enable/disable) of password-protected commands. *(p.110)*

SYST:SEC:IMM

Sanitizes all the contents saved in TOS73 series memory and initializes the panel settings to their factory default conditions. *(p.111)*

SYST:SSAV

Enables or disables the screen saver for the display of the TOS73 series. *(p.111)*

SYST:SSAV:DEL

Sets the time before the screen saver for the display of the TOS73 series to start when the front panel is not operated. *(p.111)*

SYST:TIME

Sets the time of the system clock for the TOS73 series. *(p.112)*

SYST:TIME:ADJ

Automatically synchronizes the system clock of the TOS73 series using the NTP server on the network. *(p.112)*

SYST:TZON

Sets the time zone of the system clock for the TOS73 series. *(p.112)*

SYST:TZON:CAT?

Queries all available time zone IDs for the system clock. *(p.113)*

SYST:VERS?

Queries the version of the SCPI standard that the TOS73 series complies with. *(p.113)*

TRIGger Command

TRIG:ACQ

Applies a software trigger to the ACQuire trigger subsystem. *(p.114)*

TRIG:ACQ:COUN

Sets the number of trigger actions (i.e., trigger count) to execute in one trigger sequence for the ACQuire trigger subsystem. *(p.114)*

TRIG:ACQ:DEL

Sets the delay time before the trigger action starts for the ACQuire trigger subsystem. *(p.115)*

TRIG:ACQ:SOUR

Sets for the ACQuire trigger subsystem the conditions (trigger source) for starting a trigger action from the INITiated state. *(p.116)*

TRIG:TEST

Applies a software trigger to the TEST trigger subsystem. *(p.116)*

TRIG:TEST:SOUR

Sets for the TEST trigger subsystem the conditions (trigger source) for starting a trigger action from the INITiated state. *(p.117)*

Introduction

The TOS73 Series Communication Interface Manual explains the settings that are used to control the TOS73 series remotely through the following interfaces and the available commands.

- RS232C interface
- USB interface
- LAN interface

When the TOS73 series product is operating under remote control (remote mode), the Remote icon appears on the front panel display.

To return the TOS73 series from remote mode to local mode (i.e., operation with the front panel operation), press LOCAL.

For the safety precautions, installation, operation, and specifications of the TOS73 series, read the accompanying TOS73 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 the TOS73 series before you use them *(p. 30)*.

TOS73 Series Lineup

The full lineup of the TOS73 series is as follows.

Model	Supported interfaces	With/without graph display function	Supported judgment functions	Aperture time *(p. 69)*
TOS7300	RS232C, USB	n/a	Upper limit judgment, lower limit judgment, short-circuit detection, contact check	16.66 ms, 20 ms, or 100 ms
TOS7300 WITH LAN	RS232C, USB, LAN			
TOS7301	RS232C, USB	✓	Upper limit judgment, lower limit judgment, short-circuit detection, dV judgment, contact check	10 ms, 16.66 ms, 20 ms, or 100 ms
TOS7301 WITH LAN	RS232C, USB, LAN			

In this manual, among the TOS73 series, specifically the TOS7300 WITH LAN and TOS7301 WITH LAN are also referred to as WITH LAN models.

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Measuring instrument interface standards

TOS73 series 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
- 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

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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. 19.0 or later)
- Keysight VISA by Keysight Technologies (Keysight IO Libraries Suite 18.1 or later)
- KI-VISA (Ver. 5.5 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

All models in the TOS73 series come standard with RS232C and USB interfaces.
The WITH LAN models also come standard with a LAN interface.

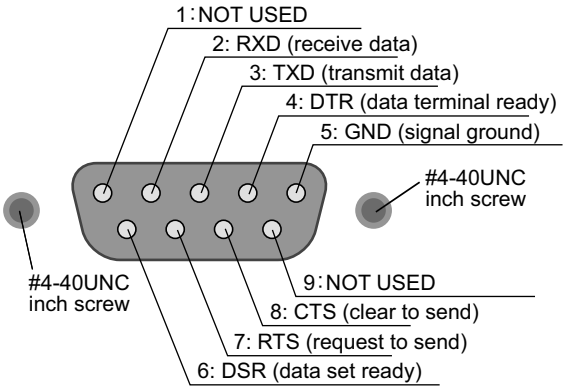
⚠WARNING

If the remote control via digital communication fails, this product will operate unexpectedly, resulting in electric shock, fire, or property damage to the EUT (device under test). When controlling the TOS73 series from a remote location, take safety measures such as using a watchdog ***(p. 98)*****.**

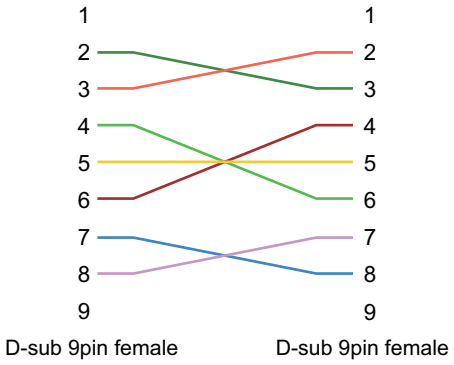
RS232C

RS232C connection

For the RS232C cable, use a D-sub, 9-pin, female-to-female crossover cable.
The RS232C port on the TOS73 series side is a D-sub 9-pin port (EIA-232D).
The figure below shows the port pinout.



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



Crossover cable example

1 **Turn off the power supply of the TOS73 series and the PC.**

2 **Connect the TOS73 series and PC with an RS232C cable.**
On the TOS73 series side, connect the cable to the RS232C port on the rear panel.
This completes the connections.

Protocol

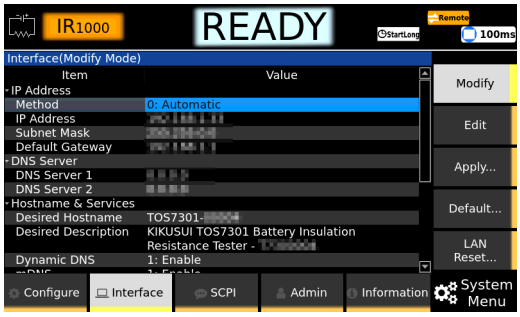
The RS232C protocol is shown in the following table. The settings underlined indicate the factory default settings.

Item	Set value	Description
Bitrate	9600/19200/38400/57600/115200	Baud rate [bps]
Data Bits	8 bit (fixed)	Data length
Stop Bits	1 bit/2 bit	Stop bits
Flow Control	None/CTS-RTS	Flow control

Configuring the RS232C interface

1 **Press SYSTEM > Interface > Modify.**

The interface setup screen (Modify Mode) appears.



2 **Use the rotary knob to select any setting item under RS232C Settings, and then press Edit.**

3 **Use the rotary knob to select a set value, and then press Edit.**

If you press Edit after changing the set value, you can continue to set other items. The changes are not applied at this point.

- Change the interface settings by repeating Step 2 and Step 3.
- When you have completed the settings for each item, proceed to Step 4.

4 **Press Apply.**

A confirmation dialog box appears. To cancel the changes, press ESCAPE.

5 **Press arrow (◀/▶) keys to select OK, and then press ENTER.**

This completes the setting.

Break signal

The break signal is used as a substitute for the IEEE 488.1 dcl (Device Clear) message and IEEE 488.1 sdc (Selected Device Clear) message.

USB

Controlling the TOS73 series via a USB interface requires a device driver that complies with the USB T&M class (USBTMC). The USBTMC driver is installed automatically by the VISA library.

USB connection

Connect the TOS73 series to your PC using a USB cable.

1 **Connect the TOS73 series and PC with an USB cable.**
On the TOS73 series side, connect the cable to the USB port on the rear panel.
This completes the connections.

Service request

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

USB function

Complies with the USB Specification 2.0
Complies with the USBTMC specification 1.0 and USBTMC-USB488 specification 1.0
Baud rate: 480 Mbps maximum (high speed)
VID (vendor ID): 0x0B3E
PID (product ID): 0x105D

LAN (WITH LAN model only)

The WITH LAN models of the TOS73 series (TOS7300 WITH LAN and TOS7301 WITH LAN) come standard with a LAN interface.

⚠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.

Controlling the TOS73 series via a LAN interface requires middleware that supports the HiSLIP/SCPI-RAW protocols. 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

Use a standard LAN cable (category 5 or above, straight) to connect the TOS73 series to a network hub or router.

1 **Connect the TOS73 series and PC with a LAN cable.**

On the TOS73 series side, connect the cable to the LAN port on the rear panel.

This completes the connections.

LAN settings

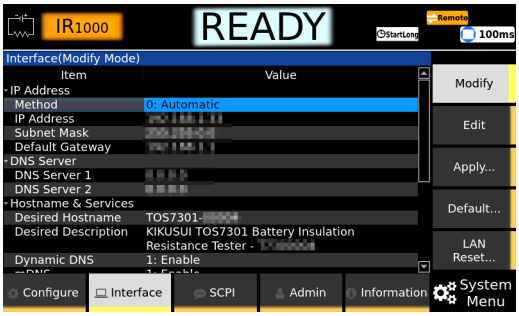
Normally, use the product with “IP Address > Method” set to “0: Automatic” (factory default setting) on the interface setup screen.

To set the IP address manually, set “IP Address > Method” to “1: Static”, and then set the IP address.

For details, see the TOS73 Series User’s Manual.

1 **Press SYSTEM > Interface > Modify.**

The interface setup screen (Modify Mode) appears.



2 **Use the rotary knob to select Method under IP Address, and then press Edit.**

3 **Use the rotary knob to select a set value, and then press Edit.**

If you press Edit after changing the set value, you can continue to set other items. The changes are not applied at this point.

- If you select “0: Automatic”, proceed directly to Step 4.
- If you select “1: Static”, set “IP Address > IP Address”, “IP Address > Subnet Mask”, and “IP Address > Default Gateway” respectively. Then, proceed to Step 4.

4 **Press Apply.**

A confirmation dialog box appears. To cancel the changes, press ESCAPE.

5 **Press arrow (◀/▶) keys to select OK, and then press ENTER.**

This completes the setting.

Service request

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

LAN specifications

Hardware

IEEE 802.3 1000Base-T/100Base-TX/10Base-T Ethernet, Auto-MDIX support, LXI Class C compliant, Specification 1.5, IPv4, RJ-45 connector

Communication protocol

HiSLIP, SCPI-RAW

Program message terminator

HiSLIP: LF or END during reception, LF + END during transmission

SCPI-RAW: LF during reception, LF during transmission

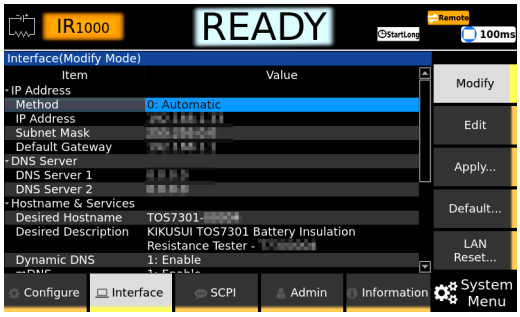
Restarting the LAN interface (resetting the connection)

The current LAN interface connection is temporarily disconnected, and the connection to the PC via the LAN interface is re-established.

The LAN interface settings are retained after the restart, and there is no impact on the panel settings of the TOS73 series.

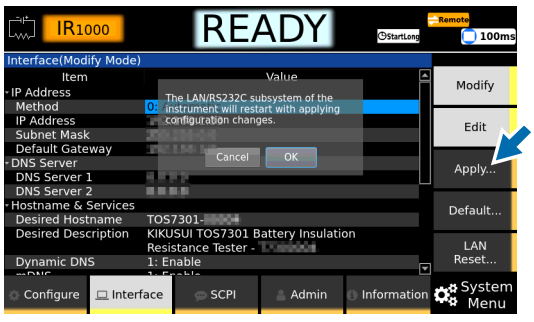
1 **Press SYSTEM > Interface > Modify.**

The interface setup screen (Modify Mode) appears.



2 **Press Apply.**

A confirmation dialog box appears.



To cancel the restarting (resetting the connection), press ESCAPE.

3 **Press arrow (◀/▶) keys to select OK, and then press ENTER.**

The LAN interface restarts.

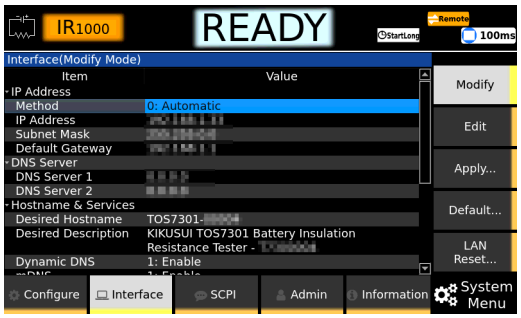
Resetting the LAN interface

You can reset the LAN interface settings on the interface setup screen.
Resetting will restore the following setting parameters to their factory default settings.

Item		Factory default setting
IP Address	Method	0: Automatic
Hostname & Services	Dynamic DNS	1: Enable
	mDNS	1: Enable
Password for the Web browser interface		Not set

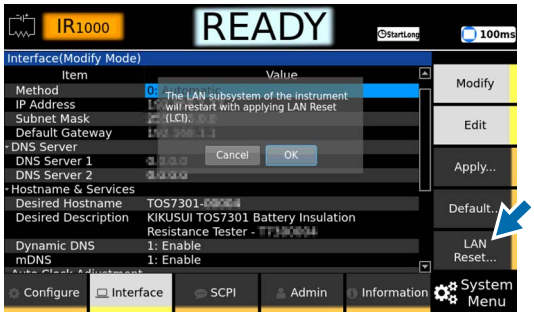
1 **Press SYSTEM > Interface > Modify.**

The interface setup screen (Modify Mode) appears.



2 **Press LAN Reset.**

A confirmation dialog box appears.



To cancel the initialization of settings, press ESCAPE.

3 **Press arrow (◀/▶) keys to select OK, and then press ENTER.**

The LAN interface settings are returned to the factory default settings.

Initializing the interface settings

You can initialize the LAN and RS232C interface settings on the interface setup screen. Once you initialize, the following items return to the factory default settings.

Item		Factory default setting
IP Address [1]	Method	0: Automatic
	IP Address	n/a
	Subnet Mask	n/a
	Default Gateway	n/a
DNS Server [1]	DNS Server 1	0.0.0.0
	DNS Server 2	0.0.0.0
Hostname & Services [1]	Desired Hostname	Model name and serial number
	Desired Description	• TOS7300 WITH LAN: KIKUSUI TOS7300 Insulation Resistance Tester and serial number • TOS7301 WITH LAN: KIKUSUI TOS7301 Battery Insulation Resistance Tester and serial number
	Dynamic DNS	1: Enable
	mDNS	1: Enable
Auto Clock Adjustment [1]	NTP Server Hostname	ntp.nict.jp
	Auto Adjustment	1: Enable
RS232C Settings	Bitrate	3: 19200 bps
	Data Bits	0: 8 bit
	Stop Bits	0: 1 bit
	Flow Control	0: None
Password for the Web browser interface [1]		Not set

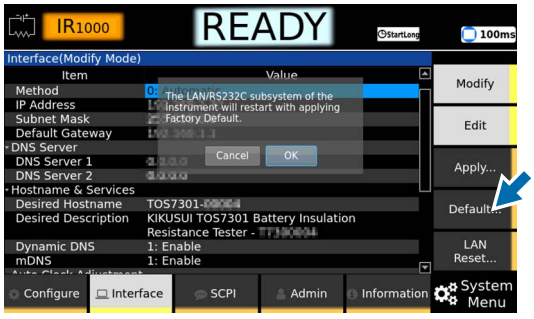
1. WITH LAN model only.

1 Press SYSTEM > Interface > Modify.

The interface setup screen (Modify Mode) appears.

2 Press Default.

A confirmation dialog box appears.



To cancel the initialization of settings, press ESCAPE.

3 Press arrow (◀/▶) keys to select OK, and then press ENTER.

The interface settings are returned to the factory default settings.

Accessing and Operating the Product from a Web Browser (WITH LAN model only)

The WITH LAN models of the TOS73 series (TOS7300 WITH LAN and TOS7301 WITH LAN) come standard with a web browser interface.

If you connect a PC to the TOS73 series using the LAN interface, you can acquire the information of the TOS73 series from the PC's browser.

Applicable browsers

Google Chrome, Microsoft Edge, Safari

Use the latest version of the browser.

Access the Web browser interface

Enter the URL in the address bar of the browser

The URL of the Web browser interface is the IP address of the TOS73 series preceded by “http://”.

You can check the IP address from the interface setup screen of the TOS73 series. *(p. 22)*

Example: When the IP address is 169.254.7.8

http://169.254.7.8

Search by VISA Application

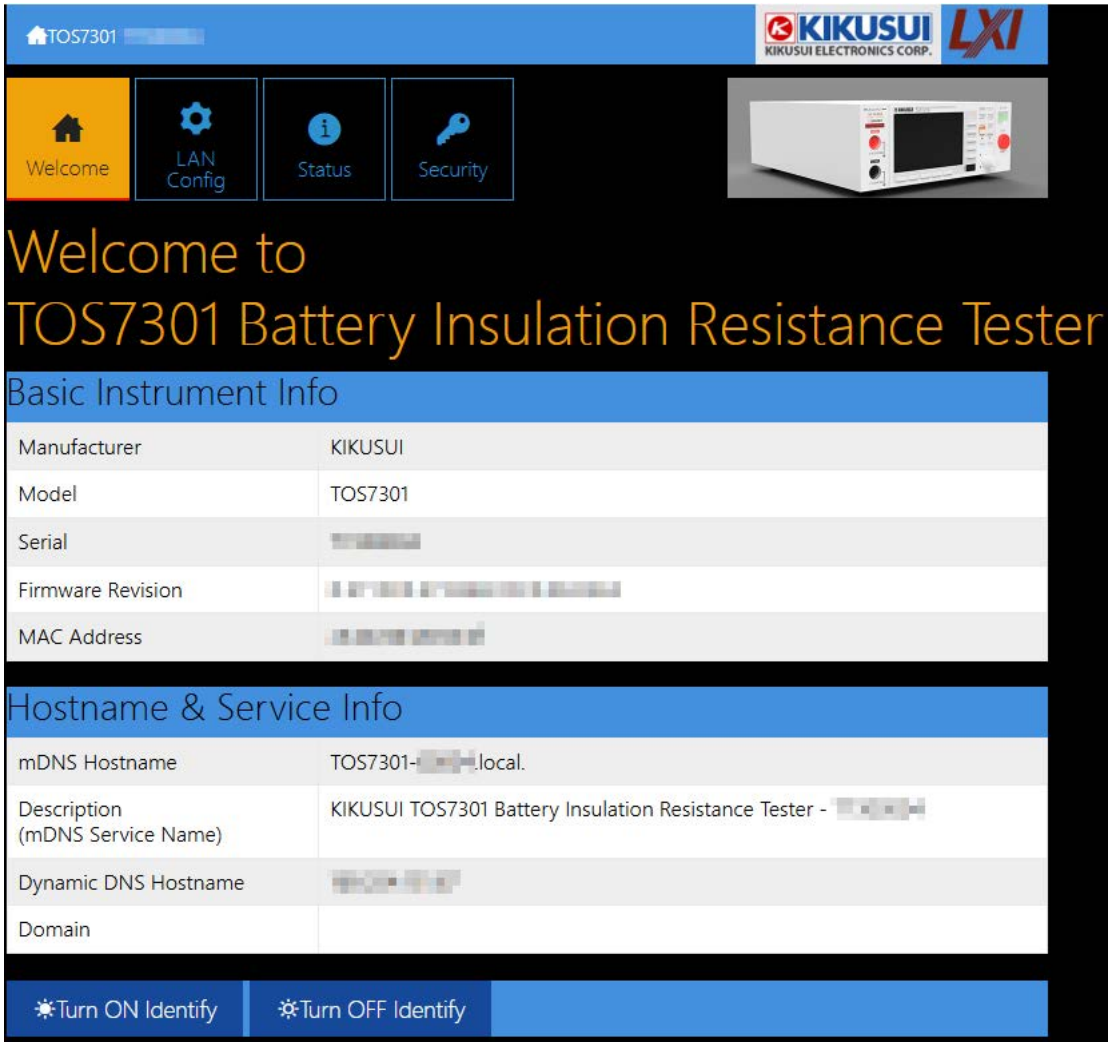
If a VISA library is in use, the Web browser interface will open if you search for measuring instrument with the applications provided by each VISA vendor (National Instruments NI-MAX, Keysight Connection Expert, Kikusui KI-VISA Instrument Explorer, or the like) and click on the web link from the search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

WELCOME page

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

There, you can check the measuring instrument information, network information, and VISA resources (I/O resources) information, etc.

To go to another page, click the navigation menu at the top.



Turn ON Identify

The Web browser interface identifies the TOS73 series currently connected to the PC.

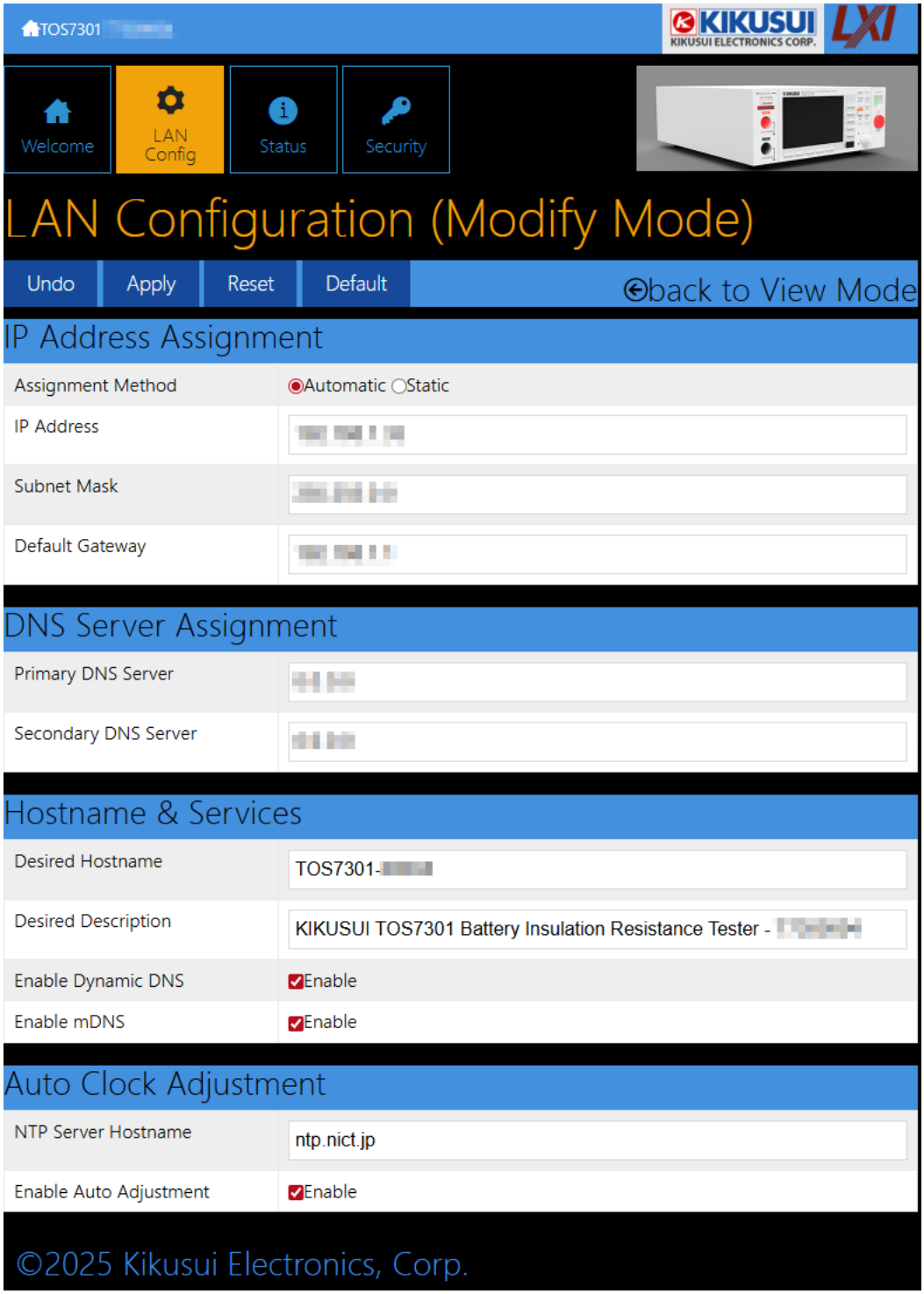
When it is clicked, the text “LXI Web Identify” is displayed on the front panel display of the connected TOS73 series.

