KIKUSUI

Part No. IB033874
Dec 2019

TELONIC
TEST INSTRUMENTS & POWER SUPPLIES
01189 786911 TELONIC.CO.UK

Communication Interface Manual

TOS93 Series Electrical Safety Analyzer

TOS9300
TOS9301
TOS9302
TOS9303
TOS9303LC

Contents

IEEE 488.2 common commands

*CLS
Clears all event registers including the status byte, event status, and error queue.

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

*ESR
Queries the event status register.

*IDN
Queries the model name and firmware version of the product.

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

*OPT
Queries the options that are installed in the product.

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

*RCL
Recalls memory content.

*RST
Resets the panel settings (see the table below).

*SAV
Saves the panel settings to the setup memory.

*SRE
Sets the service request enable register.

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

*TRG

Trigger command.

*TST

Executes a self-test.

*WAI

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

ABORt Command

ABOR

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

ABOR:ACQ

Aborts measurement operations.

ABOR:TEST

Stops the ongoing test. Clears the protection/ fail mode.

CALCulate Command

CALC:SCAL:OFFS:AUTO

Sets whether to automatically set the offset before testing.

CALC:ACW:SCAL

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

CALC:ACW:SCAL:OFFS

Sets the real part of the offset current in AC withstanding voltage tests.

CALC:ACW:SCAL:OFFS:IMAG

Sets the imaginary part of the offset current in AC withstanding voltage tests.

CALC:DCW:SCAL

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

CALC:DCW:SCAL:OFFS

Sets the offset current for DC withstanding voltage tests.

CALC:EC:SCAL

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

CALC:EC:SCAL:OFFS

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

CALC:EC:DC:SCAL

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

CALC:EC:DC:SCAL:OFFS

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

CALC:IR:SCAL

Sets whether to offset the resistance applied to the stray capacitance in insulation resistance tests.

CALC:IR:SCAL:OFFS

Sets the offset resistance for insulation resistance tests.

CALC:MET:SCAL

Sets whether to offset the current in meter mode.

CALC:MET:SCAL:OFFS

Sets the offset current for meter mode.

CALC:PAT:SCAL

Sets whether to offset the current in patient leakage current tests.

CALC:PAT:SCAL:OFFS

Sets the offset current for patient leakage current tests.

CALC:PAT:SCAL:CONV

Sets whether to convert the current with the specified voltage in patient leakage current tests.

CALC:PAT:SCAL:CONV:VOLT

Sets the conversion voltage for patient leakage current tests.

CALC:PCC:SCAL

Sets whether to offset the current in protective conductor current tests.

CALC:PCC:SCAL:OFFS

Sets the offset current for protective conductor current tests.

CALC:PCC:SCAL:CONV

Sets whether to convert the current with the specified voltage in protective conductor current tests.

CALC:PCC:SCAL:CONV:VOLT

Sets the conversion voltage for protective conductor current tests.

CALC:TC:SCAL

Sets whether to offset the current in touch current tests.

CALC:TC:SCAL:OFFS

Sets the offset current for touch current tests.

CALC:TC:SCAL:CONV

Sets whether to convert the current with the specified voltage in touch current tests.

CALC:TC:SCAL:CONV:VOLT

Sets the conversion voltage for touch current tests.

Display Command

DISP:ACW:CURR:PHOL

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

DISP:DCW:CURR:PHOL

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

DISP:EC:AC:CURR:PHOL

Displays the maximum resistance measurement from the start of the test in earth continuity tests (AC).

DISP:EC:DC:CURR:PHOL

Displays the maximum resistance measurement from the start of the test in earth continuity tests (DC).

DISP:IR:RES:PHOL

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

DISP:PAT:CURR:PHOL

Displays the maximum current measurement from the start of the test in patient leakage current tests.

DISP:PCC:CURR:PHOL

Displays the maximum current measurement from the start of the test in protective conductor current tests.

DISP:TC:CURR:PHOL

Displays the maximum current measurement from the start of the test in touch current tests.

HCOPy Command

HCOP:SDUM:DATA

Retrieves the screen capture of the present screen.