Turn OFF Identify

When it is clicked, the “LXI Web Identify” text is hidden if it is shown on the front panel display of the connected TOS73 series.

LAN Configuration page

You can check and edit the network settings.
To go to another page, click the navigation menu at the top.



Navigation (View Mode only)

Modify Now: Brings you to the network setting parameter editing screen (Modify Mode).

Navigation (Modify Mode only)

- Undo: Returns the edited network setting parameters to their previous state.
- Apply: Applies the edited network setting parameters.
- Reset: Resets the network setting parameters.
- Default: Initializes the network setting parameters.
- Back to View Mode: Changes to the network setting parameter 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.

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” and “Enable mDNS”.

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 only)

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

Reset/Initialization and factory default settings

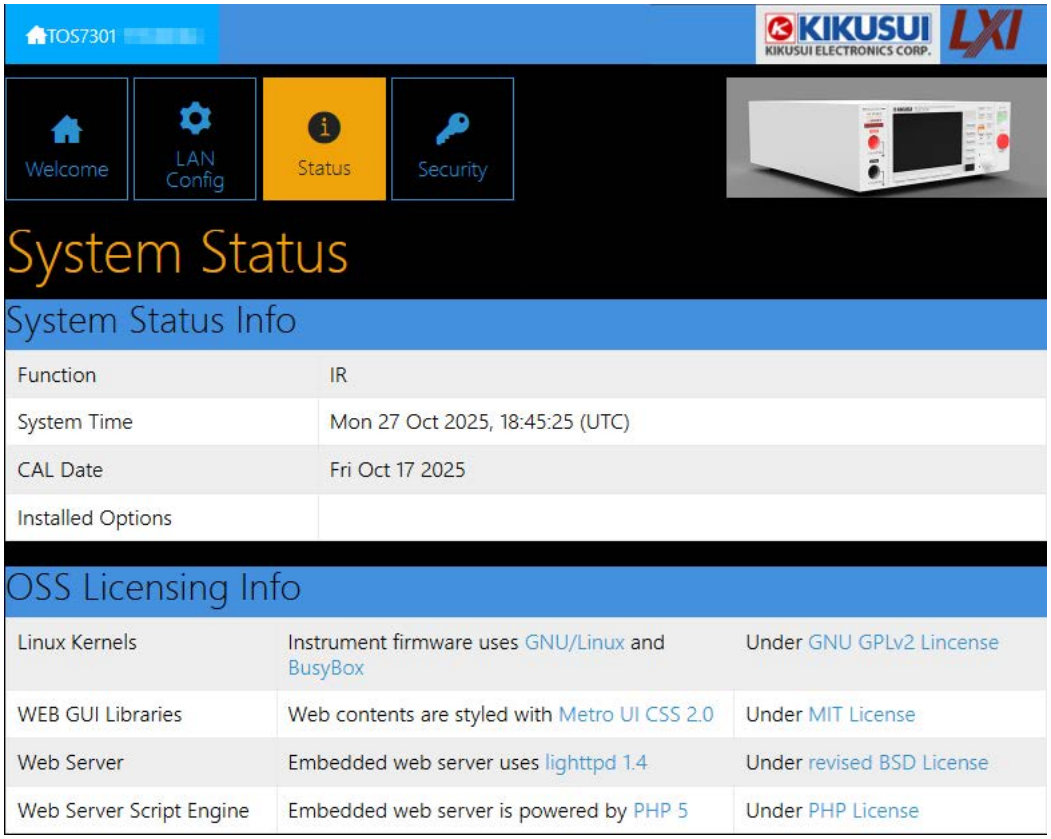
For resetting, click “Reset”. For initialization, click “Default”. The network settings will be changed as follows:

The items with a ✓ mark are returned to their factory default settings.

Item		Factory default setting	Reset	Initialization
IP Address Assignment	Assignment Method	Automatic	✓	✓
DNS Server Assignment	Primary DNS Server	0.0.0.0	✓	✓
	Secondary DNS Server	0.0.0.0	✓	✓
Hostname & Services	Desired Hostname	Model name and serial number	n/a	✓
	Desired Description	• TOS7300 WITH LAN: KIKUSUI TOS7300 Insulation Resistance Tester and serial number • TOS7301 WITH LAN: KIKUSUI TOS7301 Battery Insulation Resistance Tester and serial number	n/a	✓
	Enable Dynamic DNS	Enable	✓	✓
	Enable mDNS	Enable	✓	✓
Auto Clock Adjustment	NTP Server Hostname	ntp.nict.jp	n/a	✓
	Enable Auto Adjustment	Enable	n/a	✓

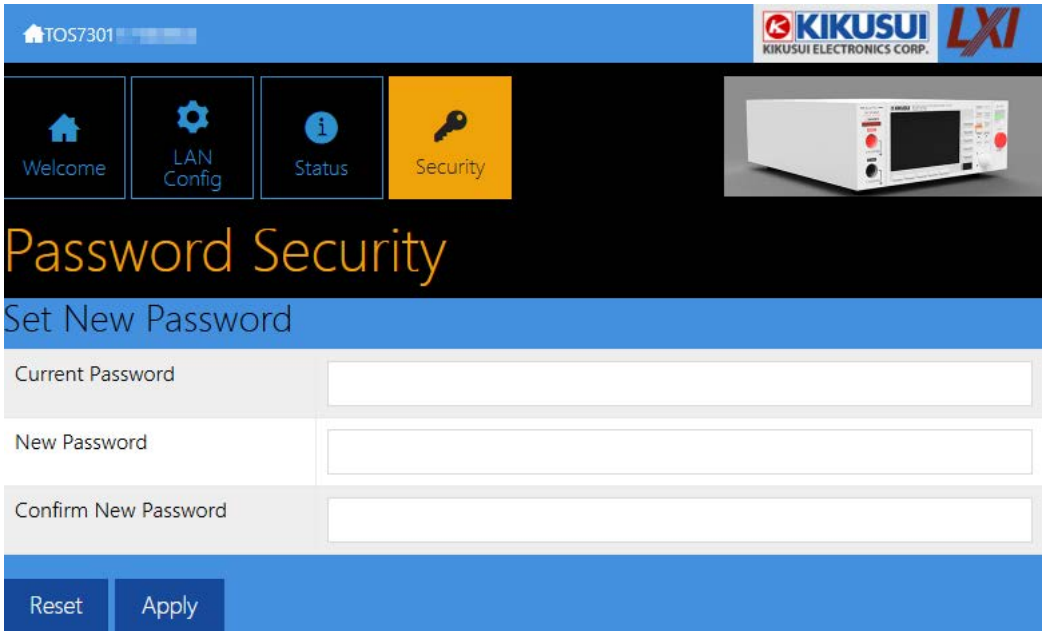
System Status page

This page shows the system information and the license information of the open-source software.
To go to another page, click the navigation menu at the top.



Password Security page

You can set and change the password for the Web browser interface here.
To go to another page, click the navigation menu at the top.



When a password is set, the following functions require password entry.

- Editing of LAN Configuration page
- Changing/Disabling the password

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

Changing/Disabling the password

After the password has been set, the screen for changing the password appears when you enter the password.

Changing the password:

To change the password, enter the following in each input form and click “Apply”.

- Current Password: The currently set password (factory default setting: Empty)
- New Password, Confirm Password: New password

Disabling the password:

To disable password protection, enter the following in each input form and click “Apply”.

- Current Password: The currently set password
- New Password, Confirm Password: Empty

If you forget the password

If you forget the Web browser interface password, you can reset it by doing one of the following:

- Resetting the LAN interface *(p. 22)*
- Initializing the interface settings *(p. 23)*

About Commands

The information that is transferred between the controller (the PC) and the TOS73 series is referred to as messages. The TOS73 series uses the SCPI language for these messages.

Messages include commands sent from the PC to the TOS73 series and responses sent from the TOS73 series to the PC.

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.

Using the SOURce subsystem as an example, the hierarchy is explained below.

Program header *(p. 31)*	Parameters *(p. 33)*	Node level
[SOURce:]		Root node (optional node, *p. 32*)
IR		2nd level
:VOLTage		3rd level
:STARt		4th level
[:LEVel]	<numeric>	5th level (optional node)
[:LEVel]?	[{MAXimum|MINimum}]	5th level (optional node)
:STATe	<boolean>	5th level
:STATe?		5th level
:TIMer	<numeric>	4th level
:TIMer?	[{MAXimum|MINimum}]	4th level
:STATe	<boolean>	5th level
:STATe?		5th level

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

Command syntax

NOTE

To use the communication interface, switch the operation of the TOS73 series to remote mode using a command. For remote programming, send one of the following commands *(p. 99)* at the beginning of the program. Either command switches the operation of the TOS73 series to remote mode and applies key lock to the front panel.

- SYST:COMM:RLST REM
  The key lock applied by this command can be unlocked using the front panel of the TOS73 series.
- SYST:COMM:RLST RWL
  The key lock applied by this command cannot be unlocked using the front panel of the TOS73 series. This is useful for preventing erroneous operation from the front panel.

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

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

- SCPI commands have short forms available. 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.
- SCPI commands that share a common upper-level node can be concatenated as compound commands using a semicolon " ; " as shown below:
  `IR:VOLTage:STARt 50PCT;STATe ON`
  This compound command concatenates the following two SCPI commands:
  `IR:VOLTage:STARt:LEVel 50PCT`
  `IR:VOLTage:STARt:STATe ON`
  In compound commands, the upper-level node specified as the "current path" is omitted from the SCPI command that follows. In the above compound command, the first SCPI command (IR:VOLTage:STARt:LEVel) sets the current path to "IR:VOLTage:STARt". The second SCPI command omits the upper-level node that matches the specified current path (IR:VOLTage:STARt).
- An error will occur if the upper-level node of the SCPI command concatenated to a compound command does not match the specified current path. In this case, use a colon and semicolon " ;: " as follows to reset the current path and concatenate the subsequent SCPI command to the compound command:
  `TRIGger:ACQuire:SOURce TSTart;:SAMPle:TESTing:ENABle ON`
  This compound command concatenates two commands from different subsystems.
- In compound commands, IEEE 488.2 Common Commands *(p. 36)* can be concatenated as follows:
  `IR:VOLTage:STARt 50PCT;*SAV 1;STATe ON;:ABORt:TEST;*TST?;*WAI;:INITiated`
  Common commands neither reference nor specify the current path; therefore, they can be concatenated after any command using a semicolon " ; ". However, for SCPI commands to be concatenated immediately after a common command, it is necessary to consider whether their upper-level node matches the specified current path. SCPI commands concatenated after a common command see the current path of the SCPI command immediately before the common command. If the upper-level nodes of the SCPI commands before and after the common command do not match, an error occurs unless the current path is reset using " ;: ".
- The maximum number of bytes that can be sent at one time is 512.

Special symbols

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

Do not include these symbols in the actual program.

- Characters and numbers enclosed by { and } and delimited by “|” indicate that one of the delimited items is to be selected.
- The angle brackets (<>) represent program data.
- [ ] denotes optional data. When optional data is not sent with the program, the default setting is applied.

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.

```
IR:VOLT? MAX
```

Response

This is a 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 terminators compatible with the TOS73 series interfaces are listed in the table below. Terminating a command string with a valid terminator always resets the path to the root level.

Interface	Receiving terminator	Transmitting terminator
LAN (SCPI-RAW) [1], RS232C	LF	LF
USB	LF or EOM	LF+EOM
LAN (HiSLIP) [1]	LF or END	LF+END

1. WITH LAN model only.

NOTE

CR (ASCII 0x0D) is not a terminator.

Common commands

There are commands that are common to the IEEE 488.2 standard and the SCPI standard for functions such as resetting devices and performing self-tests *(p. 36)*. 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 standard. The program data expression format that the TOS73 series 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).

```
SYSTem:TZONe "Asia/Tokyo"
```

If you want to include a quotation mark as part of the string, enter two 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:ACQuire:SOURce {IMMediate|BUS|TSTart}
```

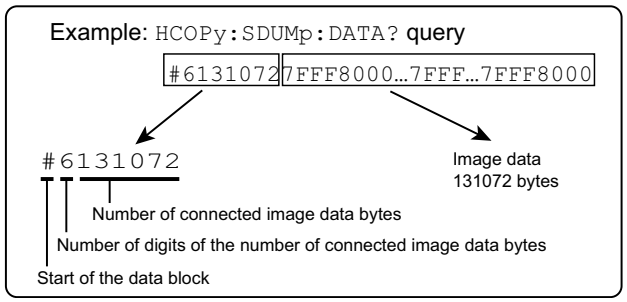
Boolean data (boolean)

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.
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.

NR3

Represents a real number in scientific notation. Details are given in the IEEE 488.2 standard.
If 380 is returned in the response data, it is returned as +3.80000E+02. Five decimal places are used.

Invalid values in response

- 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 general term, including 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.

Numeric parameters can be used together with measurement units such as V, A, and W.

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

Substitutes

The TOS73 series defines alternative options such as MINimum and MAXimum when the parameter is numeric.

- The following example sets the test voltage to the minimum value.
  ```
  IR:VOLTage MINimum
  ```
- You can query the minimum and maximum values for most parameters.
  ```
  IR:VOLTage? [{MAXimum|MINimum}]
  ```

Measurement units

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

V (voltage)	A (current)	OHM (resistance)	HR (hours)
MIN (minutes)	S (seconds)	PCT (%)	

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

These commands are commonly available on instruments compliant with IEEE 488.2.

For registers and queues, see the “STATus Command” *(p. 80)*, “Status Monitoring” *(p. 134)*, and “Error/Event queue” *(p. 135)*.

*CLS

Clears the contents of the status byte (STB) register, the event status register (SESR), the error/event queue, and all EVENt registers. Clears wait-for-completion operations created by *OPC or *OPC? command.

For details on wait-for-completion operation, see “Waiting for Operation Complete” *(p. 133)*.

Command

```
*CLS
```

*ESE

Sets the event status enable (ESE) register bits that are counted by the ESB bit of the status byte (STB) register.

When the specified bit becomes true (1) in the ESE register, it is reported to the ESB bit of the STB register (bit 5: Standard Event Status Bit Summary).

For details on the STB register and the ESB bit, see “Status Byte Register” *(p. 82)*.

For the error/event numbers corresponding to each bit in the ESE register, see “Event Status Register” *(p. 83)* or “List of Errors” *(p. 136)*.

Command

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

Parameter

Set value: 0 to 255

Response

NR1

Example

When *ESE 16 is transmitted, the EXE bit of the ESE register (bit 4: Execution Error) is set as an aggregation target. From then on, whenever the EXE bit is set to true due to the occurrence of an execution error (error number: -200 to +299), the ESB bit in the STB register will also be set to true.

*ESR?

Queries the event status register (SESR). The SESR is cleared after the query.
For details, see “Event Status Register” *(p. 83)*.

Command

```
*ESR?
```

Response

NR1

*IDN?

Queries the model name and firmware version of the TOS73 series.

Command

```
*IDN?
```

Response example

For model name TOS7301 or TOS7301 WITH LAN, serial number AB123400, version 1.17, IFC1.07.0133, IOC1.07.0105

```
KIKUSUI,TOS7301,AB123400,1.17 IFC1.07.0133 IOC1.07.0105
```

*OPC

Reports Operation Complete when all operations initiated by other commands have been completed (or none exist). The reporting behavior differs between command and query formats. For details, see “Waiting for Operation Complete” *(p. 133)*, “Event Status Register” *(p. 83)*, or Section 12.5.3 of the IEEE 488.2-1992 standard.

Command

```
*OPC
*OPC?
```

Response

If no pending actions remain for operations initiated by other commands, “1” is returned.

*OPT?

Queries whether options or SIGNAL I/O are connected to the TOS73 series.

Command

```
*OPT?
```

Response

The responses for the TOS73 series are as follows:

string	If an ENABLE signal is input to the SIGNAL I/O connector, it returns “SIGNAL I/O”.
NR1	If no option is connected, and no ENABLE signal is input, it returns “0” (ASCII 0x30).

*PSC

Sets whether the event status enable (ESE) register and the service request enable (SRE) register are cleared when the power is turned on (power-on status).

For details, see “Status Byte Register” *(p. 82)*.

Command

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

Parameter

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

Response

boolean

Example

Sending the following compound command enables the power-on SRQ (service request) function.

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

*RCL

Recalls the panel settings saved in the setup memory.
All trigger subsystems stop operation and enter the IDLE state, and active protection functions are disabled (if they cannot be disabled, they remain active). FAIL judgment is also cleared.

To save the current panel settings to setup memory, use *SAV. For the set values affected by this command, see the “List of Parameters Applicable to *RCL, *RST, *SAV, and SYST:CONF:SAV and Each Setting Command” *(p. 41)*.

Command

```
*RCL <NRf>
```

Parameter

Set value: 0 to 50 setup memory number

Example

```
*RCL 1
```

*RST

Resets the panel settings.
All trigger subsystems stop operation and enter the IDLE state, and active protection functions are disabled (if they cannot be disabled, they remain active). FAIL judgment is also cleared. OPC bit of the event status register (SESR) (bit 0: operation complete) is cleared.

For the set values affected by this command, see the “List of Parameters Applicable to *RCL, *RST, *SAV, and SYST:CONF:SAV and Each Setting Command” *(p. 41)*.

Command

```
*RST
```

*SAV

Saves current panel settings to the setup memory.

To recall saved panel settings from the setup memory, use *RCL. For the set values affected by this command, see the “List of Parameters Applicable to *RCL, *RST, *SAV, and SYST:CONF:SAV and Each Setting Command” *(p. 41)*.

The panel settings saved in setup memory 0 (*SAV 0) can be used as the settings at power-on *(p. 104)*.

Command

```
*SAV <NRf>
```

Parameter

Set value: 0 to 50 setup memory number

Example

```
*SAV 1
```

*SRE

Sets the service request enable (SRE) register.

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

Command

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

Parameter

Set value: 0 to 255

Response

NR1

Example

When *SRE 8 is transmitted, the QUES bit of the SRE register (bit 3: QUEStionable Status Register) is set to generate SRQ. In subsequent STB registers, a SRQ message will be generated by the QUES bit each time the QUEStionable status register receives a status report.

*STB?

Queries the contents of the status byte (STB) 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.

For details on the STB register, see “Status Byte Register” *(p. 82)*.

Command

```
*STB?
```

Response

NR1

*TRG

Applies a software trigger to all trigger subsystems.

This is a substitute command for IEEE 488.1 GET (Group Execute Trigger). For details on the GET, see Section 6.1.4.2.5 of IEEE 488.2-1992 standard.

- When this command is sent, all trigger subsystems (ACQ, TEST) that are in the INITiated state *(p. 120)* and have their trigger source set to BUS will start trigger action. To apply a software trigger to only the ACQ trigger subsystem or the TEST trigger subsystem, send TRIG:ACQ or TRIG:TEST.
- If none of the trigger subsystems are ready to accept a trigger, an SCPI error (-211, “Trigger ignored") occurs.

For the trigger subsystems of the TOS73 series, see “Trigger Subsystems” *(p. 120)*.

Command

```
*TRG
```

*TST?

Executes a self-test.

You can check which error occurred with SYST:ERR? *(p. 106)*.

For details, see IEEE 488.2-1992 standard section 10.38.

Command

```
*TST?
```

Response

NR1

If there is no problem, returns 0 in response to *TST?. Returns an error code *(p. 136)* if there is a problem.

*WAI

Prevents the TOS73 series from executing subsequent commands until all operations that are in standby have completed.

Command