INITiate Command

INIT:ACQ

Starts a new measurement.

INIT:TEST

Starts the test trigger function.

MEASure/READ/FETCh Command

FETC/ READ/ MEAS

Queries the measurement data (current, real part of the current, imaginary part of the current, voltage, resistance, elapsed time).

FETC:CIM/ READ:CIM/ MEAS:CIM

Queries the imaginary part of the current .

FETC:CRE/ READ:CRE/ MEAS:CRE

Queries the real part of the current.

FETC:CURR/ READ:CURR/ MEAS:CURR

Queries the current.

FETC:ETIM/ READ:ETIM/ MEAS:ETIM

Queries the test time.

FETC:RES/ READ:RES/ MEAS:RES

Queries the resistance.

FETC:VOLT/ READ:VOLT/ MEAS:VOLT

Queries the voltage.

OUTPut Command

OUTP

Sets wheter to output the temporary voltage in leakage current (TC/PCC/Patient) tests.

OUTP:110P

Sets whether to output the voltage applied from the 110% terminal to the AC LINE IN inlet in meter tests.

OUTP:110P:POL

Sets the polarity of the voltage applied from the 110 % terminal in meter tests.

PROGram Command

PROG

Sets the program to be edited.

PROG:CRE

Creates a new program.

PROG:DEL

Deletes a program.

PROG:INT:TIM

Sets the step interval time.

PROG:FAIL:COUT

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

PROG:LIST

Queries stored programs.

PROG:REN

Changes the name of the selected program.

PROG:SAVE

Saves the selected program.

PROG:STEP<n>:<prog_item>

Sets the test condition indicated by <prog-item> to step n of the selected program.

PROG:STEPS:COUN

Sets the number of steps of the selected program.

RESult command

RES:FORM

Sets the response format to use when test results are queried.

RES

Queries the previous test result.

RES:COUN

Queries the number of test results stored in the product.

RES:REM

Queries the oldest test result.

ROUTe Command

ROUT:ACW:TERM

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

ROUT:ACW:TERM:CCH

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

ROUT:CAT

Queries the available scanner channels.

ROUT:DCW:TERM

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

ROUT:DCW:TERM:CCH

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

ROUT:IR:TERM

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

ROUT:IR:TERM:CCH

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

SENS:ACW Command

SENS:ACW:CURR:FILT:HPAS

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

SENS:ACW:CURR:FILT:LPAS

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

SENS:ACW:CURR:FILT:TYPE

Sets the filter type for AC withstanding voltage tests.

SENS:ACW:CURR:MODE

Sets the current measurement mode in AC withstanding voltage tests.

SENS:ACW:JUDG

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

SENS:ACW:JUDG:LOW

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

SENS:ACW:JUDG:LOW:STAT

Sets whether to judge with the lower limit in AC withstanding voltage tests.

SENS:ACW:TERM:GRO

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

SENS:ACW:VOLT:MODE

Sets the voltage measurement mode in AC withstanding voltage tests.

SENSe:DCW Command

SENS:DCW:CURR:FILT:HPAS

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

SENS:DCW:CURR:FILT:LPAS

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

SENS:DCW:CURR:FILT:TYPE

Sets the filter type for DC withstanding voltage tests.

SENS:DCW:JUDG

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

SENS:DCW:JUDG:DEL

Sets the delay time until starting upper limit judgment in DC withstanding voltage tests.

SENS:DCW:JUDG:DEL:AUTO

Sets whether to make the judgment delay automatic in DC withstanding voltage tests.

SENS:DCW:JUDG:LOW

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

SENS:DCW:JUDG:LOW:STAT

Sets whether to judge with the lower limit in DC withstanding voltage tests.

SENS:DCW:TERM:GRO

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

SENS:DCW:VOLT:MODE

Sets the voltage measurement mode in DC withstanding voltage tests.

SENSe:EC Command

SENS:EC:JUDG

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

SENS:EC:JUDG:STAT

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

SENS:EC:JUDG:LOW

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

SENS:EC:JUDG:LOW:STAT

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

SENS:EC:JUDG:TYPE

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

SENS:EC:JUDG:VOLT

Sets the reference voltage for upper limit judgment in earth continuity tests (AC).

SENS:EC:JUDG:VOLT:STAT

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

SENS:EC:JUDG:VOLT:LOW

Sets the reference voltage for lower limit judgment in earth continuity tests (AC).

SENS:EC:JUDG:VOLT:LOW:STAT

Sets whether to judge with the lower voltage limit in earth continuity tests (AC).

SENS:EC:TERM:CCH

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

SENS:EC:TERM:WIRE

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

SENS:EC:DC:JUDG

Sets the reference resistance for upper limit judgment in earth continuity tests (DC).

SENS:EC:DC:JUDG:STAT

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

SENS:EC:DC:JUDG:LOW

Sets the reference resistance for lower limit judgment in earth continuity tests (DC).

SENS:EC:DC:JUDG:LOW:STAT

Sets whether to judge with the lower resistance limit in earth continuity tests (DC).

SENS:EC:DC:JUDG:TYPE

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

SENS:EC:DC:JUDG:VOLT

Sets the reference voltage for upper limit judgment in earth continuity tests (DC).

SENS:EC:DC:JUDG:VOLT:STAT

Sets whether to judge with the upper voltage limit in earth continuity tests (DC).

SENS:EC:DC:JUDG:VOLT:LOW

Sets the reference voltage for lower limit judgment in earth continuity tests (DC).

SENS:EC:DC:JUDG:VOLT:LOW:STAT

Sets whether to judge with the lower voltage limit in earth continuity tests (DC).

SENS:EC:DC:TERM:CCH

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

SENS:EC:DC:TERM:WIRE

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

SENSe:IR Command

SENS:IR:CURR:FILT:LPAS:STAT

Enables or disables the low-pass filter for insulation resistance tests.

SENS:IR:JUDG

Sets the reference resistance for upper limit judgment in insulation resistance tests.

SENS:IR:JUDG:STAT

Sets whether to judge with the upper resistance limit in insulation resistance tests.

SENS:IR:JUDG:CURR

Sets the reference current for upper limit judgment in insulation resistance tests.

SENS:IR:JUDG:CURR:STAT

Sets whether to judge with the upper current limit in insulation resistance tests.

SENS:IR:JUDG:CURR:LOW

Sets the reference current for lower limit judgment in insulation resistance tests.

SENS:IR:JUDG:CURR:LOW:STAT

Sets whether to judge with the lower current limit in insulation resistance tests.

SENS:IR:JUDG:DEL

Sets the time until starting upper limit judgment.

SENS:IR:JUDG:DEL:AUTO

Sets whether to make the judgment delay automatic.

SENS:IR:JUDG:LOW

Sets the reference resistance for lower limit judgment in insulation resistance tests.

SENS:IR:JUDG:LOW:STAT

Sets whether to judge with the lower resistance limit in insulation resistance tests.

SENS:IR:JUDG:TYPE

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

SENS:IR:TERM:GRO

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

SENSe:MET Command

SENS:MET:CURR:MODE

Sets the current measurement mode in meter mode.

SENS:MET:NETW

Sets the measurement circuit network to use in meter mode.

SENS:MET:RANG

Sets the meter mode measurement range.

SENS:MET:RANG:AUTO

Sets whether to set the meter mode measurement range to auto.

SENS:MET:SELV

Sets the SELV voltage of meter mode.

SENS:MET:SELV:STAT

Sets whether the SELV voltage is used.

SENS:MET:TERM

Sets the touch mode of meter mode.

SENSe:PAT Command

SENS:PAT:BAND

Sets whether to expand the band of the internal voltmeter of this product in patient leakage current tests.

SENS:PAT:COND

Sets the single fault condition for patient leakage current tests.

SENS:PAT:COND:FAUL

Sets the disconnected condition at fault for patient leakage current tests.

SENS:PAT:CURR:MODE

Sets the current measurement mode in patient leakage current tests.

SENS:PAT:JUDG

Sets the reference current for upper limit judgment in patient leakage current tests.