```
*WAI
```

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

The table below lists the default settings for each command and the parameters applicable to *RST, *RCL/*SAV and SYST:CONF:SAV.

"Default (factory default setting)" column:
Setting applied to the TOS73 series before factory shipment. This setting is also applied when SYST:SEC:IMM is sent.

"*RST" column:
For commands marked with a check (✓) in this column, their settings are reset to the defaults by sending *RST.

"*RCL/*SAV" column:
Commands marked with a check (✓) in this column can have their settings saved to the setup memory by sending *SAV or recalled from the setup memory by sending *RCL.

"SYST:CONF:SAV" column:
Commands marked with a (✓) in this column can have their set values (CONFIG settings) saved by sending SYST:CONF:SAV, allowing the TOS73 series to start up with the same CONFIG settings the next time power is turned on.

Subsystem	Command	Default (factory default setting)	*RST	*RCL/*SAV	SYST:CONF:SAV
CALC *(p. 45)*	CALC:SCAL:OFFS:AUTO	OFF	✓	✓	n/a
	CALC:IR:SCAL	OFF	✓	✓	n/a
	CALC:IR:SCAL:OFFS	0.1 GOHM	✓	✓	n/a
DATA *(p. 48)*	DATA:BSIZ	8192	✓	✓	n/a
	DATA:FORM	CURR,VOLT,RES,ETIM	✓	✓	n/a
DISPlay *(p. 51)*	DISP:IR:RES:PHOL	OFF	✓	✓	n/a
	DISP:VIEW [1]	NUM	✓	✓	n/a
GRAP *(p. 52)*	GRAP:IR:FORM [1]	VRT	✓	✓	n/a
	GRAP:IR:SCAL [1]	AUTO	✓	✓	n/a
	GRAP:IR:SCAL:RES [1]	AUTO	✓	✓	n/a
	GRAP:IR:SCAL:RES:MAX [1]	0.1 GOHM	✓	✓	n/a
	GRAP:IR:SCAL:RES:MIN [1]	0 OHM	✓	✓	n/a
	GRAP:IR:SCAL:VOLT [1]	FIX	✓	✓	n/a
RESult *(p. 62)*	RES:FORM	NUMB,FUNC,YEAR,MONT,DAY,HOUR, MIN,SEC,VOLT,CURR,RES,ETIM,JUDG	✓	n/a	n/a
	RES:NUMB:ARB	1	n/a	n/a	n/a
	RES:TZON	LOC	✓	n/a	n/a
SAMPle *(p. 67)*	SAMP:COUN	INF [2]	✓	n/a	n/a
	SAMP:TEST:ENAB	ON [3]	✓	n/a	n/a
	SAMP:TIM	0	✓	n/a	n/a

Subsystem	Command	Default (factory default setting)	*RST	*RCL/*SAV	SYST:CONF:SAV
SENSe:IR *(p. 69)*	SENS:IR:APER	100 MS	✓	✓	n/a
	SENS:IR:FILT:DIG:STAT	OFF	✓	✓	n/a
	SENS:IR:JUDG	0.1 GOHM	✓	✓	n/a
	SENS:IR:JUDG:STAT	OFF	✓	✓	n/a
	SENS:IR:JUDG:DEL	0.2 S	✓	✓	n/a
	SENS:IR:JUDG:DVOL [1]	0.01 PCT	✓	✓	n/a
	SENS:IR:JUDG:DVOL:COUN [1]	1	✓	✓	n/a
	SENS:IR:JUDG:DVOL:STAT [1]	OFF	✓	✓	n/a
	SENS:IR:JUDG:LOW	0.01 GOHM	✓	✓	n/a
	SENS:IR:JUDG:LOW:STAT	ON	✓	✓	n/a
	SENS:IR:JUDG:SCD:STAT	OFF	✓	✓	n/a
	SENS:IR:TERM:CCH	OFF	✓	✓	n/a
[SOURce:]IR *(p. 76)*	IR:VOLT	0 V	✓	✓	n/a
	IR:VOLT:PROT	1025 V	✓	✓	n/a
	IR:VOLT:STAR	50 PCT	✓	✓	n/a
	IR:VOLT:STAR:STAT	OFF	✓	✓	n/a
	IR:VOLT:SWE:TIM	0.1 S	✓	✓	n/a
	IR:VOLT:SWE:TIM:STAT	ON	✓	✓	n/a
	IR:VOLT:TIM	0.2 S	✓	✓	n/a
	IR:VOLT:TIM:STAT	ON	✓	✓	n/a

Subsystem	Command	Default (factory default setting)	*RST	*RCL/*SAV	SYST:CONF:SAV
SYSTem *(p. 96)*	SYST:BEEP	ON	n/a	n/a	n/a
	SYST:BEEP:KEY	ON	n/a	n/a	✓
	SYST:BEEP:PROT	ON	n/a	n/a	✓
	SYST:BEEP:SCPI	ON	n/a	n/a	✓
	SYST:COMM:PROT:WDOG	OFF	n/a	n/a	✓
	SYST:COMM:PROT:WDOG:DEL	60 S	n/a	n/a	✓
	SYST:COMM:RLST	LOC	n/a	n/a	n/a
	SYST:CONF:BEEP:STAT	ON	n/a	n/a	✓
	SYST:CONF:BEEP:PASS:STAT	ON	n/a	n/a	✓
	SYST:CONF:CAL:DUE:CONT	12	n/a	n/a	✓
	SYST:CONF:CAL:PROT:STAT	OFF	n/a	n/a	✓
	SYST:CONF:DACT:STAT	OFF [4]	n/a	n/a	✓
	SYST:CONF:FMOD:STAT	OFF	n/a	n/a	✓
	SYST:CONF:MOM:STAT	OFF	n/a	n/a	✓
	SYST:CONF:PHOL	0.2	n/a	n/a	✓
	SYST:CONF:FHOL	INF	n/a	n/a	✓
	SYST:CONF:DANG:VOLT	30 V	n/a	n/a	✓
	SYST:CONF:PON:STAT	AUTO	n/a	n/a	✓
	SYST:CONF:SIO:INT:STAT	OFF	n/a	n/a	✓
	SYST:CONF:SLPR:STAT	ON [4]	n/a	n/a	✓
	SYST:KLOC	OFF	n/a	n/a	✓
	SYST:KLOC:LEV	3	n/a	n/a	✓
	SYST:KLOC:PASS:NEW	“0000”	n/a	n/a	n/a
	SYST:KLOC:PASS:STAT	OFF	n/a	n/a	✓
	SYST:SSAV	OFF	n/a	n/a	✓
	SYST:SSAV:DEL	60 S	n/a	n/a	✓
	SYST:TZON	“UTC”	n/a	n/a	n/a
TRIGger *(p. 114)*	TRIG:ACQ:COUN	1	✓	n/a	n/a
	TRIG:ACQ:DEL	0 S	✓	n/a	n/a
	TRIG:ACQ:SOUR	TST [5]	✓	n/a	n/a
	TRIG:TEST:SOUR	IMM	✓	n/a	n/a

1. TOS7301 and TOS7301 WITH LAN only.
2. When a MEAS subsystem query is sent, the set value changes to 1. *(p. 125)*
3. When a MEAS subsystem query is sent, the set value changes to OFF. *(p. 125)*
4. If Double Action (SYST:CONF:DACT:STAT) and Start Long (SYST:CONF:SLPR:STAT) were both OFF the last time the power was turned off, the next time the power is turned on, the system starts with Start Long set to ON regardless of the SYST:CONF:PON:STAT setting.
5. When a MEAS subsystem query is sent, the set value changes to IMM. *(p. 125)*

ABORt Command

Stops the operation of the trigger subsystems (ACQ, TEST) and sets them to the IDLE state.
For details on the trigger subsystems and the IDLE state in the TOS73 series, see “Trigger Subsystems” *(p. 120)*.

NOTE

Sending a command in the ABOR subsystem does not clear measurement data or test results in the TOS73 series.

ABOR

Aborts measurements, tests, and other operations in all trigger subsystems to transition to IDLE state. For the TEST trigger subsystem, both the PROTECTION mode and the FAIL judgment are cleared.
Sending this command sets all trigger subsystems of the TOS73 series (ACQ, TEST) to the same state as immediately after power-on.
To stop the operation of only the ACQ trigger subsystem or TEST trigger subsystem, send ABOR:ACQ or ABOR:TEST.

Command

```
ABORt[:ALL]
```

ABOR:ACQ

Aborts measurements and other operations in ACQ trigger subsystem to transition to IDLE state.

Command

```
ABORt:ACQuire
```

ABOR:TEST

Aborts tests and other operations in TEST trigger subsystem to transition to IDLE state. Both the PROTECTION mode and the FAIL judgment are cleared.

Command

```
ABORt:TEST
```

CALCulate Command

The command relates to the offset of the measured value.

CALC:SCAL:OFFS:AUTO

Enables or disables the offset auto settings.
If set value of this command is set to ON, the offset resistance value (set value of CALC:IR:SCAL:OFFS) is automatically set based on the measured value from the test executed thereafter.

- When the auto setting of the offset resistance value completes, the set value of this command changes to OFF.
- Sending this command while a test is executed results in an error.

Command

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

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

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

Response

boolean

CALC:IR:SCAL

Enables or disables the resistance value offset.
When enabled, an offset can be applied to the resistance value of test leads, tools, etc.

- Set the offset resistance value with CALC:IR:SCAL:OFFS.
- Sending this command while a test is executed results in an error.

Command

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

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

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

Response

boolean

CALC:IR:SCAL:OFFS

Sets the offset resistance value.
The set value of this command is applied when CALC:IR:SCAL is set to ON.

- When a test is executed after sending CALC:SCAL:OFFS:AUTO ON, the set value of this command is automatically set.
- Sending this command while a test is executed results in an error.

Command

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

Parameter

Unit: OHM

Since the offset cannot be 2 mA or more when converted to a current value, the minimum value in the setting range for this command changes depending on the set value of test voltage (IR:VOLT).

Settings are reset to default when the *RST command is sent. (Default value: 0.1 GOHM)

Response

NR3

Example

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

CALibrate Command

Related to the calibration date.
To have your TOS73 series calibrated, contact your Kikusui agent or distributor.

CAL:DATE

Sets the date on which calibration was carried out.
This command is password protected and its settings can only be changed if usage is allowed by SYST:PASS.

- Queries can run regardless of password protection state.
- The password protection state can be checked with SYST:PASS:STAT?.

Use SYST:CONF:CAL:DUE:CONT to set the calibration period.

Command

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

Parameter

<year_NR1>
Set value (year): 2016 to 2099

<month_NR1>
Set value (month): 1 to 12

<day_NR1>
Set value (day): 1 to 31

Response

Returns the set calibration date in comma-separated NR1 format, in the order of year, month, and day.

Example

If calibration of the TOS73 series was completed on April 14, 2026, send the following command:

```
CAL:DATE 2026,4,14
```

DATA Command

Relates to the measurement data recorded in the data logger.

The conditions under which measurement data is recorded to the data logger depend on the settings of the TRIG:ACQ subsystem *(p. 114)* and the SAMP subsystem *(p. 67)*.

Graphs are drawn from the measurement data recorded in the data logger.

DATA:BSIZ

Sets the buffer size (maximum number of measurement data recordings) of the data logger. Sending this command clears all existing measurement data, regardless of whether the setting values were changed.

If the buffer overflows due to measurement data, the oldest measurement data points are cleared one by one in order.

Command

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

Parameter

Set value: 8192, 16384, 32768

Settings are reset to default when the *RST command is sent. (Default value: 8192)

Response

NR1

Example

```
DATA:BSIZ 16384
```

DATA:FORM

Sets the response format (types and listing order of returned items) to use when measurement data is queried.
The response format is reflected in the response to DATA:REM? and MEAS?/READ?/FETC? (for any item that cannot be returned in the response, an invalid value *(p. 34)* is returned).

Command

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

Parameter

Specify one or more types of items in any order, separated by commas. The same item cannot be specified more than once.

Set value	Description	Unit of response
VOLTage	Measured voltage value	V
CURRent	Measured current value	A
ETIMe	Elapsed test time [1]	S
RESistance	Measured resistance value	OHM
VARiant	Measured resistance value	OHM

1. When the test state is RISE, the remaining voltage rise time (negative number of seconds) is displayed; when the test state is TEST, the elapsed time after the end of the voltage rise time is displayed.

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

Response

character,character,...
Example: If the specified items and order are current value and voltage value, CURR,VOLT will be returned.

Example

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

DATA:POIN?

Queries the number of measurement data recorded in the data logger.

Command

```
DATA:POINt?
```

Response

NR1

DATA:REM?

Queries multiple pieces of measurement data starting from the oldest data piece recorded in the data logger. Measurement data returned as responses are cleared one after the other.

Specify the response format (types and listing order of returned items) using DATA:FORM.

Command

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

Parameter

Specify the number of measurement data to query at once. The maximum value that can be specified varies depending on the settings of DATA:FORM, as shown in the table below. If no parameter is specified, measurement data with the maximum number of points allowed in the table below is queried based on the DATA:FORM settings.

The number of data points that can be specified as a parameter for DATA:REM? [1]	The number of items in the response format specified by DATA:FORM
1 to 896	5
1 to 1152	4
1 to 1536	3
1 to 2304	2
1 to 4608	1

1. Whether parameters are present or absent or the numerical values are large, the number of measurement data returned in the response cannot exceed the total number of measurement data recorded in the data logger.

Response

NR3,NR3,... Starting from the oldest data recorded in the data logger, the measurement data for the number of points specified by the parameter will be returned.

- If no parameter is specified, measurement data with as many points as possible is returned based on the table above.
- Each measurement data point includes the number of items specified in DATA:FORM. Therefore, the total number of items in a single response is:

  [Number of items specified in DATA:FORM] × [Number of measurement data specified in DATA:REM? <NRf>].
- For any item that cannot be returned in the response, an invalid value *(p. 34)* is returned.

EMPT The data logger is empty of measurement data, and measurement is in progress.

IDLE The data logger is empty of measurement data, and measurement is NOT in progress.

Example

```
DATA:REM? 512
```

DISPlay Command

Relates to display settings.

DISP:IR:RES:PHOL

Enables or disables the display of the measured minimum resistance value (peak value) in the measurement screen of the display.

Command

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

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

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

Response

boolean

DISP:VIEW

Selects the display format of the measurement screen of the display from numeric value or graph. (TOS7301 and TOS7301 WITH LAN only)

Command

```
DISPlay:VIEW <character>
DISPlay: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. (TOS7301 and TOS7301 WITH LAN only)

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

Response

character

Example

```
DISP:VIEW GRAP
```

GRAPh Command

These are commands related to graph display. (TOS7301 and TOS7301 WITH LAN only)
The set value of this subsystem are applied to the display when DISP:VIEW is set to GRAP.

GRAP:IR:FORM

Sets the value displayed on the Y-axis in the graph. (TOS7301 and TOS7301 WITH LAN only)
Always displays time (seconds) on the X-axis.
The set value of this command is applied to the display when DISP:VIEW is set to GRAP.

Command

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

Parameter

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

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

Response

character

Example

```
GRAP:IR:FORM VIRT
```

GRAP:IR:SCAL

For the Y-axis of the graph, sets the scale range of the voltage-axis and resistance-axis to FIX or AUTO all at once. (TOS7301 and TOS7301 WITH LAN only)
The set value of this command is applied to the display when DISP:VIEW is set to GRAP.

NOTE

If the scale of axis is changed by Auto-scale, the maximum data points of the graph drawing shall be limited to 10000. The old measurement data that exceed the limit shall not be drawn.

Command

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

Parameter

Sets the scales of the resistance-axis (GRAP:IR:SCAL:RES) and voltage-axis (GRAP:IR:SCAL:VOLT) of the graph all at once as follows. For details, see the descriptions for GRAP:IR:SCAL:RES and GRAP:IR:SCAL:VOLT.

Set value:	AUTO	Sets both GRAP:IR:SCAL:RES and GRAP:IR:SCAL:VOLT to AUTO. (Default)
	FIX	Sets both GRAP:IR:SCAL:RES and GRAP:IR:SCAL:VOLT to FIX.

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

Response

character	AUTO	Either GRAP:IR:SCAL:RES or GRAP:IR:SCAL:VOLT is set to AUTO.
	FIX	GRAP:IR:SCAL:RES and GRAP:IR:SCAL:VOLT are both set to FIX.

Example

```
GRAP:IR:SCAL AUTO
```

GRAP:IR:SCAL:RES

For the Y-axis of the graph, sets the scale range of the resistance-axis to FIX or AUTO. (TOS7301 and TOS7301 WITH LAN only)
The set value of this command is applied to the display when DISP:VIEW is set to GRAP.

NOTE

If the scale of axis is changed by Auto-scale, the maximum data points of the graph drawing shall be limited to 10000. The old measurement data that exceed the limit shall not be drawn.

Command

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

Parameter

Set value:	AUTO	Both minimum value and maximum value shall be set at Auto-scale. (Default)
	FIX	The minimum value is fixed to the set value specified by GRAP:IR:SCAL:RES:MIN. The maximum value is fixed to the set value specified by GRAP:IR:SCAL:RES:MAX.

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

Response

character

Example

```
GRAP:IR:SCAL:RES AUTO
```

GRAP:IR:SCAL:RES:MAX

For the Y-axis of the graph, sets the maximum value of the resistance-axis. (TOS7301 and TOS7301 WITH LAN only)
The set value of this command is applied to the display when the set value of the relevant commands are as follows:

- DISP:VIEW GRAP
- GRAP:IR:SCAL:RES FIX

Command

```
GRAPh:IR:SCALe:RESistance:MAXimum <numeric>
GRAPh:IR:SCALe:RESistance:MAXimum?
```

Parameter

Unit: OHM

Settings are reset to default when the *RST command is sent. (Default value: 0.1 GOHM)

Response

NR3

Example

```
GRAP:IR:SCAL:RES:MAX 10GOHM
```

GRAP:IR:SCAL:RES:MIN

For the Y-axis of the graph, sets the minimum value of the resistance-axis. (TOS7301 and TOS7301 WITH LAN only)
The set value of this command is applied to the display when the set value of the relevant commands are as follows:

- DISP:VIEW GRAP
- GRAP:IR:SCAL:RES FIX

Command

```
GRAPh:IR:SCALe:RESistance:MINimum <numeric>
GRAPh:IR:SCALe:RESistance:MINimum?
```

Parameter

Unit: OHM

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

Response

NR3

Example

```
GRAP:IR:SCAL:RES:MIN 1GOHM
```

GRAP:IR:SCAL:VOLT

For the Y-axis of the graph, sets the scale range of the voltage-axis to FIX or AUTO. (TOS7301 and TOS7301 WITH LAN only)
The set value of this command is applied to the display when the set value of the relevant commands are as follows:

- DISP:VIEW GRAP
- GRAP:IR:FORM {VRT|VIRT}

NOTE

If the scale of axis is changed by Auto-scale, the maximum data points of the graph drawing shall be limited to 10000. The old measurement data that exceed the limit shall not be drawn.

Command

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

Parameter

Set value:	AUTO	The minimum value shall be set at 0 V, while the maximum value shall be set at Auto-scale.
	FIX	The minimum value shall be fixed at 0 V, while the maximum value shall be set at 1.2 times test voltage (IR:VOLT). (Default)

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

Response

character

Example

```
GRAP:IR:SCAL:VOLT AUTO
```

Graph Scale Details

The following scales are respectively applied to the axes of the graph.

Axis		Minimum value	Maximum value
X-axis	Time-axis	0 s	Depends on the setting of IR:VOLT:TIM *(p. 79)* • If IR:VOLT:TIM:STAT is set to ON, the total time of IR:VOLT:TIM *(p. 79)* and IR:VOLT:SWE:TIM *(p. 78)*. • If IR:VOLT:TIM:STAT is set to OFF, Auto-scale is applied.
Left side of Y-axis	Voltage-axis	Depends on the setting of GRAP:IR:SCAL:VOLT *(p. 55)*	
Right side of Y-axis	Current-axis	Auto-scale	
	Resistance-axis	Depends on the setting of GRAP:IR:SCAL:RES *(p. 54)*	

HCOPy Command

This is a command which relates to screen capture on the TOS73 series.

HCOP:SDUM:DATA?

Retrieves the screen capture of the current screen display on the TOS73 series.

Command

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

Response

Returns a captured image of the screen (png format) in block (#6<length><data>) format.
For details, see “Block data (block)” *(p. 33)*.

INITiate Command

Starts the sequence of the trigger subsystem.
Depending on the command sent, measurement data from the TOS73 series may be cleared.

When you send a command in the INITiate subsystem, the trigger subsystem in the IDLE state transitions to the INITiated state and begins the trigger sequence *(p. 120)*. At this time, a trigger subsystem with the trigger source set to IMMediate will begin a trigger action immediately after transitioning to the INITiated state.

NOTE

All measurement data recorded in the data logger by the ACQ trigger subsystem is cleared when INIT or INIT:ACQ is sent.

For details on the trigger subsystems, see description of “Trigger Subsystems” *(p. 120)*.
For details on the trigger sources, see descriptions of TRIG:ACQ:SOUR *(p. 116)* and TRIG:TEST:SOUR *(p. 117)*.

INIT

Transitions all trigger subsystems in IDLE state to INITiated state. Clears all existing measurement data recorded in the data logger.
If both the TEST trigger subsystem and ACQ trigger subsystem are in the IDLE state, both will transition to the INITiated state.

Command

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

INIT:ACQ

Transitions ACQ trigger subsystem in IDLE state to INITiated state. Clears all existing measurement data recorded in the data logger.

Command

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

INIT:TEST

Transitions TEST trigger subsystem in IDLE state to INITiated state.

Command

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

MEASure/READ/FETCh Command

This is a query to inquire about measurement data (measured values).
If either a MEAS subsystem query or a READ subsystem query is sent, all existing measurement data is cleared.

The three subsystems described here (i.e., MEASure?, READ?, and FETCh?) each return only the latest measurement data point recorded in the data logger by the ACQuire trigger subsystem.

The operational differences among these subsystems are as below: For details, see “Querying Measured Values” *(p. 124)*.

MEASure? subsystem

All existing measurement data recorded in the data logger is cleared, and the set values of the TRIGger subsystem and SAMPle subsystem are changed to the preset values listed in the table below. A new measurement is then performed, and one measured value is returned.

Command	Preset value	Command description
SAMP:COUN	1 [1]	Sampling count recorded per trigger action (sample count)
SAMP:TEST:ENAB	OFF [1]	Whether sampling is limited to during test execution
SAMP:TIM	0	Sampling interval
TRIG:ACQ:COUN	1	Count of trigger actions executed per trigger sequence (trigger count)
TRIG:ACQ:DEL	0	Delay time before a trigger action starts
TRIG:ACQ:SOUR	IMM [1]	Conditions for starting a trigger action from the INITiated state (trigger source)

1. A set value that differs from the command default is applied.

These preset values mean that when a MEAS? subsystem query is sent, the measurement starts immediately without any delay time, and the measurement ends after acquiring only one measurement data point.

For details on measurement procedures using the MEAS? subsystem, see “Simplified measurements (MEASure subsystem)” *(p. 125)*.

READ? subsystem

Clears all existing measurement data recorded in the data logger, then performs a new measurement and returns one measured value. Since the set values of the TRIGger subsystem and SAMPle subsystem are not changed, measurements can be performed using any setting applied to the commands in the table above.

For details on measurement procedures using the READ? subsystem, see “Normal measurements (READ subsystem)” *(p. 126)* and “Multi-point Measurements with Trigger Count Specified” *(p. 130)*.

FETCh? subsystem

Returns only the latest measured value from the existing measurement data recorded in the data logger.

It does not perform any measurement or clear the measurement data. If no measured values exist in the data logger, an error will occur.

For details on measurement procedures using the FETC? subsystem, see “Advanced measurements (FETCh subsystem)” *(p. 127)*.

MEAS?/READ?/FETC?

Queries the measurement data based on the response format specified in DATA:FORM.
All existing measurement data is cleared if MEAS? or READ? is sent.

Command

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

Response

Based on the DATA:FORM-specified response format (types and listing order of returned items), the measured values and other items are returned in the NR3,NR3, ... format. For any item that cannot be returned in the response, an invalid value *(p. 34)* is returned.

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

Queries the current value.
All existing measurement data is cleared if MEAS:CURR? or READ:CURR? is sent.

Command

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

Response

NR3
Unit: A

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

Queries the elapsed test time.
All existing measurement data is cleared if MEAS:ETIM? or READ:ETIM? is sent.

When the test state is RISE, the remaining voltage rise time (negative number of seconds) is displayed; when the test state is TEST, the elapsed time after the end of the voltage rise time is displayed.

Command

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

Response

NR3
Unit: S

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

Queries the resistance value.
All existing measurement data is cleared if MEAS:RES? or READ:RES? is sent.

Command

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

Response

NR3
Unit: OHM

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

Queries the voltage value.
All existing measurement data is cleared if MEAS:VOLT? or READ:VOLT? is sent.

Command

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

Response

NR3
Unit: V

RESult Command

Relates to querying the test results.
For details on saving and querying test results, see “Query the test results” *(p. 129)*.

RES?

Queries the previous test result. A query does not clear the test results.
Specify the response format (types and listing order of returned items) using RES:FORM.

Command

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

Response

Returns the items specified by RES:FORM in a comma-separated format. If there is no value that can be returned, an invalid value *(p. 34)* will be returned. If no test results are saved in the TOS73 series, +0 is returned.

Item	Description		Format
Test number	The value increments each time a test is executed, and returns to 0 after exceeding 2147483647.		NR1
Test mode	Test mode (IR 1000V fixed)		character
Test start time	Returns the date and time in RFC 2822 format.		string
Test start date (year)	n/a		NR1
Test start date (month)			
Test start date (day)			
Test start time (hour)			
Test start time (minute)			
Test start time (second)			
Voltage value at the time of judgment	n/a		NR3
Current value at the time of judgment			
Resistance value at the time of judgment			
Maximum current value during a test			
Minimum resistance value during a test			
Elapsed test time at the time of judgment[1]			
Judgment result Extended judgment result	PASS	PASS judgment	character
	U-FAIL	A value exceeding the upper limit was detected resulting in a FAIL judgment (Upper-FAIL)	
	U-FAIL(dV)	A voltage difference equal to or more than the delta voltage setting was detected consecutively for the specified number of times resulting in a FAIL judgment (Upper-FAIL(dV))	
	L-FAIL	A value below the lower limit was detected resulting in a FAIL judgment (Lower-FAIL)	
	L-FAIL(SCD)	Detects a short circuit between the HIGH and LOW terminals (Lower-FAIL(SCD))	
	C-FAIL(High&Low)	Contact failure between the OUTPUT HIGH terminal and OUTPUT LOW terminal (Contact-FAIL(HIGH&LOW))	
	C-FAIL(High)	Contact failure in the OUTPUT HIGH terminal (Contact-FAIL(HIGH))	
	C-FAIL(Low)	Contact failure in the OUTPUT LOW terminal (Contact-FAIL(LOW))	
	PROTECT[2]	A protection function was activated, and the test was stopped	
	PROTECT(factor)[3]		
	ABORT	The test was aborted with a STOP signal	

1. When the test state is RISE, the remaining voltage rise time (negative number of seconds) is displayed; when the test state is TEST, the elapsed time after the end of the voltage rise time is displayed.
2. Returned if JUDGment is included in the RES:FORM-specified response format.
3. Returned if EJUDgment is included in the RES:FORM-specified response format. For elements within an item, see “factor information” *(p. 63)* for details on the factor section.

factor information

Indicates the cause of the PROTECTION mode.

This is returned as a component of the response item if EJUDgment is specified as an item in the response format (RES:FORM) and a test result terminated by activation of the protection function is queried. Returns the factor information with the highest priority if two or more factors are causing the PROTECTION mode.

The table below describes it, beginning with the factor information with higher priority. For how to take action for each PROTECTION mode, refer to the TOS73 Series User's Manual.

factor information	Cause of PROTECTION mode	Activation condition
ILOCK	Interlock	Interlock is activated.
CAL	Calibration	The system clock date has exceeded the calibration period.[1]
OUTERR	Output Error	An output voltage exceeding the range of ±(10 % of setting + 5 V) of the set value of test voltage (IR:VOLT) was detected.
		The output changed suddenly.
SIO	Signal I/O	There is a change in the SIGNAL I/O connector's ENABLE signal.
COMM	Communication	An internal communication error is occurring.
		If the watchdog is used (SYST:COMM:PROT:WDOG ON), there has been no SCPI communication for the set duration or more.

1. Use SYST:CONF:CAL:DUE:CONT to set the calibration period. If SYST:CONF:CAL:PROT:STAT is OFF, the PROTECTION mode does not occur even if the calibration period is exceeded.

Response example

The following response is returned if the response format in RES:FORM is specified in the order of "Test start time (month)", "Test start time (day)", and "Extended judgment result".

```
10,23,PROT(ILOCK)
```

This response indicates the following information about the test result.

- Test start date: Oct 23
- Judgment result: The test terminated due to activation of the protection function (interlock)

RES:FORM

Sets the response format (types and listing order of returned items) to use when test results are queried.
The response format is reflected in the response to RES? and RES:REM? (for any item that cannot be returned in the response, an invalid value *(p. 34)* is returned).

Command

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

Parameter

Specify one or more types of items in any order, separated by commas. The same item cannot be specified more than once.

Set value:	NUMBer	Test number [1]
	FUNCtion	IR 1000V (fixed)
	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 value at the time of judgment
	CURRent	Current value at the time of judgment
	RESistance	Resistance value at the time of judgment
	PCURrent	Maximum current value during a test
	PRESistance	Minimum resistance value during a test
	ETIMe	Elapsed test time at the time of judgment [3]
	JUDGment	Judgment result
	EJUDgment	Extended judgment result [4]

1. Incremented each time a test is performed. Reset to 0 when the count exceeds 2147483647.
2. RFC2822 format
3. When the test state is RISE, the remaining voltage rise time (negative number of seconds) is displayed; when the test state is TEST, the elapsed time after the end of the voltage rise time is displayed.
4. In addition to the judgment result, the cause of occurrence of PROTECTION mode (factor information) and the test state at the time of the judgment (state information) are listed together within the item. For details, see “factor information” *(p. 63)*.

Settings are reset to default when the *RST command is sent.
(Default value: NUMB,FUNC,YEAR,MONT,DAY,HOUR,MIN,SEC,VOLT,CURR,RES,ETIM,JUDG)

Response

character,character,...
If “Test number”, “Test start time”, and “Judgment result” are specified in this order, the response will return NUMB,DATE,JUDG.

Example

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

RES:COUN?

Queries the number of test results saved in the TOS73 series.

Command

```
RESult:COUNt?
```

Response

NR1

RES:NUMB?

Queries the latest test number for the saved test results.

Command

```
RESult:NUMBer?
```

Response

NR1

RES:NUMB:ARB

Set any test number for the next test result.
The test number increments from the set numeric value each time a test is executed, and resets to 0 after exceeding 2147483647.

Command

```
RESult:NUMBer:ARBitrary[:NEXT] <NR1>
RESult:NUMBer:ARBitrary[:NEXT]?
```

Parameter

Set value: 0 to 2147483647 (Default value: 1)

Response

NR1
Returns the test number to be applied to the next test result.

Example

```
RES:NUMB:ARB 1
```

RES:REM?

Queries the oldest test result saved in the TOS73 series.
Test results returned as responses are cleared one after the other.
Specify the response format (types and listing order of returned items) using RES:FORM.

Command

```
RESult:REMove?
```

Response

Returns the items specified by RES:FORM in a comma-separated format. If there is no value that can be returned, an invalid value *(p. 34)* will be returned.
For details on the response, see the RES? *(p. 62)*.

RES:REM:ALL

Clears all test results saved in the TOS73 series.

Command

```
RESult:REMove:ALL
```

RES:TZON

Sets the time of the test results to Coordinated Universal Time (UTC) or the time in the time zone set by SYST:TZON.

Command

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

Parameter

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

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

Response

character

Example

```
RES:TZON UTC
```

SAMPle Command

Sets the sampling conditions for each trigger action of the ACQuire trigger subsystem.
The setting of this subsystem, together with the settings of the DATA subsystem *(p. 48)* and the TRIG subsystem *(p. 114)*, affects the conditions under which measurement data is recorded to the data logger. For details, see “Normal measurements (READ subsystem)” *(p. 126)* and “Multi-point Measurements with Trigger Count Specified” *(p. 130)*.
Set the sampling time with SENS:IR:APER *(p. 69)*.

SAMP:COUN

Sets the count of sample acquisition (i.e., sample count) that the ACQ trigger subsystem records per trigger action.
To set whether to limit sampling to only during testing, use SAMP:TEST:ENAB.

Command

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

Parameter

<numeric>

Specifies the sample count.

<character>

Set value:	INFinity	Records measured values indefinitely. (Default)

Settings are reset to default when the *RST command is sent.
When a MEAS subsystem query is sent, the set value changes to 1.

Response

NR1	Returns the set sample count.
character	Returns INF when it is set to INFinity.

Example

```
SAMP:COUN 10
```

SAMP:TEST:ENAB

Sets whether obtaining samples is limited to the time when the test is performed.
The count of sample acquisition (i.e., sample count) can be set by SAMP:COUN, and the sampling interval can be set by SAMP:TIM.

Command

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

Parameter

Set value:	ON (1)	Do sampling only during testing. (Default) When the test ends, sampling is interrupted even if the specified sampling count has not been reached.
	OFF (0)	Sampling is performed up to the specified sampling count, regardless of whether the test is in progress. This setting can only be applied via this command and cannot be applied from the front panel of the TOS73 series.

Settings are reset to default when the *RST command is sent.
When a MEAS subsystem query is sent, the set value changes to OFF.

Response

boolean

SAMP:TIM

Sets a sampling interval.
The set value of this command applies when the sample count (SAMP:COUN) is set to a numeric value greater than 1.

Command

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

Parameter

Unit: S (Default value: 0 S)
Resolution: 100 MS
When an *RST command or a MEAS subsystem query is sent, the set value changes to its default.

Response

NR3

Example

```
SAMP:TIM 0.2S
```

SENSe:IR Command

Sets test conditions for the insulation resistance tests (IR).
If the command to set the desired test condition cannot be found within this subsystem, also see the [SOURce:]IR Command *(p. 76)*.

SENS:IR:APER

Sets the aperture time.
Changing the set value of this command may also change the setting ranges for other commands.

- The average value obtained during the aperture time shall be the measured value. Longer aperture time increases the judgment interval but provides more stable measurement values.
- Fluctuations in measured values due to power line noise can be reduced by selecting 20 ms when the power line frequency is 50 Hz, or 16.66 ms when it is 60 Hz.

Command

```
SENSe:IR:APERture <numeric>
SENSe:IR:APERture?
```

Parameter

Unit: MS

Set value:	10MS	This can only be set on TOS7301 and TOS7301 WITH LAN. This can only be set when IR:VOLT:TIM:STAT (test time) is set to ON.
	16.66MS	This can only be set when IR:VOLT:TIM:STAT (test time) is set to ON.
	20MS	
	100MS	(Default)

The set value of this command affects the set value of other commands as follows:

Set value of this command	SENS:IR:JUDG:DEL (judgment delay)		IR:VOLT:TIM (test time)		IR:VOLT:SWE:TIM (voltage rise time	
	Setting range [1]	Resolution	Setting range	Resolution	Setting range	Resolution
10MS	0.04 S to 15.00 S	0.01 S	0.04 S to 10.00 S	0.01 S	0.01 S to 5.00 S	0.01 S
16.66MS	0.05 S to 15.00 S	0.05 S	0.05 S to 10.00 S	0.05 S	0.05 S to 5.00 S	0.05 S
20MS	0.04 S to 100.00 S	0.02 S	0.04 S to 1000.00 S	0.02 S	0.02 S to 200.00 S	0.02 S
100MS	0.2 S to 100.0 S	0.1 S	0.2 S to 1000.0 S	0.1 S	0.1 S to 200.0 S	0.1 S

1. The set value of SENS:IR:JUDG:DEL cannot be changed to a value greater than the sum of IR:VOLT:SWE:TIM (voltage rise time) and IR:VOLT:TIM (test time); attempting to do so will result in an error.

Settings are reset to default when the *RST command is sent. (Default value: 100MS)

Response

NR3

Example

```
SENS:IR:APER 20MS
```

SENS:IR:FILT:DIG:STAT

For insulation resistance tests, enables or disables the digital filter function, which detects poor contact with the EUT or broken test leads.
For details of digital filter, see the TOS73 Series User's Manual.

Command

```
SENSe:IR:FILTer:DIGital:STATe <boolean>
SENSe:IR:FILTer:DIGital:STATe?
```

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

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

Response

boolean

SENS:IR:JUDG

For insulation resistance tests, sets the reference resistance value for upper limit judgment (i.e., upper limit).
The set value of this command applies when SENS:IR:JUDG:STAT is set to ON.

Command

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

Parameter

Unit: OHM

The set value of this command cannot be changed to a value less than the setting for SENS:IR:JUDG:LOW (lower limit); attempting to do so will result in an error.

Settings are reset to default when the *RST command is sent. (Default value: 0.1 GOHM)

Response

NR3

Example

```
SENS:IR:JUDG 100MOHM
```

SENS:IR:JUDG:STAT

For insulation resistance tests, sets whether to perform an upper limit judgment based on the resistance upper limit. To set the upper limit for insulation resistance tests, use SENS:IR:JUDG.

Command

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

Parameter

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

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

Response

boolean

SENS:IR:JUDG:DEL

For insulation resistance tests, sets the time before starting the lower limit judgment and/or dV judgment (judgment delay). The set value of this command is applied when SENS:IR:JUDG:LOW:STAT and/or SENS:IR:JUDG:DVOL:STAT is set to ON.

Command

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

Parameter

Unit: S

Set the time shorter than the sum of IR:VOLT:SWE:TIM (voltage rise time) and IR:VOLT:TIM (test time).

The setting range that can be specified changes according to the set value of SENS:IR:APER (aperture time), as shown in the table below.

Setting condition (set value of SENS:IR:APER)	Range of settings applicable to this command [1]	Resolution
10MS [2 3]	0.04 S to 15.00 S	0.01 S
16.66MS [3]	0.05 S to 15.00 S	0.05 S
20MS	0.04 S to 100.00 S	0.02 S
100MS (Default of SENS:IR:APER)	0.2 S to 100.0 S	0.1 S

1. The set value of this command cannot be changed to a value greater than the sum of IR:VOLT:SWE:TIM (voltage rise time) and IR:VOLT:TIM (test time); attempting to do so will result in an error.
2. TOS7301 and TOS7301 WITH LAN only.
3. Only when IR:VOLT:TIM:STAT (test time) is set to ON.

Settings are reset to default when the *RST command is sent. (Default value: 0.2 S)

Response

NR3

Example

```
SENS:IR:JUDG:DEL 2
```

SENS:IR:JUDG:DVOL

For insulation resistance tests, sets the delta voltage for dV judgment in percentage (%) of the test voltage. (TOS7301 and TOS7301 WITH LAN only)
The set value of this command applies when SENS:IR:JUDG:DVOL:STAT is set to ON.

- Set the number of consecutive detections for the dV judgment criterion with SENS:IR:JUDG:DVOL:COUN.
- Set the judgment delay before starting dV judgment with SENS:IR:JUDG:DEL.

Command

```
SENSe:IR:JUDGment:DVOLtage[:LEVel] <numeric>
SENSe:IR:JUDGment:DVOLtage[:LEVel]?
```

Parameter

Unit: PCT

Settings are reset to default when the *RST command is sent. (Default value: 0.01 PCT)

Response

NR3

Example

```
SENS:IR:JUDG:DVOL 5PCT
```

SENS:IR:JUDG:DVOL:COUN

For insulation resistance tests, sets the number of consecutive detections as the dV judgment criterion. (TOS7301 and TOS7301 WITH LAN only)
The set value of this command applies when SENS:IR:JUDG:DVOL:STAT is set to ON.

- Set the delta voltage for dV judgment with SENS:IR:JUDG:DVOL.
- Set the judgment delay before starting dV judgment with SENS:IR:JUDG:DEL.

Command

```
SENSe:IR:JUDGment:DVOLtage:COUNt <numeric>
SENSe:IR:JUDGment:DVOLtage:COUNt?
```

Parameter

Settings are reset to default when the *RST command is sent. (Default value: 1)

Response

NR3

Example

```
SENS:IR:JUDG:DVOL:COUN 100
```

SENS:IR:JUDG:DVOL:STAT

For insulation resistance tests, enables or disables the dV judgment function. (TOS7301 and TOS7301 WITH LAN only)

- Set the delta voltage for dV judgment with SENS:IR:JUDG:DVOL.
- Set the number of consecutive detections for the dV judgment criterion with SENS:IR:JUDG:DVOL:COUN.
- Set the judgment delay before starting dV judgment with SENS:IR:JUDG:DEL.

Command

```
SENSe:IR:JUDGment:DVOLtage:STATe <boolean>
SENSe:IR:JUDGment:DVOLtage:STATe?
```

Parameter

Set value:	ON (1)	Judged
	OFF (0)	Not judged (default)

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

Response

boolean

SENS:IR:JUDG:LOW

For insulation resistance tests, sets the reference resistance value for lower limit judgment (i.e., lower limit).
The set value of this command applies when SENS:IR:JUDG:LOW:STAT is set to ON.
Set the judgment delay before starting lower limit judgment with SENS:IR:JUDG:DEL.

Command

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

Parameter

Unit: OHM

The set value of this command cannot be changed to a value greater than the setting for SENS:IR:JUDG (upper limit); attempting to do so will result in an error.

Settings are reset to default when the *RST command is sent. (Default value: 0.01 GOHM)

Response

NR3

Example

```
SENS:IR:JUDG:LOW 1000000
```

SENS:IR:JUDG:LOW:STAT

For insulation resistance tests, sets whether to enable or disable the judgment based on the lower limit reference value (i.e., lower limit judgment).

- To set the lower limit for insulation resistance tests, use SENS:IR:JUDG:LOW.
- Set the judgment delay before starting lower limit judgment with SENS:IR:JUDG:DEL.

Command

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

Parameter

Set value:	ON (1)	Judged (default)
	OFF (0)	Not judged

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

Response

boolean

SENS:IR:JUDG:SCD:STAT

For insulation resistance tests, enables or disables the short-circuit detection function, which detects short circuits between the HIGH and LOW terminals.
For details of short-circuit detection, see the TOS73 Series User's Manual.

Command

```
SENSe:IR:JUDGment:SCDetection:STATe <boolean>
SENSe:IR:JUDGment:SCDetection:STATe?
```

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

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

Response

boolean

SENS:IR:TERM:CCH

For insulation resistance tests, enables or disables the contact check function, which detects poor contact with the EUT or broken test leads.
For details of contact check, see the TOS73 Series User's Manual.

Command

```
SENSe:IR:TERMinals:CCHeck <boolean>
SENSe:IR:TERMinals:CCHeck?
```

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

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

Response

boolean

[SOURce:]IR Command

Sets test conditions for the insulation resistance tests (IR).

If the command to set the desired test condition cannot be found within this subsystem, also see the SENSe:IR command *(p. 69)*.

IR:VOLT

For insulation resistance tests, sets the test voltage.

Command

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

Parameter

Unit: V

The set value of this command cannot be changed to a value greater than the setting for IR:VOLT:PROT (limit voltage); attempting to do so will result in an error.

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

Response

NR3

Example

```
IR:VOLT 500
```

IR:VOLT:PROT

For insulation resistance tests, sets the limit voltage.

Command

```
[SOURce:]IR:VOLTage:PROTection[:LEVel][:UPPer] <numeric>
[SOURce:]IR:VOLTage:PROTection[:LEVel][:UPPer]?
```

Parameter

Unit: V

The set value of this command cannot be changed to a setting smaller than the value set for IR:VOLT (test voltage); attempting to do so will result in an error.

Settings are reset to default when the *RST command is sent. (Default value: 1025 V)

Response

NR3

Example

```
IR:VOLT:PROT 500
```

IR:VOLT:STAR

For insulation resistance tests, sets the start voltage as a percentage (%) of IR:VOLT (test voltage).
The set value of this command applies 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. (Default value: 50 PCT)

Response

NR3

Example

```
IR:VOLT:STAR 50PCT
```

IR:VOLT:STAR:STAT

For insulation resistance tests, enables or disables the start voltage.
The start voltage for insulation resistance tests is set by IR:VOLT:STAR.

Command

```
[SOURce:]IR:VOLTage:STARt:STATe <boolean>
[SOURce:]IR:VOLTage:STARt:STATe?
```

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

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

Response

boolean

IR:VOLT:SWE:TIM

For insulation resistance tests, sets the number of seconds for the voltage rise time.
The set value of this command applies when IR:VOLT:SWE:TIM:STAT is set to ON (default).

Command

```
[SOURce:]IR:VOLTage:SWEep[:RISE]:TIMer <numeric>
[SOURce:]IR:VOLTage:SWEep[:RISE]:TIMer?
```

Parameter

Unit: S

The setting range that can be specified changes according to the set value of SENS:IR:APER (aperture time), as shown in the table below.

Setting condition (set value of SENS:IR:APER)	Range of settings applicable to this command	Resolution
10MS [1] [2]	0.01 S to 5.00 S	0.01 S
16.66MS [2]	0.05 S to 5.00 S	0.05 S
20MS	0.02 S to 200.00 S	0.02 S
100MS (Default of SENS:IR:APER)	0.1 S to 200.0 S	0.1 S

1. TOS7301 and TOS7301 WITH LAN only.
2. Only when IR:VOLT:TIM:STAT (test time) is set to ON.

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

Response

NR3

Example

```
IR:VOLT:SWE:TIM 1
```

IR:VOLT:SWE:TIM:STAT

For insulation resistance tests, enables or disables the voltage rise time.
Use IR:VOLT:SWE:TIM to set the voltage rise time (number of seconds) for insulation resistance tests.

Command

```
[SOURce]:IR:VOLTage:SWEep[:RISE]:TIMer:STATe <boolean>
[SOURce]:IR:VOLTage:SWEep[:RISE]:TIMer:STATe?
```

Parameter

Set value:	ON (1)	Enabled (default)
	OFF (0)	Disabled

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

Response

boolean

IR:VOLT:TIM

For insulation resistance tests, sets the number of seconds for the test time.
The set value of this command applies when IR:VOLT:TIM:STAT is set to ON (default).

Command

```
[SOURce:]IR:VOLTage:TIMer <numeric>
[SOURce:]IR:VOLTage:TIMer?
```

Parameter

Unit: S

The setting range that can be specified changes according to the set value of SENS:IR:APER (aperture time), as shown in the table below.

Setting condition (set value of SENS:IR:APER)	Range of settings applicable to this command	Resolution
10MS [1] [2]	0.04 S to 10.00 S	0.01 S
16.66MS [2]	0.05 S to 10.00 S	0.05 S
20MS	0.04 S to 1000.00 S	0.02 S
100MS (Default of SENS:IR:APER)	0.2 S to 1000.0 S	0.1 S

1. TOS7301 and TOS7301 WITH LAN only.
2. Only when IR:VOLT:TIM:STAT (test time) is set to ON.

Settings are reset to default when the *RST command is sent. (Default value: 0.2 S)

Response

NR3

Example

```
IR:VOLT:TIM 5
```

IR:VOLT:TIM:STAT

For insulation resistance tests, enables or disables the test time.
Changing the set value of this command may also change the set value of SENS:IR:APER (aperture time).
To set the test time (number of seconds) for insulation resistance tests, use IR:VOLT:TIM.

Command

```
[SOURce:]IR:VOLTage:TIMer:STATe <boolean>
[SOURce:]IR:VOLTage:TIMer:STATe?
```

Parameter

Set value:	ON (1)	Enabled test time. (Default)
	OFF (0)	Disabled test time. The applicable set value for SENS:IR:APER (aperture time) is limited to 20 MS or more. If a set value below 20 MS is applied, it will be changed to 20 MS.

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

Response

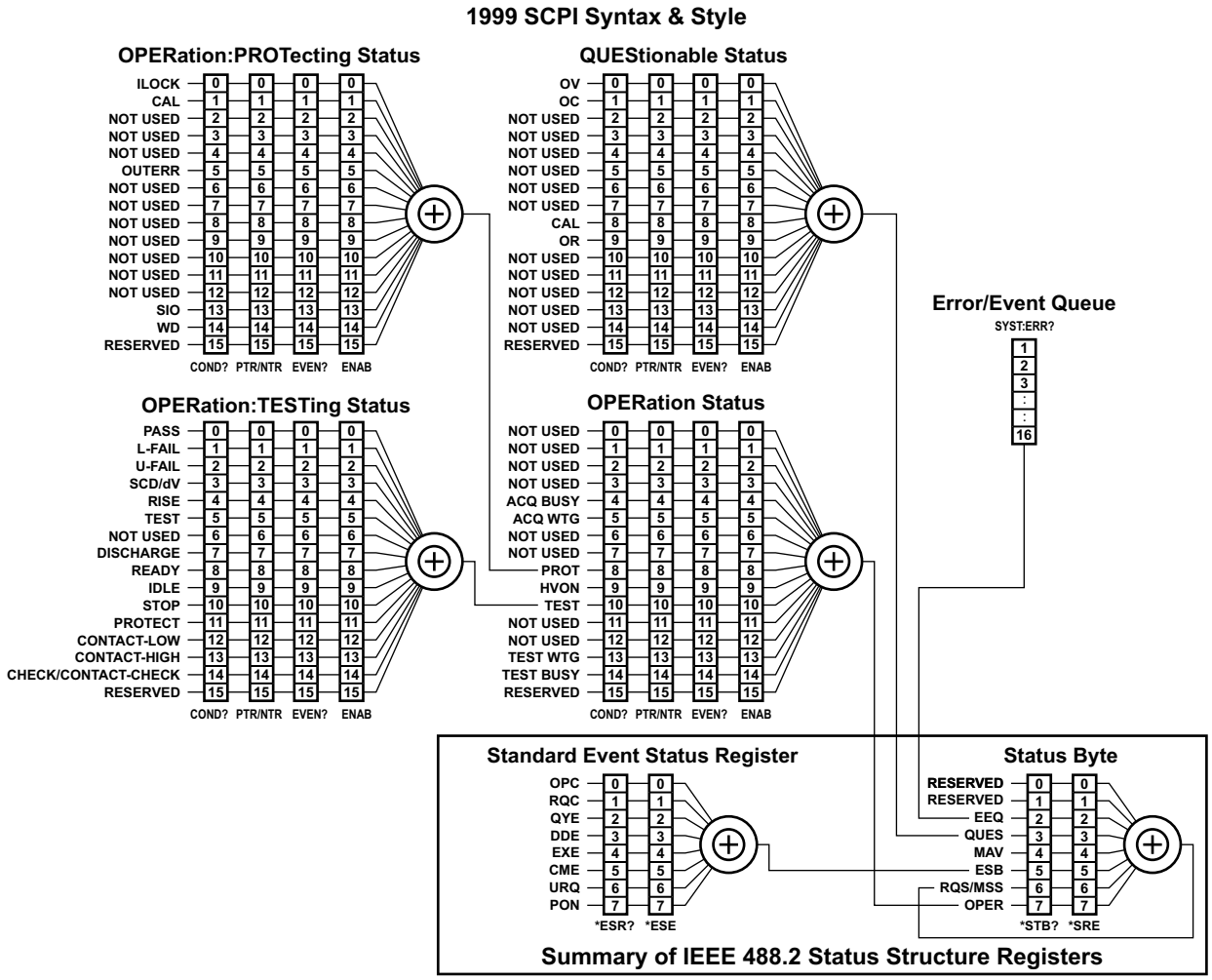
boolean

STATus Command

Relate to the operating status of the TOS73 series.