SENS:PAT:JUDG:STAT

Sets whether to judge with the upper current limit in patient leakage current tests.

SENS:PAT:JUDG:DEL
Set the time until starting judgments in patient leakage current tests.

SENS:PAT:JUDG:DEL:STAT
Sets whether to set the judgment delay in patient leakage current tests.

SENS:PAT:JUDG:LOW
Sets the reference current for lower limit judgment in patient leakage current tests.

SENS:PAT:JUDG:LOW:STAT
Sets whether to judge with the lower current limit in patient leakage current tests.

SENS:PAT:NETW
Sets the measurement circuit network that is compatible with the patient leakage current test standard.

SENS:PAT:NETW:PROB
Sets the B terminal probe connection destination for patient leakage current tests.

SENS:PAT:PROB:A
Queries the A terminal probe connection destination in patient leakage current tests.

SENS:PAT:RANG:AUTO
Sets the measurement range for patient leakage current tests.

SENS:PAT:TIM
Sets the test time for patient leakage current tests.

SENS:PAT:TIM:STAT
Sets whether to set the test time in patient leakage current tests.

SENSe:PCC Command

SENS:PCC:BAND
Sets whether to expand the band of the internal voltmeter of this product in protective conductor current tests.

SENS:PCC:COND
Sets the single fault mode for protective conductor current tests.

SENS:PCC:COND:FAUL
Queries the disconnected condition at fault for protective conductor current tests.

SENS:PCC:CURR:MODE

Sets the current measurement mode in protective conductor current tests.

SENS:PCC:JUDG

Sets the reference current for upper limit judgment in protective conductor current tests.

SENS:PCC:JUDG:STAT

Sets whether to judge with the upper current limit in protective conductor current tests.

SENS:PCC:JUDG:DEL

Sets the time until starting judgments in protective conductor current tests.

SENS:PCC:JUDG:DEL:STAT

Sets whether to set the judgment delay in protective conductor current tests.

SENS:PCC:JUDG:LOW

Sets the reference current for lower limit judgment in protective conductor current tests.

SENS:PCC:JUDG:LOW:STAT

Sets whether to judge with the lower current limit in protective conductor current tests.

SENS:PCC:NETW

Sets the measurement circuit network to use in protective conductor current tests.

SENS:PCC:RANG:AUTO

Sets the measurement range for protective conductor current tests.

SENS:PCC:TIM

Sets the test time for protective conductor current tests.

SENS:PCC:TIM:STAT

Sets whether to set the test time in protective conductor current tests.

SENSe:TC Command

SENS:TC:BAND

Sets whether to expand the band of the internal voltmeter of this product in touch current tests.

SENS:TC:COND

Sets the single fault condition for touch current tests.

SENS:TC:COND:FAUL

Sets the disconnected condition at fault for touch current tests.

SENS:TC:CURR:MODE

Sets the current measurement mode in touch current tests.

SENS:TC:JUDG

Sets the reference current for upper limit judgment in touch current tests.

SENS:TC:JUDG:STAT

Sets whether to judge with the upper current limit in touch current tests.

SENS:TC:JUDG:DEL

Set the time until starting judgments in touch current tests.

SENS:TC:JUDG:DEL:STAT

Sets whether to set the judgment delay in touch current tests.

SENS:TC:JUDG:LOW

Sets the reference current for lower limit judgment in touch current tests.

SENS:TC:JUDG:LOW:STAT

Sets whether to judge with the lower current limit in touch current tests.

SENS:TC:NETW

Sets the measurement circuit network to use in touch current tests.

SENS:TC:NETW:PROB

Sets the B terminal probe connection destination for touch current tests.

SENS:TC:NETW:PROB:A

Queries the A terminal probe connection destination in touch current tests.

SENS:TC:RANG:AUTO

Sets the measurement range for touch current tests.

SENS:TC:TIM

Sets the test time for touch current tests.

SENS:TC:TIM:STAT

Sets whether to set the test time in touch current tests.

[SOURce:] command

FUNC

Set the test mode.

[SOURce:]ACW Command

ACW:VOLT

Sets the test voltage for AC withstanding voltage tests.