Status Report Structure

A “+” represents the logical OR of the register bits.



Standard Architecture

Status reporting in the TOS73 series uses IEEE 488.2 registers and SCPI status registers.

IEEE 488.2 registers

- Status Byte Register *(p. 82)*
- Event Status Register *(p. 83)*

SCPI status registers

- OPERation Status Register *(p. 84)*
- OPERation:PROTecting Status Register *(p. 89)*
- OPERation:TESTing Status Register *(p. 91)*
- QUEStionable Status Register *(p. 93)*

Sub registers

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.

CONDition register (read-only register)

Transitions of the CONDition register are automatic and apply the condition of the TOS73 series in real-time. This register is not reset by reading.

EVENt register (read-only register)

The EVENt register bits (i.e., event bits) are automatically set to true (1) according to the transitions in the CONDition register. The condition under which event bits are set can be modified by setting the transition filters. This register is reset when it is read.

ENABle register (writable register)

The ENABle register allows you to set whether the setting of the event bits to true (1) is reported to a higher-level register (the summary bit in the SCPI status register or the status bit in the status byte (STB) register).

Transition filters (writable register)

Configurable registers that control under what transitions of the CONDition register a report is sent to the EVENt register. There are two types of transition filters: PTRansition (positive transition) and NTRansition (negative transition). By combining these settings, the conditions for reporting from the CONDition register to the EVENt register can be controlled as follows:

- Bit with only the PTRansition filter set:
  Reporting to the corresponding bit in the EVENt register occurs only when the corresponding bit in the CONDition register transitions from false (0) to true (1).
- Bit with only the NTRansition filter set:
  Reporting to the corresponding bit in the EVENt register occurs only when the corresponding bit in the CONDition register transitions from true (1) to false (0).
- Bit with both the PTRansition filter and NTRansition filters set:
  Reporting to the corresponding bit in the EVENt register occurs regardless of how the corresponding bit in the CONDition register transitions.
- Bit with neither the PTRansition filter nor the NTRansition filter set:
  No reporting to the corresponding bit in the EVENt register occurs regardless of how the corresponding bit in the CONDition register transitions.

Status Byte Register

The status byte (STB) register stores STB message and RQS (or MSS) messages as defined by the IEEE 488.1 standard. The STB register can be read by sending IEEE 488.1 serial polling or the IEEE 488.2 common command *STB?.

- When the controller executes serial polling, bit 6 responds with the RQS (request service). The status byte value is not changed by serial polling.
- *STB? makes the device send the content of the STB register and the MSS (Master Summary Status) message. *STB? does not change the status byte, MSS, or RQS.

Bit	Bit weight	Bit name	Description (conditions for a bit to become "true")
0	1	RESERVED	Always 0
1	2		
2	4	Error/Event Queue (EEQ)	If data exists in the error/event queue *(p. 135)*, this bit is set to true.
3	8	Questionable Status Register (QUES)	In the QUEStionable status register *(p. 93)*, if the truth value of any bit is “true” in both the EVENt register and the ENABle register, this bit becomes “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 (SESR) *(p. 83)*.
6	64	Request Service (RQS)	This bit is set to true when a bit is set in the service request enable (SRE) register and the corresponding bit exists in the status byte.
		Master Summary Status (MSS)	This bit is set to true when any bit in the STB register is set to 1 and the corresponding bit in the SRE register is set to 1.
7	128	Operation Status Register (OPER)	In the OPERation status register *(p. 84)*, if the truth value of any bit is “true” in both the EVENt register and the ENABle register, this bit becomes “true”.
8 to 15	n/a	NOT USED	Always 0

Event Status Register

The event status register (SESR) bits are set when certain events occur during TOS73 series operation. All bits in the SESR are set by the error/event queue *(p. 135)*.

The SESR, defined by the IEEE 488.2 standard, is controlled sending the IEEE 488.2 common commands *ESE, *ESE, and *ESR?.

The error descriptions can be viewed with SYST:ERR?.

Bit	Bit weight	Bit name	Description (conditions for a bit to become "true")	Error number
0	1	Operation Complete (OPC)	*OPC command is received and all operations in standby have been completed. *(p. 133)*	-800 to -899
1	2	Request Control (RQC)	Always 0	n/a
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 if there is an error specific to the TOS73 series.	-300 to -399 +100 to +999
4	16	Execution Error (EXE)	Set when the TOS73 series evaluates that the program data after the header is outside the formal input range or does not match the specifications of the TOS73 series. Indicates that a valid SCPI command may not be executed correctly depending on the state of the TOS73 series.	-200 to -299
5	32	Command Error (CME)	Set when a 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 command input buffer.	-100 to -199
6	64	User Request (URQ)	Always 0	n/a
7	128	Power On (PON)		
8 to 15	n/a	RESERVED		

OPERation Status Register

The OPERation status register is a 16-bit register that contains information about the normal operating conditions for the TOS73 series.

Bit	Bit weight	Bit name	Description (conditions for a bit to become "true")
0	1	NOT USED	Always 0
1	2		
2	4		
3	8		
4	16	MEASuring (ACQ BUSY)	This bit becomes true during measurement.
5	32	ACQuire Waiting for TRIGger (ACQ WTG)	“True” while waiting for a measurement trigger *(p. 120)*.
6	64	NOT USED	Always 0
7	128		
8	256	RROTecting (PROT)	“True” if any bit in the OPERation:PROTecting status register *(p. 89)* is “true” in both the EVENt register and the ENABle register.
9	512	Voltage ON (HVON)	“True” during the test or when a voltage exceeding the set value of SYST:CONF:DANG:VOLT remains across the output terminals.
10	1024	TESTing (TEST)	“True” if the truth value of any bit in the OPERation:TESTing status register *(p. 91)* is “true” in both the EVENt register and the ENABle register.
11	2048	NOT USED	Always 0
12	4096		
13	8192	READY (TEST WTG)	“True” while waiting for a test trigger *(p. 120)*.
14	16384	TEST is running (TEST BUSY)	“True” while waiting for test execution or during the test.
15	32768	RESERVED	Always 0

<bit-item>

In the STAT:OPER subsystem commands, the <bit-item> node can be used to specify a bit. Replace the <bit-item> node with the necessary bits, referring to the table below:

<bit-item>	Bit	Bit name
ABUS	4	MEASuring (ACQ BUSY)
AWTG	5	ACQuire Waiting for TRIGger (ACQ WTG)
HVON	9	Voltage ON (HVON)
TWTG	13	READY (TEST WTG)
TBUS	14	TEST is running (TEST BUSY)

STAT:OPER?

Queries the bits set to true (1) in the EVENt register of the OPERation status register.
Upon query, all bits in the EVENt register are reset to false (0).

Command

```
STATus:OPERation[:EVENt]?
```

Response

NR1

STAT:OPER:<bit-item>?

Queries whether the specified bit in the EVENt register of the OPERation status register is set to true (1).
Upon query, all bits in the EVENt register are reset to false (0).
For details on the <bit-item> node, see “<bit-item>” *(p. 84)*.

Command

```
STATus:OPERation[:EVENt][:BIT]:<bit-item>?
```

Response

boolean	1	Set
	0	Not set

Example

```
STAT:OPER:ABUS?
```

STAT:OPER:COND?

Queries the bits set to true (1) in the CONDition register of the OPERation status register.
Querying does not reset the bits in the CONDition register.

Command

```
STATus:OPERation:CONDition?
```

Response

NR1

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

Queries whether the specified bit in the CONDition register of the OPERation status register is set to true (1).
Querying does not reset the bits in the CONDition register.
For details on the <bit-item> node, see "<bit-item>" *(p. 84)*.

Command

```
STATus:OPERation:CONDition[:BIT]:<bit-item>?
```

Response

boolean	1	Set
	0	Not set

Example

```
STAT:OPER:COND:AWTG?
```

STAT:OPER:ENAB

Sets the ENABle register for the OPERation status register.

Command

```
STATus:OPERation:ENABle <NR1>
STATus:OPERation:ENABle?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:ENAB:<bit-item>

Sets the specified bit in the ENABle register for the OPERation status register.
For details on the <bit-item> node, see "<bit-item>" *(p. 84)*.

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)

Response

boolean

Example

```
STAT:OPER:ENAB:HVON ON
```

STAT:OPER:NTR

Sets the NTRansition filter for the OPERation status register.
For the conditions for reporting to the EVENt register, see “Transition filters (writable register)” *(p. 81)*.

Command

```
STATus:OPERation:NTRansition <NR1>
STATus:OPERation:NTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:NTR:<bit-item>

Sets the specified bit in the NTRansition filter for the OPERation status register.
For details on the <bit-item> node, see “<bit-item>” *(p. 84)*.
For the conditions for reporting to the EVENt register, see “Transition filters (writable register)” *(p. 81)*.

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)

Response

boolean

Example

```
STAT:OPER:NTR:LOUT ON
```

STAT:OPER:PTR

Sets the PTRansition filter for the OPERation status register.
For the conditions for reporting to the EVENt register, see “Transition filters (writable register)” *(p. 81)*.

Command

```
STATus:OPERation:PTRansition <NR1>
STATus:OPERation:PTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:PTR:<bit-item>

Sets the specified bit in the PTRansition filter for the OPERation status register.
For details on the <bit-item> node, see “<bit-item>” *(p. 84)*.
For the conditions for reporting to the EVENt register, see “Transition filters (writable register)” *(p. 81)*.

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

Response

boolean

Example

```
STAT:OPER:PTR:TWTG ON
```

OPERation:PROTecting Status Register

The OPERation:PROTecting status register is a 16-bit register specific to the TOS73 series that stores information about the protection operation mode *(p. 63)* of the TOS73 series.

Bit	Bit weight	Bit name	Description (conditions for a bit to become "true")
0	1	Interlock (ILOCK)	At the SIGNAL I/O connector, the INTERLOCK+ (pin 1) and INTER-LOCK- (pin 13) terminals are open (interlock activated)
1	2	Calibration (CAL)	The system clock date has exceeded the calibration period *(p. 100)*
2	4	NOT USED	Always 0
3	8		
4	16		
5	32	Output Error (OUTERR)	The output voltage is outside the preset value range *(p. 63)*
6	64	NOT USED	Always 0
7	128		
8	256		
9	512		
10	1024		
11	2048		
12	4096		
13	8192	SIGNAL I/O (SIO)	A change in the SIGNAL I/O connector's ENABLE signal was detected
14	16384	Watchdog (WD)	A Watchdog PROTECTION mode *(p. 98)* or internal communication error was detected
15	32768	RESERVED	Always 0

STAT:OPER:PROT?

Queries the bits set to true (1) in the EVENt register of the OPERation:PROTecting status register.
Upon query, all bits in the EVENt register are reset to false (0).

Command

```
STATus:OPERation:PROTecting[:EVENt]?
```

Response

NR1

STAT:OPER:PROT:COND?

Queries the bits set to true (1) in the CONDition register of the OPERation:PROTecting status register.
Querying does not reset the bits in the CONDition register.

Command

```
STATus:OPERation:PROTecting:CONDition?
```

Response

NR1

STAT:OPER:PROT:ENAB

Sets the ENABle register for the OPERation:PROTecting status register.

Command

```
STATus:OPERation:PROTecting:ENABle <NR1>
STATus:OPERation:PROTecting:ENABle?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:PROT:NTR

Sets the NTRansition filter for the OPERation:PROTecting status register.
For the conditions for reporting to the EVENt register, see “Transition filters (writable register)” *(p. 81)*.

Command

```
STATus:OPERation:PROTecting:NTRansition <NR1>
STATus:OPERation:PROTecting:NTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:PROT:PTR

Sets the PTRansition filter for the OPERation:PROTecting status register.
For the conditions for reporting to the EVENt register, see “Transition filters (writable register)” *(p. 81)*.

Command

```
STATus:OPERation:PROTecting:PTRansition <NR1>
STATus:OPERation:PROTecting:PTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

OPERation:TESTing Status Register

The OPERation:TESTing status register is a TOS73 series-specific 16-bit register that stores information about the status of testing of the TOS73 series.

Bit	Bit weight	Bit name	Description (conditions for a bit to become "true")
0	1	PASS	PASS judgment
1	2	L-FAIL	Lower-FAIL judgment or Lower-FAIL(SCD) judgment [1]
2	4	U-FAIL	Upper-FAIL judgment or Upper-FAIL(dV) judgment [2]
3	8	SCD/dV	Lower-FAIL(SCD) judgment [1] or Upper-FAIL(dV) judgment [2]
4	16	RISE	Voltage rising
5	32	TEST	During test
6	64	NOT USED	Always 0
7	128	DISCHARGE	Discharging
8	256	READY	The TEST trigger subsystem is Waiting for trigger application (WTG state *(p. 120)*)
9	512	IDLE	The TEST trigger subsystem is stopped (IDLE state *(p. 120)*)
10	1024	STOP	Stopping testing (pressing the STOP/RESET switch, or sending the STOP signal to the SIGNAL I/O connector)
11	2048	PROTECT	Any PROTECTION mode has occurred
12	4096	CONTACT-LOW	OUTPUT LOW terminal are open
13	8192	CONTACT-HIGH	OUTPUT HIGH terminal are open
14	16384	CONTACT-CHECK	Contact check in progress
		CHECK	Short-circuit detection in progress
15	32768	RESERVED	Always 0

1. If a Lower-FAIL(SCD) judgment (short-circuit detection) occurs, bits 1 and 3 become true simultaneously.
2. If an Upper-FAIL(dV) judgment (dV judgment) occurs, bits 2 and 3 become true simultaneously.

STAT:OPER:TEST?

Queries the bits set to true (1) in the EVENt register of the OPERation:TESTing status register.
Upon query, all bits in the EVENt register are reset to false (0).

Command

```
STATus:OPERation:TESTing[:EVENt]?
```

Response

NR1

STAT:OPER:TEST:COND?

Queries the bits set to true (1) in the CONDition register of the OPERation:TESTing status register.
Querying does not reset the bits in the CONDition register.

Command

```
STATus:OPERation:TESTing:CONDition?
```

Response

NR1

STAT:OPER:TEST:ENAB

Sets the ENABle register for the OPERation:TESTing status register.

Command

```
STATus:OPERation:TESTing:ENABle <NR1>
STATus:OPERation:TESTing:ENABle?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:TEST:NTR

Sets the NTRansition filter for the OPERation:TESTing status register.
For the conditions for reporting to the EVENt register, see “Transition filters (writable register)” *(p. 81)*.

Command

```
STATus:OPERation:TESTing:NTRansition <NR1>
STATus:OPERation:TESTing:NTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:OPER:TEST:PTR

Sets the PTRansition filter for the OPERation:TESTing status register.
For the conditions for reporting to the EVENt register, see “Transition filters (writable register)” *(p. 81)*.

Command

```
STATus:OPERation:TESTing:PTRansition <NR1>
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 following status and events of the TOS73 series. The QUEStionable status register bits may indicate that there are problems with the measurement data of the TOS73 series.

Bit	Bit weight	Bit name	Description (conditions for a bit to become "true")
0	1	Over Voltage (OV)	Voltage measurement over-range
1	2	Over Current (OC)	Current measurement over-range
2	4	NOT USED	Always 0
3	8		
4	16		
5	32		
6	64		
7	128		
8	256	CALibration (CAL)	The system clock date has exceeded the calibration period *(p. 100)*
9	512	Over Resistance (OR)	Resistance measurement over-range
10	1024	NOT USED	Always 0
11	2048		
12	4096		
13	8192		
14	16384		
15	32768	RESERVED	

STAT:QUES?

Queries the bits set to true (1) in the EVENt register of the QUEStionable status register.
Upon query, all bits in the EVENt register are reset to false (0).

Command

```
STATus:QUEStionable[:EVENt]?
```

Response

NR1

STAT:QUES:COND?

Queries the bits set to true (1) in the CONDition register of the QUEStionable status register.
Querying does not reset the bits in the CONDition register.

Command

```
STATus:QUEStionable:CONDition?
```

Response

NR1

STAT:QUES:ENAB

Sets the ENABle register for the QUEStionable status register.

Command

```
STATus:QUEStionable:ENABle <NR1>
STATus:QUEStionable:ENABle?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:QUES:NTR

Sets the NTRansition filter for the QUEStionable status register.
For the conditions for reporting to the EVENt register, see “Transition filters (writable register)” *(p. 81)*.

Command

```
STATus:QUEStionable:NTRansition <NR1>
STATus:QUEStionable:NTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

STAT:QUES:PTR

Sets the PTRansition filter for the QUEStionable status register.
For the conditions for reporting to the EVENt register, see “Transition filters (writable register)” *(p. 81)*.

Command

```
STATus:QUEStionable:PTRansition <NR1>
STATus:QUEStionable:PTRansition?
```

Parameter

Set value: 0 to 32767

Response

NR1

Preset Status

STAT:PRES

Resets the writable sub-registers (ENABle register, PTRansition filter, and NTRansition filter) of all SCPI status registers (including TOS73 series specific registers) to their default settings.

Command

```
STATus:PRESet
```

Default settings

STATus:ENABle = 0x0000
STATus:PTRansition = 0x7FFF
STATus:NTRansition = 0x0000

SYSTem Command

Relates to system settings.

The set values applied to commands such as the SYST:CONF subsystem (CONFIG settings) can be saved by SYST:CONF:SAV, allowing the TOS73 series to start up with the same CONFIG settings the next time power is turned on.

For the set value that can be saved by SYST:CONF:SAV, see “List of Parameters Applicable to *RCL, *RST, *SAV, and SYST:CONF:SAV and Each Setting Command *(p. 41)*”.

SYST:BEEP

Enables or disables all configurable beep sounds collectively.

The table below lists the applicable beep sounds. Upon sending this command, the set values in the commands below are also changed accordingly.

Conditions for beep sound	Applicable command [1]
An invalid key operation occurred	SYST:BEEP:KEY *(p. 97)*
A protection function was activated (PROTECTION mode)	SYST:BEEP:PROT *(p. 97)*
An SCPI error occurred	SYST:BEEP:SCPI *(p. 97)*
The test result was a FAIL judgment	SYST:CONF:BEEP:STAT *(p. 99)*
The test result was a PASS judgment	SYST:CONF:BEEP:PASS:STAT *(p. 100)*

1. If even one applicable command is set to ON, the set value of this command will also be changed to ON accordingly.

Command

```
SYSTem:BEEPer[:ALL][:STATe] <boolean>
SYSTem:BEEPer[:ALL][:STATe]?
```

Parameter

Set value:	ON (1)	Enabled (default)
	OFF (0)	Disabled

Response

boolean	1	One or more of the commands in the table above associated with the beep sounds are set to ON.
	0	The commands associated with the beep sounds in the table above are all set to OFF.

SYST:BEEP:KEY

Enables or disables the beep sound generated when an invalid key operation is performed. This command and SYST:BEEP may interact to change each other's settings.

Command

```
SYSTem:BEEPer:KEY[:STATe] <boolean>
SYSTem:BEEPer:KEY[:STATe]?
```

Parameter

Set value:	ON (1)	Enabled (default)
	OFF (0)	Disabled

Response

boolean

SYST:BEEP:PROT

Enables or disables the beep sounds generated when a protection function is activated. This command and SYST:BEEP may interact to change each other's settings.

Command

```
SYSTem:BEEPer:PROTection[:STATe] <boolean>
SYSTem:BEEPer:PROTection[:STATe]?
```

Parameter

Set value:	ON (1)	Enabled (default)
	OFF (0)	Disabled

Response

boolean

SYST:BEEP:SCPI

Enables or disables the beep sounds generated when an SCPI error occurs. This command and SYST:BEEP may interact to change each other's settings.

Command

```
SYSTem:BEEPer:SCPI[:STATe] <boolean>
SYSTem:BEEPer:SCPI[:STATe]?
```

Parameter

Set value:	ON (1)	Enabled (default)
	OFF (0)	Disabled

Response

boolean

SYST:COMM:PROT:WDOG

Enables or disables Watchdog.
When this is enabled, if there is no SCPI communication for a certain period, a PROTECTION mode starts and the TOS73 series automatically turns off output.
The time until it enters the PROTECTION mode can be set using SYST:COMM:PROT:WDOG:DEL.
To enable or disable the beep sounding during PROTECTION mode, use SYST:BEEP:PROT.

Command

```
SYSTem:COMMunicate:PROTection:WDOG[:STATe] <boolean>
SYSTem:COMMunicate:PROTection:WDOG[:STATe]?
```

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

Response

boolean

SYST:COMM:PROT:WDOG:DEL

Sets the time until the PROTECTION mode starts after the last SCPI communication if the Watchdog is enabled.
Watchdog is enabled when SYST:COMM:PROT:WDOG is ON.

Command

```
SYSTem:COMMunicate:PROTection:WDOG:DELay <numeric>
SYSTem:COMMunicate:PROTection:WDOG:DELay?
```

Parameter

Unit: S (default value: 60 S)

Response

NR3

Example

```
SYST:COMM:PROT:WDOG:DEL 1S
```

SYST:COMM:RLST

Sets the operating method (local mode/remote mode) of the TOS73 series.
In remote mode, the Remote icon lights up on the display of the TOS73 series. In the local mode, the Remote icon turns off.

Command

```
SYSTem:COMMunicate:RLSTate <character>
SYSTem:COMMunicate:RLSTate?
```

Parameter

Set value:	LOCal	Switches to local mode. (Default) This enables both operations from the panel and by command. The commands of the SAMP subsystem *(p. 67)* and the TRIG:ACQ subsystem *(p. 114)* are set to their default settings. This is a substitute command for IEEE 488.1 REN FALSE (Remote Disable).
	REMote	Switches to remote mode. The front panel locks all panel operations except the LOCAL key, the START switch, and the STOP/RESET switch. This is a substitute command for IEEE 488.1 REN (Remote Enable). This is also the substitute command for address specification.
	RWLock	Switches to remote mode. The front panel locks all panel operations except for the START switch and the STOP/RESET switch, and prohibits unlocking from the front panel. This is a substitute command for IEEE 488.1 LLO (Local Lock Out).

Response

character

Example

```
SYST:COMM:RLST REM
```

SYST:CONF:BEEP:STAT

Enables or disables the beep sound generated when a FAIL judgment occurs. This command and SYST:BEEP may interact to change each other's settings.

Command

```
SYSTem:CONFigure:BEEPer:[FAIL]:STATe <boolean>
SYSTem:CONFigure:BEEPer:[FAIL]:STATe?
```

Parameter

Set value:	ON (1)	Enabled (default)
	OFF (0)	Disabled

Response

boolean

SYST:CONF:BEEP:PASS:STAT

Enables or disables the beep sound generated when a PASS judgment occurs. This command and SYST:BEEP may interact to change each other's settings.

Command

```
SYSTem:CONFigure:BEEPer:PASS:STATe <boolean>
SYSTem:CONFigure:BEEPer:PASS:STATe?
```

Parameter

Set value:	ON (1)	Enabled (default)
	OFF (0)	Disabled

Response

boolean

SYST:CONF:CAL:DUE:CONT

Sets the calibration period.
The calibration period is set by the number of months elapsed from the calibration date (CAL:DATE).
To set how it should operate when the calibration period has passed, use SYST:CONF:CAL:PROT:STAT.

Command

```
SYSTem:CONFigure:CALibration:DUE:CONTrol <NRf>
SYSTem:CONFigure:CALibration:DUE:CONTrol?
```

Parameter

Set value:	0	The calibration period is not monitored
	1 to 24	The calibration period is monitored (default: 12)

Response

NR1

Example

If the following command is sent when the calibration date is 26/03/06 (Mar 6, '26), the calibration period date will be set to 27/04/06 (April 6, '27), i.e., 13 months later.

```
SYST:CONF:CAL:DUE:CONT 13
```

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.
To enable or disable the beep sounding during PROTECTION mode, use SYST:BEEP:PROT.

Command

```
SYSTem:CONFigure:CALibration:PROTection[:KEEP]:STATe <boolean>
SYSTem:CONFigure:CALibration:PROTection[:KEEP]:STATe?
```

Parameter

Set value:	ON (1)	Switches to PROTECTION mode
	OFF (0)	Does not switch PROTECTION mode (default)

Response

boolean

SYST:CONF:DACT:STAT

Enables or disables Double Action for the test start operation.
When this command is enabled, the Start Long (SYST:CONF:SLPR:STAT) is disabled.
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/RESET switch.

- Double Action applies not only to operations from the front panel of the TOS73 series, but also to signals sent from external devices to the SIGNAL I/O connector.
- Double Action can be used together with Momentary (SYST:CONF:MOM:STAT).
- Double Action and Start Long cannot be used together; enabling either one will automatically disable the other.

Command

```
SYSTem:CONFigure:DACTion:STATe <boolean>
SYSTem:CONFigure:DACTion:STATe?
```

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

Response

boolean

SYST:CONF:FMOD:STAT

Enables or disables the fail mode.
When the fail mode is enabled, the FAIL judgment and PROTECTION mode cannot be cleared from a device connected to the SIGNAL I/O connector.

Command

```
SYSTem:CONFigure:FMODe:STATe <boolean>
SYSTem:CONFigure:FMODe:STATe?
```

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

Response

boolean

SYST:CONF:MOM:STAT

Enables or disables Momentary for the test start operation.
When Momentary is enabled, the test will be executed only while holding down the START switch.

- Momentary applies not only to operations from the front panel of the TOS73 series, but also to signals sent from external devices to the SIGNAL I/O connector.
- Momentary can be used together with either Double Action (SYST:CONF:DACT:STAT) or Start Long (SYST:CONF:SLPR:STAT). Note that Start Long does not apply to signals sent to the SIGNAL I/O connector.

Command

```
SYSTem:CONFigure:MOMentary:STATe <boolean>
SYSTem:CONFigure:MOMentary:STATe?
```

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

Response

boolean

SYST:CONF:PHOL

Sets the duration for retain displaying the judgment result on the display of the TOS73 series when the PASS judgment is made (Pass Hold).

Command

```
SYSTem:CONFigure:PHOLd {<NRf>|<character>}
SYSTem:CONFigure:PHOLd?
```

Parameter

<NRf>

Set value:	0.05 to 10.00	Set the duration in seconds, for which the PASS judgment result remains displayed. (Default value: 0.2) When a PASS judgment is made, the judgment result will remain displayed until the set time has elapsed or the STOP/RESET switch is pressed.

<character>

Set value:	INFinity	When a PASS judgment is made, the judgment result will remain displayed until the STOP/RESET switch is pressed.

Response

NR3	Returns the currently specified holding time.
character	Returns INF when it is set to INFinity.

Example

```
SYST:CONF:PHOL INF
```

SYST:CONF:FHOL

Sets whether to continue displaying the judgment result on the display of the TOS73 series when the FAIL judgment is made (Fail Hold).

Command

```
SYSTem:CONFigure:FHOLd {<NRf>|<character>}
SYSTem:CONFigure:FHOLd?
```

Parameter

<NRf>

Set value:	0.2	When a FAIL judgment is made, the judgment result shall be displayed for 200 ms.

<character>

Set value:	INFinity	When a FAIL judgment is made, the judgment result will remain displayed until the STOP/RESET switch is pressed. (Default)

Response

NR3	+2.00000E-01 returns.
character	Returns INF when it is set to INFinity.

Example

```
SYST:CONF:FHOL 0.2
```

SYST:CONF:DANG:VOLT

Sets the threshold voltage at which the DANGER LED turns on/off.
If a voltage exceeding the set value of this command remains at the output terminals of the TOS73 series, the DANGER LED turns on.

Command

```
SYSTem:CONFigure:DANGer:VOLTage <NRf>
SYSTem:CONFigure:DANGer:VOLTage?
```

Parameter

Unit: V
Set value: 1 to 30 (Default value: 30)

Response

NR3

Example

```
SYST:CONF:DANG:VOLT 30
```

SYST:CONF:PON:STAT

Sets the panel setting status when the power is turned on.

Command

```
SYSTem:CONFigure:PON:STATe <character>
SYSTem:CONFigure:PON:STATe?
```

Parameter

The panel setting state at power-on can be selected from the following.

Set value:	RST	The system will start up with the same reset settings as when *RST was sent. *(p. 41)*
	RCL0	Start with the settings saved in No. 0 (*RCL 0) in setup memory.
	AUTO	Start with the same settings as when the power supply was turned off the previous time (Resume). (Default)

Double Action (SYST:CONF:DACT:STAT) and Start Long (SYST:CONF:SLPR:STAT) are not affected by this command. When the power is turned on, the following settings are applied depending on the conditions for the previous power-off.

Setting conditions at the time of the previous power-off	Power-on settings applied to Double Action and Start Long
Setting either Double Action or Start Long to ON	Same settings as at the time of the previous power-off
Setting both Double Action and Start Long to OFF	Only Start Long is set to ON

Response

character

Example

```
SYST:CONF:PON:STAT AUTO
```

SYST:CONF:SAV

Saves the current CONFIG settings applied to the TOS73 series.

Sending this command saves the set values of commands corresponding to the CONFIG settings (such as the SYST:CONF subsystem), allowing the TOS73 series to start up with the same CONFIG settings the next time power is turned on.

For the set values affected by this command, see “List of Parameters Applicable to *RCL, *RST, *SAV, and SYST:CONF:SAV and Each Setting Command” *(p. 41)*.

Command

```
SYSTem:CONFigure:SAVe
```

SYST:CONF:SIO:INT:STAT

Enables or disables interlock.

Command

```
SYSTem:CONFigure:SIO:INTerlock:STATe <boolean>
SYSTem:CONFigure:SIO:INTerlock:STATe?
```

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

Response

boolean

SYST:CONF:SLPR:STAT

Enables or disables Start Long for the test start operation.
When this command is enabled, the Double Action (SYST:CONF:DACT:STAT) will be disabled.

If Start Long is enabled, the test will begin only if the START switch is pressed and held down for 1 second or more.

- Start Long applies only to operations from the front panel of the TOS73 series. (It does not apply to signals sent to the SIGNAL I/O connector)
- Start Long can be used together with Momentary (SYST:CONF:MOM:STAT).
- Double Action and Start Long cannot be used together; enabling either one will automatically disable the other.

Command

```
SYSTem:CONFigure:SLPRess:STATe <boolean>
SYSTem:CONFigure:SLPRess:STATe?
```

Parameter

Set value:	ON (1)	Enabled (default)
	OFF (0)	Disabled

If Double Action was set to OFF at the time of the previous power-off, the set value of this command will always be set to ON at power-on.

Response

boolean

SYST:DATE

Sets the date of the system clock for the TOS73 series.
To set the time, use 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_NRf>,<month_NRf>,<day_NRf>
SYSTem:DATE?
```

Parameter

<year_NRf>
Set value (year): 2016 to 2099

<month_NRf>
Set value (month): 1 to 12

<day_NRf>
Set value (day): 1 to 31

Response

Returns the system clock's date in a comma-separated NR1 format in the year, month, day order.

Example

```
SYST:DATE 2025,4,30
```

SYST:ERR?

Reads the oldest error information or event information from the error/event queue.
The error/event queue can store up to 16 pieces of error information, which are cleared sending the *CLS command.
For details, see “Error Checking” *(p. 135)* and “List of Errors” *(p. 136)*.

Command

```
SYSTem:ERRor[:NEXT]?
```

Response

Returns the oldest error or event from the error/event queue in the following format.

Response example: If there is no error or event
This command returns +0 "No error".

Response example: If the received command is unexecutable in the current operating state of the TOS73 series
this command returns -221, “Settings conflict”.

SYST:ERR:COUN?

Returns the number of unread errors in the error/event queue.

Command

```
SYSTem:ERRor:COUNt?
```

Response

NR1

SYST:KLOC

Enable or disables the key lock for panel operations of the TOS73 series.
The set value of this command can be changed during local mode.
To set the key lock level, use SYST:KLOC:LEV. Operations via remote control are not restricted by the key lock.
To set whether a password is required to unlock the key lock, use SYST:KLOC:PASS:STAT.

Command

```
SYSTem:KLOCk <boolean>
SYSTem:KLOCk?
```

Parameter

Set value:	ON (1)	Enabled key lock
	OFF (0)	Disabled key lock (default)

Response

boolean

SYST:KLOC:LEV

Sets the key lock level to be applied when the panel key operations of the TOS73 series are locked.
To enable or disable the key lock, use SYST:KLOC. Operations via remote control are not restricted by the key lock.

Command

```
SYSTem:KLOCk:LEVel <NRf>
SYSTem:KLOCk:LEVel?
```

Parameter

While key lock is active, the following operations are allowed depending on the level:

Set value:	1	Corresponds to Lock Level: Low. Allowed operations: Key lock disable, STOP/RESET switch, START switch, setup memory recall
	2	Corresponds to Lock Level: Medium. Allowed operations: Key lock disable, STOP/RESET switch, START switch
	3	Corresponds to Lock Level: High. (Default) Allowed operations: Key lock disable, STOP/RESET switch

Response

NR1

Example

```
SYST:KLOC:LEV 3
```

SYST:KLOC:PASS:NEW

Sets the password for unlocking the panel key lock.
The password is valid when SYST:KLOC:PASS:STAT *(p. 109)* is set to ON.
The password returns to the default when SYST:SEC:IMM *(p. 111)* is sent.

Command

```
SYSTem:KLOCk:PASSword:NEW "<string_exist>","<string_new>"
```

Parameter

"<string_exist>" (existing password), "<string_new>" (new password)
Specify the password according to the following naming convention. (Default value: ”0000”)

Available characters:
Digits (0 to 9)

Others:
Number of characters: 4 to 15

Example

To change the default password (0000) to “11852960”, send the following command:

```
SYST:KLOC:PASS:NEW “0000”,”11852960”
```

SYST:KLOC:PASS:STAT

Sets whether password input is required when unlocking the key lock.
If the setting is enabled, password input *(p. 108)* is required when unlocking the key lock using SYST:KLOC.
The password for unlocking the key lock can be specified using SYST:KLOC:PASS:NEW.

Command

```
SYSTem:KLOCk:PASSword:STATe <boolean>
SYSTem:KLOCk:PASSword:STATe?
```

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

Response

boolean

SYST:PASS

Enables the use of password-protected commands.
The password-protected commands are CAL:DATE and SYST:SEC:IMM.

- To enable the use, enter the correct password as the parameter for this command and send it.
- The password protection state can be checked with SYST:PASS:STAT?.

Command

```
SYSTem:PASSword[:CENable] "<string>"
```

Parameter

Set value: The password set by SYST:PASS:NEW

Example

```
SYST:PASS "password"
```

SYST:PASS:CDIS

Disables the use of password-protected commands.
The password-protected commands are CAL:DATE and SYST:SEC:IMM.

- To disable the use, enter the correct password as the parameter for this command and send it.
- The password protection state can be checked with SYST:PASS:STAT?.

Command

```
SYSTem:PASSword:CDISable "<string>"
```

Parameter

Set value: The password set by SYST:PASS:NEW

Example

```
SYST:PASS:CDIS "password"
```

SYST:PASS:NEW

Sets a password to enable/disable the use of password-protected commands.
The password-protected commands are CAL:DATE and SYST:SEC:IMM.

Command

```
SYSTem:PASSword:NEW "<string_exist>","<string_new>"
```

Parameter

"<string_exist>" (existing password), "<string_new>" (new password)
Specify the password according to the following naming convention. (Default value: “”)

Available characters:
Alphanumeric characters (A-Z, a-z, 0-9), underscore, hyphen

Others:
Number of characters: 4 to 15

Example

```
SYST:PASS:NEW "existing password","new password"
SYST:PASS:NEW "","new password"
```

SYST:PASS:STAT?

Queries the state of the password-protection (enable/disable) of password-protected commands.
The password-protected commands are CAL:DATE and SYST:SEC:IMM.

Command

```
SYSTem:PASSword[:CENable]:STATe?
```

Response

boolean	1	The password-protected commands are enabled
	0	The password-protected commands are disabled.

SYST:SEC:IMM

Sanitizes all the contents saved in TOS73 series memory and initializes the panel settings to their factory default conditions.
When this command is sent, interface settings and command values are changed to the factory default settings described in the referenced sections below.

- “Initializing the interface settings” *(p. 23)*
- “List of Parameters Applicable to *RCL, *RST, *SAV, and SYST:CONF:SAV and Each Setting Command” *(p. 41)*

This command is password-protected and can only be executed when enabled by SYST:PASS. The password protection state can be checked with SYST:PASS:STAT?.

Command

```
SYSTem:SECurity:IMMediate
```

SYST:SSAV

Enables or disables the screen saver for the display of the TOS73 series.
To set the time until the screen saver starts, use SYST:SSAV:DEL.

Command

```
SYSTem:SSAVer[:STATe] <boolean>
SYSTem:SSAVer[:STATe]?
```

Parameter

Set value:	ON (1)	Enabled
	OFF (0)	Disabled (default)

Response

boolean

SYST:SSAV:DEL

Sets the time before the screen saver for the display of the TOS73 series to start when the front panel is not operated.
The set value of this command applies when SYST:SSAV is set to ON.

Command

```
SYSTem:SSAVer:DELay <numeric>
SYSTem:SSAVer:DELay?
```

Parameter

Unit: S (Default value: 60 S)

Response

NR3

Example

```
SYST:SSAV:DEL 3600S
```

SYST:TIME

Sets the time of the system clock for the TOS73 series.
Set the date using SYST:DATE.

Command

```
SYSTem:TIME <hour_NRf>,<min_NRf>,<sec_NRf>
SYSTem:TIME?
```

Parameter

<hour_NRf>
Set value (hour): 0 to 23

<min_NRf>
Set value (minute): 0 to 59

<sec_NRf>
Set value (second): 0 to 59

Response

Returns the system clock time in a comma-separated NR1 format in the hour, minute, second order.

Example

```
SYST:TIME 23,0,0
```

SYST:TIME:ADJ

Automatically synchronizes the system clock of the TOS73 series using the NTP server on the network.

Command

```
SYSTem:TIME:ADJust
```

SYST:TZON

Sets the time zone of the system clock for the TOS73 series.
Use SYST:TZON:CAT? to check the time zone ID.

Command

```
SYSTem:TZONe "<string>"
SYSTem:TZONe?
```

Parameter

Set value: Time zone ID or UTC (default value: "UTC")

Response

string

Example

```
SYST:TZON "Asia/Tokyo"
```

SYST:TZON:CAT?

Queries all available time zone IDs for the system clock.
The time zone can be set for the system clock using SYST:TZON.

Command

```
SYSTem:TZONe:CATalog?
```

Response

Comma-separated string format

SYST:VERS?

Queries the version of the SCPI standard that the TOS73 series complies with.

Command

```
SYSTem:VERSion?
```

Response

Returns 1999.0.

TRIGger Command

Relates to trigger.
For details on triggers in the TOS73 series, see below.

- Trigger overview: “Trigger Subsystems” *(p. 120)*
- Testing by trigger: “Executing a Test” *(p. 121)*, “Querying Test Results” *(p. 129)*
- Measurement by Trigger: “Querying Measured Values” *(p. 124)* and “Multi-point Measurements with Trigger Count Specified” *(p. 130)*

TRIG:ACQ

Applies a software trigger to the ACQuire trigger subsystem.
If the ACQ trigger subsystem is in the INITiated state *(p. 120)* and the trigger source is set to BUS, a trigger action will start. Unlike *TRG, the software trigger does not apply to the TEST trigger subsystem.

Command

```
TRIGger:ACQuire[:IMMediate]
```

TRIG:ACQ:COUN

Sets the number of trigger actions (i.e., trigger count) to execute in one trigger sequence for the ACQuire trigger subsystem.

Command

```
TRIGger:ACQuire:COUNt {<numeric>|<character>}
TRIGger:ACQuire:COUNt?
```

Parameter

<numeric>

Set value:	1 to 8192	Specifies the trigger count. (Default value: 1) The number of trigger actions is finite. The ACQ trigger subsystem transitions to the IDLE state *(p. 120)* after the specified number of trigger actions are completed.

<character>

Set value:	INFinity	The trigger action continues indefinitely until the IDLE state begins.

In the following cases, the set value are changed to default. (They are fixed to default in the local mode.)

- When an *RST command or a MEAS subsystem query is sent
- During the transitions to local mode by sending SYST:COMM:RLST LOC command
- During the transitions to local mode by pressing LOCAL

Response

NR1	Returns the set trigger count.
character	Returns INF when it is set to INFinity.

Example

```
TRIG:ACQ:COUN 10
```

TRIG:ACQ:DEL

Sets the delay time before the trigger action starts for the ACQuire trigger subsystem.
When the ACQ trigger subsystem starts the trigger action, measurement begins after the set delay time elapses.

Command

```
TRIGger:ACQuire:DELay <numeric>
TRIGger:ACQuire:DELay?
```

Parameter

Unit: S

Set value: 1 to 100.0 (Default value: 0 S)

Resolution: 100 MS

In the following cases, the set value are changed to default.

- When an *RST command or a MEAS subsystem query is sent
- During the transitions to local mode by sending SYST:COMM:RLST LOC command
- During the transitions to local mode by pressing LOCAL

Response

NR3

Example

```
TRIG:ACQ:DEL 0S
```

TRIG:ACQ:SOUR

Sets for the ACQuire trigger subsystem the conditions (trigger source) for starting a trigger action from the INITiated state.
When the ACQ trigger subsystem starts the trigger action, measurement begins after the delay time set by TRIG:ACQ:DEL.

Command

```
TRIGger:ACQuire:SOURce <character>
TRIGger:ACQuire:SOURce?
```

Parameter

Set value:	IMMediate	Starts the trigger action immediately from the INITiated state *(p. 120)*.
	BUS	Starts the trigger action when the software trigger (*TRG or TRIG:ACQ) is applied.
	TSTart	Starts trigger action simultaneously with the start (test start) of trigger action of the TEST trigger subsystem. (Default)

In the following cases, the set value are changed to default. (They are fixed to default in the local mode.)

- When an *RST command is sent
- During the transitions to local mode by sending SYST:COMM:RLST LOC command
- During the transitions to local mode by pressing LOCAL

When a query in the MEAS subsystem is sent, the set value changes to IMM.

Response

character

Example

```
TRIG:ACQ:SOUR IMM
```

TRIG:TEST

Applies a software trigger to the TEST trigger subsystem.
If the TEST trigger subsystem is in the INITiated state *(p. 120)* and the trigger source is set to BUS, the test will start. Unlike *TRG, the software trigger will not apply to the ACQ trigger subsystem.

Command

```
TRIGger:TEST[:IMMediate]
```

TRIG:TEST:SOUR

Sets for the TEST trigger subsystem the conditions (trigger source) for starting a trigger action from the INITiated state. When the TEST trigger subsystem starts the trigger action, the test begins immediately without delay time.

Command

```
TRIGger:TEST:SOURce <character>
TRIGger:TEST:SOURce?
```

Parameter

The following describes the operation during an insulation resistance test immediately after the TEST trigger subsystem transitions to the INITiated state *(p. 120)*. In the TOS73 series, there is no difference between EXTernal and ONCE operations.

Set value:	IMMediate	Starts the test immediately. (Default)
	BUS	Starts the test when the software trigger (*TRG or TRIG:TEST) is applied.
	EXTernal	Starts the test with the start operation [1] to the main unit of the TOS73 series.
	ONCE	Starts the test with the start operation [1] to the main unit of the TOS73 series.

1. Start operation is either pressing the START switch on the front panel or sending a START signal from an external device to the SIGNAL I/O connector. The start operation judgment criterion is based on the combination of settings for Double Action *(p. 101)*, Momentary *(p. 102)*, and Start Long *(p. 105)*; by default, only Start Long is enabled. Note that Start Long does not apply to signals sent to the SIGNAL I/O connector.

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

Response

character

Example

```
TRIG:TEST:SOUR BUS
```

Insulation resistance test Settings

Test condition setting commands

Test conditions	Command	Default
Offset	CALC:SCAL:OFFS:AUTO	OFF
	CALC:IR:SCAL	OFF
	CALC:IR:SCAL:OFFS	0.1 GOHM
Measurement screen display during the test	DISP:IR:RES:PHOL	OFF
	DISP:VIEW [1]	NUM
	GRAP:IR:FORM [1]	VRT
	GRAP:IR:SCAL [1]	AUTO
	GRAP:IR:SCAL:RES [1]	AUTO
	GRAP:IR:SCAL:RES:MAX [1]	0.1 GOHM
	GRAP:IR:SCAL:RES:MIN [1]	0 OHM
	GRAP:IR:SCAL:VOLT [1]	FIX
Aperture time	SENS:IR:APER	100 MS
Digital filter	SENS:IR:FILT:DIG:STAT	OFF
Upper limit judgment	SENS:IR:JUDG:STAT	OFF
	SENS:IR:JUDG	0.1 GOHM
Lower limit judgment	SENS:IR:JUDG:LOW:STAT	ON
	SENS:IR:JUDG:LOW	0.01 GOHM
Judgment delay [2]	SENS:IR:JUDG:DEL	0.2 S
Short-circuit detection	SENS:IR:JUDG:SCD:STAT	OFF
Contact check	SENS:IR:TERM:CCH	OFF
dV judgment	SENS:IR:JUDG:DVOL:STAT [1]	OFF
	SENS:IR:JUDG:DVOL [1]	0.01 PCT
	SENS:IR:JUDG:DVOL:COUN [1]	1
Test voltage	IR:VOLT	0 V
Limit voltage	IR:VOLT:PROT	1025 V
Start voltage	IR:VOLT:STAR:STAT	OFF
	IR:VOLT:STAR	50 PCT
Voltage rise time	IR:VOLT:SWE:TIM:STAT	ON
	IR:VOLT:SWE:TIM	0.1 S
Test time	IR:VOLT:TIM:STAT	ON
	IR:VOLT:TIM	0.2 S

1. TOS7301 and TOS7301 WITH LAN only.
2. Applicable to the lower limit judgment and/or the dV judgment.

Setting test conditions

Initializing the Settings

Send the following command. The TOS73 series transitions to the remote mode, the settings are initialized, and the trigger subsystem transitions to the IDLE state *(p. 120)*. If the settings are not to be initialized, do not code anything after the semicolon.

```
SYST:COMM:RLST REM;*RST
```

Setting test conditions

Set the numeric values of the test conditions (example of setting the numeric parameters)

The following example sets the test conditions in the table below for insulation resistance tests:

Test conditions	Set value
Test voltage	500 V
Upper limit	0.1 GΩ
Test time	60 s
Voltage rise time	5 s
Other settings	Applies the default setting values *(p. 118)*

Sending the following commands will apply the above settings:

```
IR:VOLT 500
SENS:IR:JUDG 0.1GOHM
IR:VOLT:TIM 60
IR:VOLT:SWE:TIM 5
```

Set the test conditions on/off (example of setting the boolean parameters)

- To execute tests continuously until the STOP/RESET switch is pressed or ABOR is sent, send the following command to turn off test time. The test time set by IR:VOLT:TIM will not apply to tests with the time turned off.

  ```
  IR:VOLT:TIM:STAT OFF
  ```

  To apply the test time again, send the following command to turn it on.

  ```
  IR:VOLT:TIM:STAT ON
  ```

- The following test conditions are off by default:

  Start voltage, upper limit judgment, short-circuit detection, dV judgment (TOS7301 and TOS7301 WITH LAN only), contact check, peak value display, digital filter, offset

  To apply the above test conditions to the test, turn on each test condition before setting the parameters.
  As an example, to set the start voltage to 50%, send the following two commands:

  ```
  IR:VOLT:STAR:STAT ON
  IR:VOLT:STAR 30PCT
  ```

Select the set values of test conditions from the options (example of setting the character parameters)

For TOS7301 and TOS7301 WITH LAN, the measurement screen display format can be selected from numerical value display or graph display.