ACW:VOLT:FREQ

Sets the test voltage frequency for AC withstanding voltage tests.

ACW:VOLT:PROT

Sets the limit voltage for AC withstanding voltage tests.

ACW:VOLT:STAR

Sets the start voltage as a percentage for AC withstanding voltage tests.

ACW:VOLT:STAR:STAT

Sets whether to set the start voltage for AC withstanding voltage tests.

ACW:VOLT:SWE:FALL:TIM

Sets the voltage fall time for AC withstanding voltage tests.

ACW:VOLT:SWE:FALL:TIM:STAT

Sets whether to set the voltage fall time for AC withstanding voltage tests.

ACW:VOLT:SWE:TIM

Sets the voltage rise time for AC withstanding voltage tests.

ACW:VOLT:TIM

Sets the test time for AC withstanding voltage tests.

ACW:VOLT:TIM:STAT

Sets whether to set the test time for AC withstanding voltage tests.

[SOURce:]DCW Command

DCW:VOLT

Sets the test voltage for DC withstanding voltage tests.

DCW:VOLT:DISC:INT:STAT

Sets whether to discharge when interlock is activated in DC withstanding voltage tests.

DCW:VOLT:DISC:TIM

Sets the discharge time for DC withstanding voltage tests.

DCW:VOLT:PROT

Sets the limit voltage for DC withstanding voltage tests.

DCW:VOLT:STAR

Sets the start voltage as a percentage for DC withstanding voltage tests.

DCW:VOLT:STAR:STAT

Sets whether to set the start voltage for DC withstanding voltage tests.

DCW:VOLT:SWE:FALL:TIM

Sets the voltage fall time for DC withstanding voltage tests.

DCW:VOLT:SWE:FALL:TIM:STAT

Sets whether to set the voltage fall time for DC withstanding voltage tests.

DCW:VOLT:SWE:TIM

Sets the voltage rise time for DC withstanding voltage tests.

DCW:VOLT:TIM

Sets the test time for DC withstanding voltage tests.

DCW:VOLT:TIM:STAT

Sets whether to set the test time for DC withstanding voltage tests.

[SOURce:]EC Command

EC:AC:CURR

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

EC:AC:CURR:PROT

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

EC:AC:CURR:SWE:FALL:TIM

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

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

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

EC:AC:CURR:SWE:TIM

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

EC:AC:CURR:TIM

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

EC:AC:CURR:TIM:STAT

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

EC:CURR:FREQ

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

EC:DC:CURR

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

EC:DC:CURR:PROT

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

EC:DC:CURR:SWE:FALL:TIM

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

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

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

EC:DC:CURR:SWE:TIM

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

EC:DC:CURR:TIM

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

EC:DC:CURR:TIM:STAT

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

[SOURce:]IR command

IR:TERM:POL

Queries the polarity of the power supplied to the output terminals in insulation resistance tests.

IR:VOLT

Sets the test voltage for insulation resistance tests.

IR:VOLT:DISC:INT:STAT

Sets whether to discharge when interlock is activated in insulation resistance tests.

IR:VOLT:DISC:TIM

Sets the discharge time for insulation resistance tests.

IR:VOLT:PROT

Sets the limit voltage for insulation resistance tests.

IR:VOLT:RANG

Sets the output voltage range for insulation resistance tests.

IR:VOLT:STAR

Sets the start voltage as a percentage for insulation resistance tests.

IR:VOLT:STAR:STAT

Sets whether to set the start voltage for insulation resistance tests.

IR:VOLT:SWE:TIM

Sets the voltage rise time for insulation resistance tests.

IR:VOLT:TIM

Sets the test time for insulation resistance tests.

IR:VOLT:TIM:STAT

Sets whether to set the test time for insulation resistance tests.

[SOURce:]PATient Command

PAT:110P:OUTP

Sets whether to apply the voltage applied from the 110% terminal to the AC LINE IN inlet in patient leakage current tests.

PAT:110P:POL

Sets the polarity of the voltage applied from the 110% terminal in patient leakage current tests.

PAT:POL

Sets the polarity of the power supply line supplied to the EUT for patient leakage current tests.

[SOURce:]PCC Command

PCC:POL

Sets the polarity of the power supply line for protective conductor current tests.

[SOURce:]TC Command

TC:110P:OUTP

Sets whether to apply the voltage applied from the 110% terminal to the AC LINE IN inlet in touch current tests.

TC:110P:POL

Sets the polarity of the voltage applied from the 110% terminal in touch current tests.

TC:POL

Sets the polarity of the power supply line supplied to the EUT for touch current tests.

STATus Command

STAT:OPER

Queries the event of the OPERation status register.

STAT:OPER:COND

Queries the condition of the OPERation status register.

STAT:OPER:ENAB

Sets the enable register of the OPERation status register.

STAT:OPER:NTR

Sets the negative transition filter of the OPERation status register.

STAT:OPER:PTR

Sets the positive transition filter of the OPERation status register.

STAT:OPER:PROT

Queries the event of the OPERation:PROTecting status register.

STAT:OPER:PROT:COND

Queries the condition of the OPERation:PROTecting status register.

STAT:OPER:PROT:ENAB

Sets the enable register of the OPERation:PROTecting status register.

STAT:OPER:PROT:NTR

Sets the negative transition filter of the OPERation:PROTecting status register.

STAT:OPER:PROT:PTR

Sets the positive transition filter of the OPERation:PROTecting status register.

STAT:OPER:TEST

Queries the event of the OPERation:TESTing status register.

STAT:OPER:TEST:COND

Queries the condition of the OPERation:TESTing status register.

STAT:OPER:TEST:ENAB

Sets the enable register of the OPERation:TESTing status register.

STAT:OPER:TEST:NTR

Sets the negative transition filter of the OPERation:TESTing status register.

STAT:OPER:TEST:PTR

Sets the positive transition filter of the OPERation:TESTing status register.

STAT:QUES

Queries the event of the QUEStionable status register.

STAT:QUES:COND

Queries the condition of the QUEStionable status register.

STAT:QUES:ENAB

Sets the enable register of the QUEStionable status register.

STAT:QUES:NTR

Sets the negative transition filter of the QUEStionable status register.

STAT:QUES:PTR

Sets the positive transition filter of the QUEStionable status register.

STAT:PRES

Resets the ENABle, PTRansition, and NTRansition filter registers of all status registers (including sub registers) to their default values.

SYSTem Command

SYST:BEEP

Turns all buzzers on and off.

SYST:BEEP:KEY

Turns on or off the buzzer that sounds when an invalid key is pressed.

SYST:BEEP:PROT

Turns on or off the buzzer that sounds when a protection function is activated.

SYST:BEEP:SCPI

Turns on or off the buzzer that sounds when an SCPI error occurs.

SYST:COMM:PROT:WDOG

Enables or disables the communication monitoring (WATCHDOG) timer.

SYST:COMM:PROT:WDOG:DEL

Sets the delay time of the communication monitoring (WATCHDOG) timer.

SYST:COMM:RLST

Switches the TOS93 to local or remote mode.

SYST:DATE

Sets the date.

SYST:ERR

Reads the oldest error information or event information from the error queue.

SYST:ERR:COUN

Returns the number of unread errors in the error queue.

SYST:KLOC

Sets or releases panel control lock.

SYST:KLOC:LEV

Sets the panel control lock level.

SYST:PASS

Enables a password-protected command.

SYST:PASS:CDIS

Disables the password-protected command.

SYST:PASS:NEW

Sets the password.

SYST:PASS:STAT

Queries the enabled/disabled state of the password-protected command.

SYST:LOC/ SYST:REM/ SYST:RWL

This is an old style command.

SYST:SEC:IMM

Sanitizes all contents stored in memory and initializes the panel settings to their factory default conditions.

SYST:SSAV

Enables or disables the screen saver.

SYST:SSAV:DEL

Sets the time until the screen saver starts.

SYST:TIME

Sets the time.

SYST:TIME:ADJ

Automatically synchronizes the system clock using the NTP server on the network.

SYST:TZON

Sets the time zone of the system clock.