Numerical value display is applied by default. When changing the measurement screen display format, select either numerical value display or graph display. If you select graph display, set the Y-axis scale as desired.

For example, to change the measurement screen display format to a graph display and display the voltage, current, and resistance values on the Y-axis scale, send the following commands:

```
DISP:VIEW GRAP
GRAP:IR:FORM VIRT
```

Check the minimum/maximum setting values

To check the minimum/maximum setting values, send a query with MINimum or MAXimum Parameter.

```
IR:VOLT? MINimum
IR:VOLT? MAXimum
```

Trigger Subsystems

Types of trigger subsystems

Note that the term “trigger subsystem” in this manual has a different meaning from a subsystem as a group of commands under a common upper node.

The TOS73 series has two different trigger subsystems. The following describes each trigger subsystem.

ACQuire trigger subsystem

The trigger subsystem that controls measurements. *(p. 130)*

- This manual may refer to this trigger subsystem as the “ACQ trigger subsystem” or “ACQ”.
- The measurement data acquirable in measurement includes voltage value, current value, resistance value, and elapsed test time. *(p. 124)*
- A delay time can be set for the ACQ trigger subsystem. When the ACQ trigger subsystem starts the trigger action after a trigger applies to it, it starts the measurement after the delay time set by TRIG:ACQ:DEL.

TEST trigger subsystem

The trigger subsystem that controls tests. *(p. 121)*

- This manual may refer to this trigger subsystem as “TEST”.
- The TEST trigger subsystem does not have a delay time setting parameter. After a trigger is applied to a TEST trigger subsystem, it immediately starts the test once the trigger action begins.

States of trigger subsystems

Each trigger subsystem has three states: IDLE state, INITiated state, and WTG state.

IDLE state

Immediately after turning on the TOS73 series power supply, all trigger subsystems are in the IDLE state.

In this state, the trigger subsystems ignore all applied triggers. Therefore, the trigger subsystems do not normally execute the trigger actions by any panel operation or command transmission until they transition to the INITiated state.

If you send any of the following commands, the trigger subsystem is switched to the IDLE state, regardless of its current state.

- ABOR
- *RST
- *RCL
- IEEE 488.1 dcl (Device Clear) or IEEE 488.1 sdc (Selected Device Clear)

INITiated state

Each trigger subsystem in the IDLE state transitions to the INITiated state and starts the trigger sequence when the subsystem receives a command in the INIT subsystem *(p. 58)*.

In the INITiated state, the trigger action starts when the following conditions are met according to the currently set trigger source.

- IMMediate: The trigger action starts immediately without transitioning it to the WTG (Waiting for Trigger) state.
- BUS/EXT/ONCE: Transitions to the WTG state and waits for the application of the trigger corresponding to each trigger source.
- TST: A trigger source dedicated to the ACQ trigger subsystem. Starts trigger action of the ACQ trigger subsystem simultaneously with the start of trigger action of the TEST trigger subsystem (test start).

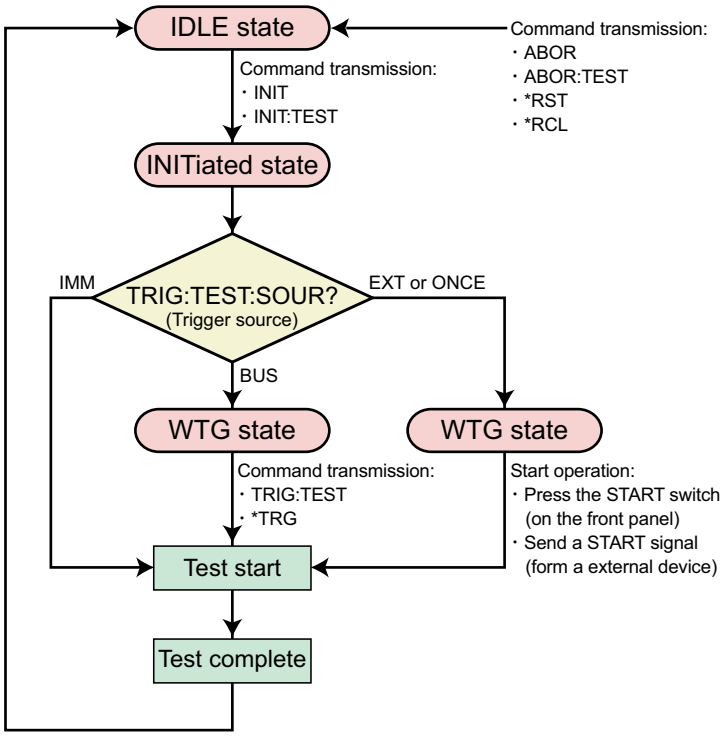
WTG (Waiting for Trigger) state

The WTG state is the state in which the trigger subsystem is waiting for a trigger to be applied. At this time, applying a trigger (software trigger or start operation) corresponding to the trigger source, the trigger subsystem starts the trigger action.

The exception is that a trigger subsystem that has its trigger source set to IMMediate does not have a WTG state.

Executing a Test

Use the TEST trigger subsystem to perform a test.
The following flowchart shows, for reference, the operation of the TEST trigger subsystem in a test.



Command transmission:
Means that one of the bulleted commands is sent.
For differences in specifications and operation of the selectable commands, see the individual descriptions for each command.

Start operation:
To perform one of the bulleted operations. *(p. 122)*

Starting a test

The commands described here are examples. There may be other commands not listed here that can perform similar operations or functions.
For procedures on setting test conditions for tests, see “Insulation resistance test Settings” *(p. 118)*.

Resetting the TEST trigger subsystem

- First, send the following command to transition the TEST trigger subsystem to the IDLE state *(p. 120)*.
  `ABOR:TEST`
- Proceed to one of the following procedures to set the trigger source according to your application, then start a test.
  “Starting a test immediately (Trigger Source: IMMediate)” *(p. 122)*
  “Starting a test by applying a software trigger (Trigger Source: BUS)” *(p. 122)*
  “Starting a test by a start operation on the product's main unit (Trigger Source: EXTernal or ONCE)” *(p. 122)*

Starting a test immediately (Trigger Source: IMMediate)

Sending the following commands starts the test immediately:

- Set the trigger source to IMM.
  ```
  TRIG:TEST:SOUR IMM
  ```
- Transitions the TEST trigger subsystem to the INITiated state *(p. 120)*.
  ```
  INIT:TEST
  ```
  The test starts immediately.

Starting a test by applying a software trigger (Trigger Source: BUS)

Sending the following commands allows you to start the test by applying a software trigger (described later):

- Set the trigger source to BUS.
  ```
  TRIG:TEST:SOUR BUS
  ```
- Transitions the TEST trigger subsystem to the INITiated state *(p. 120)*.
  ```
  INIT:TEST
  ```
  The TEST trigger subsystem with the trigger source set to BUS immediately transitions from the INITiated state to the WTG state *(p. 120)* and waits for the software trigger to be applied.
- Apply the software trigger.
  ```
  TRIG:TEST
  ```
  The test starts immediately.

Software trigger in the TEST trigger subsystem:

Applied by sending a command to control the start of the trigger action. To apply a software trigger to the TEST trigger subsystem of the TOS73 series, send one of the following commands:

- TRIG:TEST applies a software trigger only to the TEST trigger subsystem.
- *TRG and IEEE 488.1 GET (Group Execute Trigger) apply software triggers simultaneously to all trigger subsystems. Therefore, if the ACQuire trigger subsystem is also in the WTG state, the trigger action is executed simultaneously.

Starting a test by a start operation on the product's main unit (Trigger Source: EXTernal or ONCE)

Sending the following commands allows you to start the test by the start operation (described later) on the product's main unit.

For TOS73 series, the same trigger action is executed regardless of whether EXT or ONCE is selected as the trigger source.

- Set the trigger source to EXT or ONCE.
  ```
  TRIG:TEST:SOUR EXT
  ```
  The example below uses EXT.
- Transitions the TEST trigger subsystem to the INITiated state *(p. 120)*.
  ```
  INIT:TEST
  ```
  The TEST trigger subsystem set to EXT or ONCE immediately transitions from the INITiated state to the WTG state *(p. 120)* and then waits for a start operation on the product. When a start operation is performed in this case, the test starts immediately.

Start operation:

Also commonly called a hardware trigger. The start operation in the TEST trigger subsystem of the TOS73 series is one of the following operations:

- Press the START switch on the front panel.
- Send a START signal from an external device to the SIGNAL I/O connector

The start operation judgment criterion is based on the combination of settings for Double Action *(p. 101)*, Momentary *(p. 102)*, and Start Long *(p. 105)*; by default, only Start Long is enabled. Note that Start Long does not apply to signals sent to the SIGNAL I/O connector.

After the test completion

Once a test is completed, the TEST trigger subsystem returns to the IDLE state *(p. 120)* again.

Test interruption (transition to the IDLE state)

Sending the following command cancels the test, returning the TEST trigger subsystem to the IDLE state from any condition. For differences in the specifications and operation of each command, see the individual descriptions for each command.

ABOR or ABOR:TEST

Cancels the test but does not change settings such as test conditions.

***RST or *RCL**

Cancels the test and resets all applied settings, including the test conditions, to their default set values *(p. 41)*.

Querying Measured Values

In the TOS73 Series, the measured values and other items listed in the following table can be measured and queried:

Item	Header or parameter string	Unit of response
Measurement data [1]	n/a	n/a
Current value	CURRent	A
Elapsed test time [2]	ETIMe	S
Resistance value	RESistance	OHM
Voltage value	VOLTage	V

1. Based on the DATA:FORM-specified response format (types and listing order of returned items), one or more items can be queried at a time.
2. When the test state is RISE, the remaining voltage rise time (negative number of seconds) is displayed; when the test state is TEST, the elapsed time after the end of the voltage rise time is displayed.

The ACQuire trigger subsystem is used for Querying Measured Values. There are three querying methods.
(For details on the subsystems, also see “MEASure/READ/FETCh Command” *(p. 59)*.)

Simplified measurements (MEASure subsystem) *(p. 125)*

Clears all existing measurement data recorded in the data logger, then changes the settings of the TRIGger subsystem and SAMPle subsystem to the default settings. Thereafter, it performs measures for only one new measurement data point and returns the result.

Normal measurements (READ subsystem) *(p. 126)*

Clears all existing measurement data recorded in the data logger. Thereafter, it newly measures the number of data points specified by another command and returns only the latest point of measurement data from the results.

Unlike Simplified measurements (MEASure subsystem), it does not change the settings of other commands. This subsystem performs measurements based on the sampling count, trigger source, and other settings already specified in the SAMPle subsystem and TRIGger subsystem.

Advanced measurements (FETCh subsystem) *(p. 127)*

Returns only the latest point from the existing measurement data recorded in the data logger.

This subsystem performs neither measurement nor measurement data clearing, unlike Simplified measurements (MEASure subsystem) or Normal measurements (READ subsystem). It only queries measurement data without changing the settings of other commands.

Simplified measurements (MEASure subsystem)

To acquire an instantaneous measured value in a more simplified manner, use a MEAS subsystem query.

When the query of this subsystem is sent, it first clears all existing measurement data recorded in the data logger. Then, it changes the settings of the TRIG subsystem *(p. 114)* and SAMP subsystem *(p. 67)* to the preset values in the following table that are suitable for measurement. Thereafter, it performs measures for only one new measurement data point and returns the result.

Command	Preset value	Description
SAMP:COUN	1 [1]	Sampling count recorded per trigger action (sample count)
SAMP:TEST:ENAB	OFF [1]	Whether sampling is limited to during test execution
SAMP:TIM	0	Sampling interval
TRIG:ACQ:COUN	1	Number of trigger actions executed in one trigger sequence (trigger count)
TRIG:ACQ:DEL	0	Delay time before a trigger action starts
TRIG:ACQ:SOUR	IMM [1]	Conditions for starting a trigger action from the INITiated state (trigger source)

1. A set value that differs from the command default is applied.

List of queries

Items to query	Query to send (short form)	Unit of response
Measurement data (described later)	MEAS? *(p. 60)*	n/a
Current value	MEAS:CURR? *(p. 60)*	A
Elapsed test time [1]	MEAS:ETIM? *(p. 60)*	S
Resistance value	MEAS:RES? *(p. 61)*	OHM
Voltage value	MEAS:VOLT? *(p. 61)*	V

1. When the test state is RISE, the remaining voltage rise time (negative number of seconds) is displayed; when the test state is TEST, the elapsed time after the end of the voltage rise time is displayed.

Querying Measurement data (MEAS? query)

The MEAS? query can query one or more measurement data items at a time. The response format (types and listing order of returned items) can be specified by DATA:FORM.

This example uses the MEAS? query to query measurement data based on the following setting example:

Example:

Response format: “Current value”, “resistance value”, “elapsed test time”

Command examples:

- First, send the following command to transition the TOS73 series to the remote mode.
  ```
  SYST:COMM:RLST REM
  ```
- Specifies the response format.
  ```
  DATA:FORM CURR,RES,ETIM
  ```
- Queries the measurement data.
  ```
  MEAS?
  ```
  The returned response indicates, for the acquired measurement data, the items of the same types and order as specified by the response format.

NOTE

To maintain simultaneity between measured values, when querying two or more measured values, follow the procedure of “Advanced measurements (FETCh subsystem)” *(p. 127)*. Alternatively, specify the measured values to be queried with DATA:FORM before sending MEAS?.

Normal measurements (READ subsystem)

To acquire measured values with arbitrary measurement conditions, use a READ subsystem query.

When the query of this subsystem is sent, it first clears all existing measurement data recorded in the data logger. Then, it starts new measurement based on the settings applied to the TRIG subsystem *(p. 114)* and SAMP subsystem *(p. 67)*, and returns only the latest measurement data point.

It does not change the settings of other commands, unlike simplified measurements *(p. 125)*. The total number of measurement data points acquired by a READ subsystem query can be specified by the sampling count *(p. 67)* or trigger count *(p. 114)*.

For further details, see also “Multi-point Measurements with Trigger Count Specified” *(p. 130)*.

List of queries

Items to query	Query to send (short form)	Unit of response
Measurement data (described later)	READ? *(p. 60)*	n/a
Current value	READ:CURR? *(p. 60)*	A
Elapsed test time [1]	READ:ETIM? *(p. 60)*	S
Resistance value	READ:RES? *(p. 61)*	OHM
Voltage value	READ:VOLT? *(p. 61)*	V

1. When the test state is RISE, the remaining voltage rise time (negative number of seconds) is displayed; when the test state is TEST, the elapsed time after the end of the voltage rise time is displayed.

Querying Measurement data (READ? query)

The READ? query can query one or more measurement data items at a time. The response format (types and listing order of returned items) can be specified by DATA:FORM.

This example uses the READ? query to query measurement data based on the following setting example:

Example:

Sampling acquisition count: 10 times

Response format: “Voltage value”, “resistance value”, “elapsed test time”

Command examples:

- First, send the following command. The TOS73 Series transitions to the remote mode, and the settings are initialized.
  ```
  SYST:COMM:RLST REM;*RST
  ```
- Set the sampling acquisition count to 10 times.
  ```
  SAMP:COUN 10
  ```
- Specifies the response format.
  ```
  DATA:FORM VOLT,RES,ETIM
  ```
- Queries the measurement data.
  ```
  READ?
  ```
  If the trigger source remains at the default (TST), measurement starts simultaneously with the trigger action (test start) of the TEST trigger subsystem *(p. 132)*. If you set the trigger source to other than TST, set SAMP:TEST:ENAB to OFF so that samples can be taken even when a test is not in progress.

  When 10 samples have been acquired, the measurement ends and a response is returned. The returned response indicates, for only the latest measurement data point among the acquired samples, the items of the same types and order as specified by the response format.

NOTE

- To maintain simultaneity between measured values, when querying two or more measured values, follow the procedure of “Advanced measurements (FETCh subsystem)” *(p. 127)*. Alternatively, specify the measured values to be queried with DATA:FORM before sending READ?.
- Measurement conditions cannot be changed during measurement. To change measurement conditions, wait until the ongoing measurement is completed, or stop the measurement with ABOR:ACQ or a similar command.

Advanced measurements (FETCh subsystem)

To query an already acquired measured value(s) without affecting the existing measurement conditions or measurement data, send a FETC subsystem query.

When a query to this subsystem is sent, only the latest data point is returned from the existing measurement data recorded in the data logger.

Unlike simplified measurements *(p. 125)*, this subsystem does not change the settings of the TRIG subsystem *(p. 114)* and SAMP subsystem *(p. 67)*. Also, unlike normal measurements *(p. 126)* or simplified measurements, neither the measurement data in the data logger is cleared nor a new measurement is performed.

Only the measurement data recorded in the data logger is queried. Therefore, when querying measured values using a query to this subsystem, the measurement data must be recorded in the data logger after performing the measurement in advance.

NOTE

- If no measurement data exists in the data logger, sending a FETC subsystem query will result in an error.
- To query two or more measurement data points at a time from the data logger, use DATA:REM? *(p. 50)*. Note that, unlike FETC subsystem queries, when DATA:REM? is used to query measurement data, the measurement data returned as the response is sequentially cleared from the data logger.

List of queries

Items to query	Query to send (short form)	Unit of response
Measurement data (described later)	FETC? *(p. 60)*	n/a
Current value	FETC:CURR? *(p. 60)*	A
Elapsed test time [1]	FETC:ETIM? *(p. 60)*	S
Resistance value	FETC:RES? *(p. 61)*	OHM
Voltage value	FETC:VOLT? *(p. 61)*	V

1. When the test state is RISE, the remaining voltage rise time (negative number of seconds) is displayed; when the test state is TEST, the elapsed time after the end of the voltage rise time is displayed.

Querying Measurement data (FETC? query)

The FETC? query can query one or more items (measurement data) at a time. The response format (types and listing order of returned items) can be specified by DATA:FORM.

This example uses the FETC? query to query measurement data based on the following setting example:

Example:

Limit sampling to during testing: OFF

Trigger source: IMM

Trigger delay time: 10 seconds

Response format: “Elapsed test time”, “voltage value”, “current value”, “resistance value”

Command example (acquiring measurement data):

- Send the following command. The TOS73 series transitions to the remote mode, and the settings are initialized. If the settings are not to be initialized, do not code anything after the semicolon.

  ```
  SYST:COMM:RLST REM;*RST
  ```

- Send the following commands to change the settings of each command to the contents of “Example”.

  ```
  SAMP:TEST:ENAB OFF
  TRIG:ACQ:SOUR IMM
  TRIG:ACQ:DEL 10
  DATA:FORM ETIM,VOLT,CURR,RES
  ```

- Transitions the ACQ trigger subsystem to the INITiated state *(p. 120)*.

  ```
  INIT:ACQ
  ```

  If the trigger source of the ACQ trigger subsystem is IMM, measurement starts after the delay time (10 seconds in this example) has elapsed. The number of times of sampling remains at the default (INF), so you must send ABOR:ACQ at the desired time to end the measurement.

Command example (querying measurement data):

After the measurement is completed, query the measurement data.

```
FETC?
```

The returned response indicates, for the latest point of the acquired measurement data, the items of the same types and order as specified by the response format. If no measurement data exists in the data logger, an error will occur.

NOTE

- If a FETC subsystem query is sent during measurement, it may fail to acquire accurate measurement data.

  To confirm whether the measurement has been completed before querying measurement data, use the *OPC common command or *OPC? common query as follows. For details, see “Waiting for Operation Complete” *(p. 133)*.

  Reporting measurement completion to the OPC bit:

  ```
  INIT:ACQ;*OPC
  ```

  After sending this compound command, send *ESR?. If the response of *ESR? contains the “bit weight” of the OPC bit (i.e., 1), it can be judged that the measurement has been completed.

  Receiving measurement completion as a response:

  ```
  INIT:ACQ;*OPC?
  ```

  When “1” is returned as a response after sending this compound query, it can be judged that the measurement has been completed.

- The FETC subsystem query has no function to clear the measurement data from the data logger. To clear the measurement data, send *RST, *RCL, or INIT:ACQ.
  - *RST and *RCL can also be sent during measurement. If either is sent during measurement, the measurement is aborted before the measurement data is cleared from the data logger.
  - INIT:ACQ can be sent only when the ACQ trigger subsystem is in the IDLE state *(p. 120)*, that is, before measurement starts or after it completes.

Querying Test Results

Test results are automatically saved temporarily in the memory of the TOS73 series.

Up to 1000 of the latest test results are saved in memory, and are cleared by turning off the power of the TOS73 series. When the number of test results reaches 1000 in memory, the oldest test result is cleared each time a new test result is saved.

Test results can be saved to a USB memory in CSV format. For details, see the TOS73 Series User's Manual.

Specify the items to be queried

First, use RES:FORM to specify the response format (types and listing order of returned items) for querying the test results. For the specifiable items of test results, see RES:FORM *(p. 64)*.

The following example sets the response format below:

Example

Response format: "Test start date (day)", "test start date (month)", "test start date (year)", "voltage value", "resistance value", "judgment result"

Command examples

```
RES:FORM DAY,MONT,YEAR,VOLT,RES,JUDG
```

Query the test results

Next, query the test results. The two queries below are available querying:

RES?	Queries only the latest test result. The test result returned as a response is not cleared.
RES:REM?	Queries only the oldest test result. Test results returned as responses are cleared one after the other.

For the items of test results returned in the response, see RES? *(p. 62)*.

Response example

For example, if the applied response format is the same as the one set in "Specify the items to be queried" *(p. 129)*, the following response may be returned to the query.