SYST:TZON:CAT

Queries the time zone IDs that can be used.

SYST:VERS

Queries the version of the SCPI specifications that the product complies with.

SYSTem:CONFigure Command

SYST:CONF:BEEP:VOL

Sets the volume level of the buzzer that is sounded when a FAIL judgment occurs.

SYST:CONF:BEEP:VOL:PASS

Sets the volume level of the buzzer that is sounded when a PASS judgment occurs.

SYST:CONF:CAL:DUE:CONT

Sets the calibration period.

SYST:CONF:CAL:PROT:STAT

Sets whether to activate the protection function and switch to protection mode when the calibration period is expired.

SYST:CONF:DACT:STAT

Enables or disables the double action function.

SYST:CONF:FMOD:STAT

Enables or disables the fail mode.

SYST:CONF:MOM:STAT

Enables/disables momentary.

SYST:CONF:PHOL

Sets the length of time that a PASS judgment result will be held.

SYST:CONF:PON:STAT

Sets the condition panel setting state when the POWER switch is turned on.

SYST:CONF:SIO:JUDG:STAT

Turns on or off the judgment result output at STEP END of the SIGNAL I/O connector.

SYST:CONF:SLPR:STAT

Enables/disables the start long function.

SYST:CONF:SOUT:FAIL:LOW:STAT

Sets whether to output a signal from the STATUS OUT connector during “L-FAIL.”

SYST:CONF:SOUT:FAIL:UPP:STAT

Sets whether to output a signal from the STATUS OUT connector during “U-FAIL.”

SYST:CONF:SOUT:HVON:STAT

Sets whether to output a signal from the STATUS OUT connector while voltage is residing or while a test is in progress.

SYST:CONF:SOUT:PASS:STAT

Sets whether to output a signal from the STATUS OUT connector during “PASS.”

SYST:CONF:SOUT:PON:STAT

Sets whether to output a signal from the STATUS OUT connector while the POWER switch is turned on.

SYST:CONF:SOUT:PROT:STAT

Sets whether to output a signal from the STATUS OUT connector during protection mode.

SYST:CONF:SOUT:READ:STAT

Sets whether to output a signal from the STATUS OUT connector during “READY.”

SYST:CONF:SOUT:TEST:STAT

Sets whether to output a signal from the STATUS OUT connector while the test voltage is at the set value.

TRIGger Command

TRIG:TEST

Executes a software trigger on the TEST trigger subsystem.

TRIG:TEST:SOUR

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

Introduction

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

- RS232C interface
- USB interface
- LAN interface

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

For the safety precautions, installation, operation, and specifications of the product, read the accompanying TOS9300 Series User's Manual.

■ Reading environment

This manual is in PDF format. The following environments are recommended for reading this manual.

PDF Reader: Adobe Reader

■ 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 product before you use them.

Structure of the manual

This manual consists of the following sections.

- Overview
- Setup
- Message Overview
- Commands
- Tutorial
- Appendix

Trademarks

Microsoft Windows is a trademark of Microsoft Corporation in the United States and/or other countries.

All other company and product names used in this guide are trademarks or registered trademarks of their respective owners.

Firmware version of the product to which this manual applies

This manual applies to products with firmware versions 1.1x.

Measuring instrument interface standards

This product complies with the following standards.

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

Copyright

Installing the VISA Library

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

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

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

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

—Note—

- Depending on the interface, you may not be able to use your VISA library if it is an older version than that specified.
- Do not install multiple VISA libraries on the same PC. Doing so may cause errors.

Setting Up the Interface

The product is standard equipped with RS232C, USB, and LAN interfaces.

There is no need to switch interfaces. All interfaces can be used simultaneously. Each interface can be turned off using CONFIG settings.