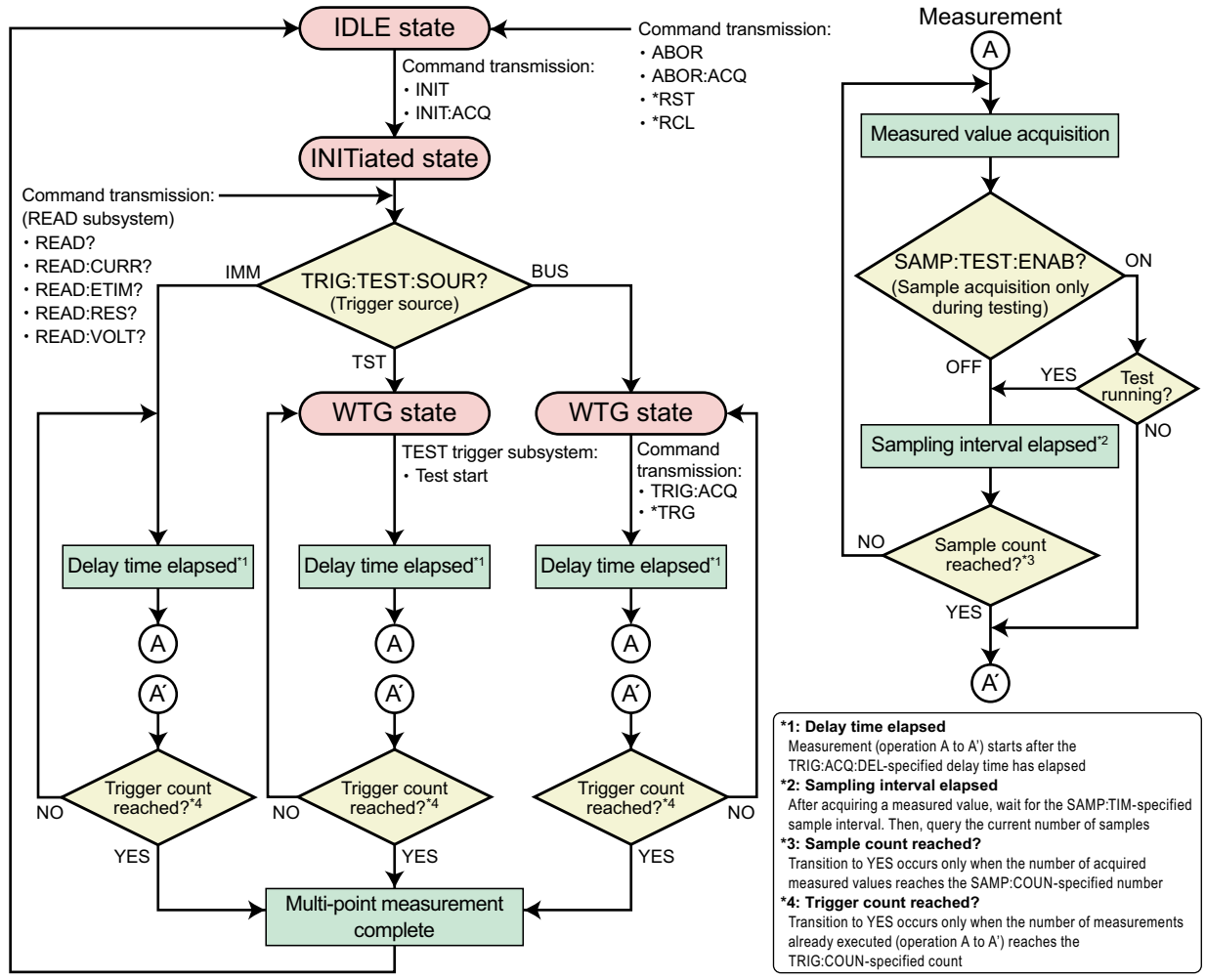
```
30,6,2026,+1.41421E+02,+3.14159E+07,PASS
```

This response indicates the following information about the test result.

- Test start date: June 30, 2026
- Voltage value at the time of judgment: 141.421 V
- Resistance value at the time of judgment: 31.4159 MΩ
- Judgment result: PASS judgment

Multi-point Measurements with Trigger Count Specified

The multi-point measurement available with remote control in the TOS73 series, can execute up to 8192 measurements per trigger sequence of the ACQuire trigger subsystem. The number of measurements to be executed in one trigger sequence can be specified by the trigger count (TRIG:ACQ:COUN); the number of measurement data points to be acquired in one measurement can be specified by the sampling count (SAMP:COUN).
The following flowchart shows, for reference, the operation of the ACQ trigger subsystem in multi-point measurement.



Command transmission:
Means that one of the bulleted commands is sent.
For differences in specifications and operation of the selectable commands, see the individual descriptions for each command.

NOTE

In the procedure examples in the following explanation, the start of multi-point measurement (transition to the INITiated state) is performed by sending a READ? query *(p. 126)* for simplification.

- When any query to the READ subsystem is sent, the ACQ trigger subsystem automatically transitions to the INITiated state without passing through the IDLE state; then, it starts measurement according to the trigger source and delay time settings.
- When the READ? query is sent, all measurements are completed before the measured value is returned for the measurement data of the latest acquired sample, with the same types and order as the RES:FORM-specified response format.

Symbols in the flowchart:
For details on processes and conditional branches, see the individual command descriptions in the footnotes and symbols within the chart.

Starting multi-point measurement

Measurement data becomes available once multi-point measurement is completed (p. 132). A multi-point measurement is complete when all measurements specified by the trigger count (A to A' operations in the flowchart) have been executed.

Initializing the Settings

- Send the following command. The TOS73 series transitions to the remote mode, the settings are initialized, and the trigger subsystem transitions to the IDLE state (p. 120). If the settings are not to be initialized, do not code anything after the semicolon.

  ```
  SYST:COMM:RLST REM;*RST
  ```

- Proceed with one of the following procedures to set the appropriate trigger source for your application. Then, start multi-point measurement.

  “Starting multi-point measurement immediately and continuously (Trigger Source: IMMediate)” (p. 131)

  “Starting multi-point measurement one at a time by applying software triggers (Trigger Source: BUS)” (p. 131)

  “Starting multi-point measurement one at a time in conjunction with test start (Trigger Source: TSTart)” (p. 132)

Starting multi-point measurement immediately and continuously (Trigger Source: IMMediate)

Sending the command shown here allows multi-point measurement to start immediately.

If the trigger source is set to IMM, the ACQ trigger subsystem does not transition to the WTG state (p. 120) during multi-point measurement. Measurements are executed continuously for the trigger count setting, and multi-point measurement proceeds automatically to completion.

- Set the trigger source to IMM and transition the ACQ trigger subsystem to the INITiated state (p. 120).

  ```
  TRIG:ACQ:SOUR IMM;:READ?
  ```

  After the command is sent and the TRIG:ACQ:DEL-specified delay time has elapsed, the first measurement starts.

- After the first measurement ends, the second measurement starts after the delay time has again elapsed. This sequence repeats continuously until the measurements for the trigger count setting are completed.

Starting multi-point measurement one at a time by applying software triggers (Trigger Source: BUS)

Sending the following commands allows the multi-point measurement to start one at a time by applying a software trigger (described later).

If the trigger source is set to BUS, the ACQ trigger subsystem transitions to the WTG state (p. 120) after each measurement during multi-point measurement. Until the measurements specified by the trigger count setting are completed, multi-point measurement must be controlled by applying software triggers.

- Set the trigger source to BUS and transition the ACQ trigger subsystem to the INITiated state (p. 120).

  ```
  TRIG:ACQ:SOUR BUS;:READ?
  ```

  The ACQ trigger subsystem immediately transitions from the INITiated state to the WTG state and waits for the software trigger to be applied.

- Apply the software trigger.

  ```
  TRIG:ACQ
  ```

  After the command is sent and the TRIG:ACQ:DEL-specified delay time has elapsed, the first measurement starts.

- Once the first measurement is completed, it transitions to the WTG state. Then, when the software trigger is applied again, the second measurement starts after the delay time has elapsed. After this, repeat applying software triggers until the count specified by the trigger count is completed, and control the multi-point measurement.

Software trigger in the ACQ trigger subsystem:

Applied by sending a command to control the start of the trigger action. To apply a software trigger to the ACQ trigger subsystem of the TOS73 series, send one of the following commands:

- TRIG:ACQ applies a software trigger only to the ACQ trigger subsystem.
- *TRG and IEEE 488.1 GET (Group Execute Trigger) apply software triggers simultaneously to all trigger subsystems. Therefore, if the TEST trigger subsystem is also in the WTG state, the trigger action is executed simultaneously.

Starting multi-point measurement one at a time in conjunction with test start (Trigger Source: TSTart)

By sending the command shown here, the trigger actions of the ACQ trigger subsystem and TEST trigger subsystem can be linked. That is, each time a test starts, a multi-point measurement can be started one at a time after the delay time elapses.

If the trigger source is set to TST, the ACQ trigger subsystem transitions to the WTG state *(p. 120)* after each measurement during multi-point measurement. Until the number of measurements specified by the trigger count is completed, multi-point measurements must be controlled by initiating trigger actions in the TEST trigger subsystem.

- Set the trigger source to TST and transition the ACQ trigger subsystem to the INITiated state *(p. 120)*.

  ```
  TRIG:ACQ:SOUR TST;:READ?
  ```

  After immediately transitioning from the INITiated state to the WTG state, the ACQ trigger subsystem waits for the start of the trigger action in the TEST trigger subsystem (test start).
- Start a test.

  The test starts by applying the trigger set by TRIG:TEST:SOUR to the TEST trigger subsystem. For details, see “Starting a test” *(p. 121)*.

  After the test starts, the first measurement begins after the TRIG:ACQ:DEL-specified delay time has elapsed.
- Once the first measurement ends, it transitions to the WTG state. Then, when the TEST trigger subsystem restarts its trigger action, the second measurement begins after the delay time has elapsed. After this, control the multi-point measurement by repeating the test start (applying triggers to the TEST trigger subsystem) until the measurements for the number of trigger count setting are completed.

Querying the results of multi-point measurement

Measurement data and test results acquired through multi-point measurement can be queried by sending a command or query listed in the table below. For further details, see “Advanced measurements (FETCh subsystem)” *(p. 127)* and “Querying Test Results” *(p. 129)*.

Target data	Related command	Command description
Measurement data	DATA:FORM *(p. 49)*	Sets the response format (types and listing order of returned items) to use when measurement data is queried.
	DATA:POIN? *(p. 49)*	Queries the number of measurement data recorded in the data logger.
	DATA:REM? *(p. 50)*	Queries multiple pieces of measurement data starting from the oldest data piece recorded in the data logger. Measurement data returned as responses are cleared one after the other.
	FETC subsystem query *(p. 59)*	Returns only the latest point from the existing measurement data recorded in the data logger.
Test result	RES? *(p. 62)*	Queries the previous test result. A query does not clear the test results.
	RES:FORM *(p. 64)*	Sets the response format (types and listing order of returned items) to use when test results are queried.
	RES:COUN? *(p. 65)*	Queries the number of test results saved in the TOS73 series.
	RES:REM? *(p. 66)*	Queries the oldest test result saved in the TOS73 series. Test results returned as responses are cleared one after the other.

Waiting for Operation Complete

The common command *OPC *(p. 37)* has a function to wait for operation completion.

- "Operation" used here specifically is a time-consuming operation initiated by sending a particular command.
- "Operation Complete" is the state in which no operations remain either in execution or standby.
- As the prerequisite information, the table below shows the "device states" defined by the IEEE 488.2 standard.

Section in IEEE 488.2 standard	Device state		Operation in the TOS73 series	
	Name	Abbre-viation	Description	Conditions for transitioning to the state
12.5.2.1.1	Operation Complete Command Idle State	OCIS	• Normal state (e.g., immediately after power-on) in which Waiting for Operation Complete is disabled. • When *OPC is sent, the state transitions to OCAS.	• At power on • *CLS or *RST was sent. • All operations in execution/ standby were completed in OCAS
12.5.2.1.2	Operation Complete Command Active State	OCAS	• State in which Waiting for Operation Complete is enabled. • Once all operations in execution/standby are completed, the OPC bit is set to true (1) before transition to OCIS.	The *OPC command was sent in OCIS
12.5.3.1.1	Operation Complete Query Idle State	OQIS	• Normal state (e.g., immediately after power-on) in which Waiting for Operation Complete is disabled. • When *OPC? is sent, the state transitions to OQAS.	• At power on • *CLS or *RST was sent. • All operations in execution/ standby were completed in OQAS
12.5.3.1.2	Operation Complete Query Active State	OQAS	• State in which Waiting for Operation Complete is enabled. • Once all operations in execution/standby are completed, "1" is set in the output queue before transition to OCIS.	The *OPC? query was sent in OQIS

Reporting Operation Complete to the OPC bit

- When *OPC (common command) is sent, the state of the TOS73 series transitions from OCIS to OCAS.

  If all operations started by other commands, including those which are in execution or standby, have been completed (or none of them exist), the state of the TOS73 series transitions back to OCIS again. At this time, the OPC bit (bit 0: Operation Complete) of the event status register (SESR) is set to true (1), and Operation Complete is reported to the status report structure *(p. 80)*. To check whether Operation Complete has been reported, send *ESR?. If the numeric value in the response is odd, it includes the "bit weight" of the OPC bit (i.e., 1), indicating that Operation Complete has been reported to the status report structure (OPC bit is true).
- An example of using *OPC is shown below. To generate an SRQ (Service Request) after measurement completion, send the following command:

  ```
  *ESE 1;*SRE 32;*CLS;INIT:ACQ;*OPC
  ```

  When the measurement is completed, the event status enable (ESE) register and service request enable (SRE) register generate an SRQ. The SRQ function is not available for remote control via RS232C interface.

Receiving Operation Complete as a response

- When an *OPC? (common query) is sent, the state of the TOS73 series transitions from OQIS to OQAS.

  If all operations started by other commands, including those which are in execution or standby, have been completed (or none of them exist), the state of the TOS73 series transitions back to OQIS again. At this time, "1" (NR1 format) is set in the output queue, and Operation Complete is reported to the controller as a response.

  Unlike when *OPC is sent as a command, Operation Complete is not reported to the OPC bit.
- An example of using *OPC? is shown below. To know measurement completion via response (1), send the following command:

  ```
  INIT:ACQ;*OPC?
  ```

Status Monitoring

In addition to the IEEE 488.2 standard registers, the TOS73 series includes the following mandatory standard SCPI registers:

- OPERation status register (STATus:OPERation)
- QUEStionable status register (STATus:QUEStionable)

For how to check errors and events, also see “Error Checking” *(p. 135)*.

Register basics

All SCPI status registers have a standard architecture *(p. 81)* 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 state indicators.
- ENABle, PTRansition and NTRansition are read-write registers working as event and summary filters.

STATus:OPERation

The OPERation status register *(p. 84)* is used to record events and notifications that occur during normal operations.

How to check the OPERation status register

The example below checks whether a measurement is in execution in the TOS73 series.
When the TOS73 series is measuring with the ACQuire trigger subsystem, the ACQ BUSY bit (bit 4: MEASuring) of the OPERation status register is set to true (1). Note that when the command described here is sent, all bits in the EVENt register of the OPERation status register are reset to false (0).

- In the EVENt register of the OPERation status register, query the bits that are set to true.
  `STAT:OPER?`
- Check the returned response. If the “bit weight” of the ACQ BUSY bit (i.e., 16) is included in the response, it indicates that the TOS73 series is measuring (ACQ BUSY bit is true) and this is reported to the status report structure *(p. 80)*.

In the OPERation status register of the TOS73 Series, individual bits can be specified directly to check their contents.

- To check the ACQ BUSY bit directly, specify ABUS for <bit-item> in the STAT:OPER:<bit-item>? query.
  `STAT:OPER:ABUS?`
- Check the returned response. A returned “1” indicates that the TOS73 series is measuring.

STATus:QUEStionable

The QUEStionable status register *(p. 93)* is used to record events and notifications that occur during abnormal operations.

How to check the QUEStionable status register

The example below checks whether the measured voltage values of the TOS73 series are in overrange.
If an overrange occurs in voltage measurement on the TOS73 Series, the OV bit (bit 0: Over Voltage) in the QUEStionable status register is set to true (1). Note that when the command described here is sent, all bits in the EVENt register of the QUEStionable status register are reset to false (0).

- In the EVENt register of the QUEStionable status register, query the bits that are set to true.
  `STAT:QUES?`
- Check the returned response. If the numeric value in the response is odd, it includes the “bit weight” of the OV bit (i.e., 1), indicating that overrange of the measured voltage (OV bit is true) has been reported to the status report structure *(p. 80)*.

Error Checking

Error/Event queue

The SCPI specifications define a standard error reporting scheme, “error/event queue”.
This queue is a FIFO (First-In, First-Out) queue that can record up to a total of 16 errors or events that occurred in the TOS73 series.

Querying error/event information

- The error/event queue information can be queried using the SYST:ERR? query.
  ```
  SYST:ERR?
  ```
- The response to this query includes a numeric part (error/event number) and a text part (error message) as shown below.
  ```
  -222,"Data out of range"
  ```
  For details on error/event information, see “List of Errors” *(p. 136)*.

Conditions for clearing error/event information

The error/event queue is cleared under any of the following conditions:

- The *CLS common command was sent
- The last item in the queue was read
- When turning on the power supply of the TOS73 series

When the error/event queue is empty, the SYST:ERR? query returns the following response.

```
0, “No error”
```

When Using Commands on a PLC (Sequencer, Controller)

When using with a PLC (sequencer, controller), note the following:

- At the end of the command, append a program terminator (ASCII 0x0A). *(p. 32)*
- Match the protocol to the sequencer settings.
- Return values vary in length. Because exponential (NR3) responses 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 a IEEE 488.2 syntax error has been detected by the instrument's parser. If an error occurs in this class, the CME bit (bit 5: Command Error) in the event status register (SESR) *(p. 83)* is set to true (1).

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. An invalid separator exists in the command string.
-104	Data type error	Data type error. The parser recognized a data element different than one allowed.
-105	GET not allowed	GET (Group Execute Trigger) is not allowed. A Group Execute Trigger was received in a program message.
-108	Parameter not allowed	Parameter is not allowed. More parameters were received than expected for the header.
-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. The header is inappropriate for TOS73 series.
-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 is inappropriate for the TOS73 series.
-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	The character data is invalid.
-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.
-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 error

An error in the range [-299, -200] indicates that an error has been detected by the instrument's execution control block. If an error occurs in this class, the EXE bit (bit 4: Execution Error) in the SESR *(p. 83)* is set to true (1).

Error code		Error message description
-200	Execution error (generic)	Execution error. A generic error of the TOS73 series.
-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 TOS73 series cannot execute in its present operating mode.
-222	Data out of range	Parameter was out of range.
-223	Too much data	Too many parameters were received.
-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 dependent error

An error in the range [-399, -300] indicates that an error other than command error, query error, or execution error was detected. If an error occurs in this class, the DDE bit (bit 3: Device Dependent Error) in the SESR *(p. 83)* is set to true (1).

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.
-314	Save/recall memory lost	Test condition file is lost. Damage to nonvolatile data saved by *SAV?.
-315	Configuration memory lost	Configuration data lost. Damage to nonvolatile panel settings.
-316	Calibration Memory error	Uncalibrated error.
-330	Self-test failed	An error occurred during the self-test.
-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.
-365	Time out error	Time out error.

Query error

An error 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 section 6 of IEEE 488.2 standard. If an error occurs in this class, the QYE bit (bit 2: Query Error) in the SESR *(p. 83)* is set to true (1).

Error code		Error message description
-400	Query error (generic)	Query error. A generic error of the TOS73 series.
-410	Query INTERRUPTED	Received a new command after the query was received and before the response was read.
-420	Query UNTERMINATED	If a non-supported query was received or if no query was received, the controller attempted to receive a response, this error is stored in the error/event queue together with -100, "COMMAND ERROR". 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	After a query that returned a variable response, another query was received in a semicolon-separated format. (e.g., for the compound command *IDN?;SYST:ERR?)

Operation Complete event error

An error in the range [-899, -800] is used when the TOS73 series wants to report a 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 operations that were in standby. *(p. 133)*

If an error occurs in this class, the OPC bit (bit 0: Operation Complete) in the SESR *(p. 83)* is set to true (1).

Error code		Error message description
-800	Operation complete	Operation complete.

A TOS73 series-specific error

If an error occurs in this class, the DDE bit (bit 3: Device Dependent Error) in the SESR *(p. 83)* is set to true (1).

Configuration conflict errors and configuration change rejection errors

These errors occur when the specified configuration changes cannot be permitted.

Error code	Error message description
+101 Setting conflicts due to PROTection state	Configuration is not possible because the protection function is active (PROTECTION mode).
+102 Setting conflicts while TEST is running	Configuration is not possible because a test is running.
+106 Setting conflicts due to invalid FUNCtion:MODE	Configuration is not possible because of the test mode.
+108 Wrong password given	The password is not correct.
+109 Illegal password format	The password format is not correct.
+112 Setting conflicts while MEASure is in progress	Configuration is not possible because measurement is in progress.
+113 Setting conflicts due to RISE state	Configuration is not possible because during a voltage rise time.

Out of range setting errors

Error code	Error message description
+201 Illegal buffers size due to not in 2^N	The buffer size is illegal.
+202 Same items is specified more than once	Duplicate setting.
+203 NONE is invalid in multiple item settings	NONE is invalid.
+204 IMMediate is invalid in multiple item settings	IMM is invalid.
+205 BUS is invalid in multiple item settings	BUS is invalid.

Command Processing Time

A certain amount of time is required before the commands shown in the following table are received by this product.

- The processing times indicated here are standard values. They are not guaranteed.
- The processing times vary depending on the setting condition, the test condition, and the measurement condition.
- The values shown below do not include hardware response times.

Command	Processing time (ms)		
	LAN (HiSLIP) [1]	USB	RS232C [2]
IR:VOLT 1KV	1.500	0.062	1.485
IR:VOLT:TIM 1S	1.800	0.062	1.718
SENS:IR:JUDG 5MOHM	0.016	0.062	1.641
MEAS:VOLT?	19.985	19.968	20.047
STAT:OPER:TEST:COND?	2.141	0.328	16.000

1. WITH LAN model only.
2. Measured at a bitrate of 115200 bps.

Legacy Commands

The TOS73 series supports legacy commands used in the TOS7200, TOS7200S, or TOS7210S. However, when creating new programs, use the commands specific to the TOS73 series.

- For details on legacy command settings and responses, refer to the manuals of TOS7200, TOS7200S, or TOS7210S.
- Although legacy commands have been verified for basic operation with the TOS73 series, their full functionality is not guaranteed.

Legacy commands	Commands for the corresponding TOS73 series	Description
RECall	*RCL	Recalls the panel settings saved in the setup memory. • All trigger subsystems stop operation and enter the IDLE state *(p. 120)*, and active protection functions are disabled. (If they cannot be disabled, they remain active.) • FAIL judgment is also cleared.
STORe	*SAV	Saves current panel settings to the setup memory.
WaitTIMe	SENS:IR:JUDG:DEL	For insulation resistance tests, sets the time before starting the lower limit judgment and/or dV judgment (judgment delay).
UPPer	SENS:IR:JUDG SENS:IR:JUDG:STAT	Sets the upper limit and enables or disables upper limit judgment.
LOWer	SENS:IR:JUDG:LOW SENS:IR:JUDG:LOW:STAT	Sets the lower limit and enables or disables lower limit judgment.
TEStv	IR:VOLT	For insulation resistance tests, sets the test voltage.
TIMer	IR:VOLT:TIM IR:VOLT:TIM:STAT	Sets the test time in seconds and enables or disables the test time.
CLR	STAT:PRES	Resets the writable sub-registers (ENABle register, PTRansition filter, and NTRansition filter) of all SCPI status registers (including TOS73 series specific registers) to their default settings.
BuzzerVOL	SYST:BEEP	Enables or disables all configurable beep sounds collectively. 0：Beep sounds enabled Other than 0: Beep sounds disabled
DoubleACtion	SYST:CONF:DACT:STAT	Enables or disables Double Action for the test start operation. When this command is enabled, the Start Long (SYST:CONF:SLPR:STAT) is disabled.
FailMODe	SYST:CONF:FMOD:STAT	Enables or disables the fail mode.
MOMentary	SYST:CONF:MOM:STAT	Enables or disables Momentary for the test start operation.
PassHOLd	SYST:CONF:PHOL	Sets the duration for displaying the PASS judgment result (Pass Hold) on the TOS73 series display.
FAIL?	n/a	Queries the result of FAIL judgment. 0: Other than FAIL 2: L-FAIL 4: U-FAIL 6: C-FAIL
MEMory	n/a	Saves the test conditions to the specified setup memory number. Or, queries the contents of the specified setup memory number.

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.

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