RS232C

USB

LAN

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

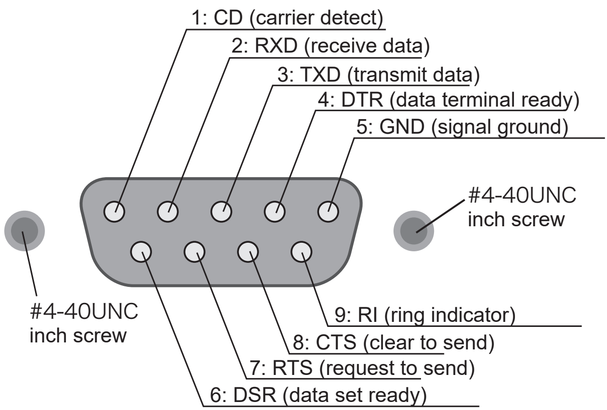
RS232C

RS232C connection

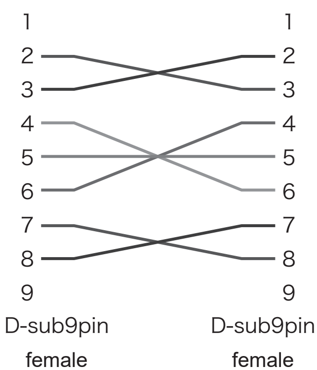
The RS232C port on the product side is D-sub 9-pin. Check that the product and your PC are off, and then connect them.

For the RS232C cable, use a D-sub, 9-pin, female-to-female AT crossover cable.

The following figure shows the connector pinout when you are facing the rear panel.



Viewing the front panel



Crossover cable example 1

Protocol

The RS232C protocol is shown in the following table.

The underlined value is the factory default value.

Parameter	Value
Baudrate: Baud rate	9 600 bps/ 19 200 bps/ 38 400 bps/ 57 600 bps/ 115 200 bps
Data: Data length	8 bit (fixed)
Stop: Stop bits	1 bit (fixed)
Parity: Parity	None (fixed)
Flow Ctrl: Flow control	CTS/RTS, none

RS232C settings

For details, see the user's manual.

1. **Press SYSTEM > Interface.**

2. **Press Modify, and use the rotary knob to select the parameter you want to change.**

3. **Press Edit, and then use the numeric keypad or the rotary knob to select the appropriate value.**
   Press ENTER to continue setting other parameters.

4. **Press Apply.**
   A confirmation screen appears.

5. **Press ENTER.**
   To cancel, use the rotary knob to select NO, and then press ENTER.

Break signal

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

—Note—

To use the RS232C interface, a "SYST:COMM:RLST REM" command must be sent to set the product to remote mode. To use remote programming, send "SYST:COMM:RLST REM" at the beginning of the program.

USB

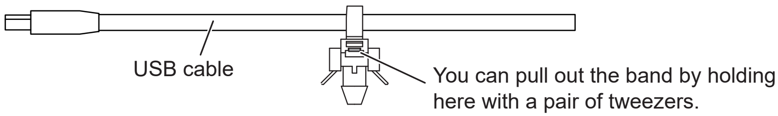
To use the USB interface to control the product, a device driver that supports the USB Test & Measurement class (USBTMC) must be installed on the controller. The USBTMC driver is installed automatically by the VISA library.

■ USB connection

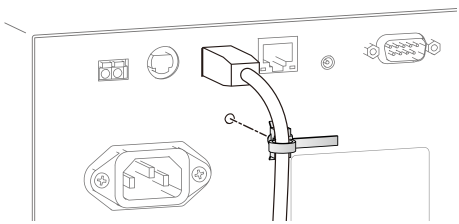
Connect the product to a PC using a USB cable. To prevent the USB cable from coming loose unexpectedly, fix the cable to the product using a cable tie.

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

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



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



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

■ Service request

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

■ USB function

Complies with USB specification 2.0

Complies with USBTMC specification 1.0 and USBTMC-USB488 specification 1.0

Baud rate: 480 Mbps maximum (high speed)

VID (vendor ID)

0x0B3E

PID (product ID)

0x104F

LAN

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

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

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

If you are using a host name (a Bonjour host name), you have to install Apple Bonjour.

■ LAN connection

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

LAN settings

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

To set the IP address manually, set IP Address Method to Static, and then set the IP address.

For details, see the user’s manual.

1. **Press SYSTEM > Interface.**

2. **Press Modify, and use the rotary knob to select the parameter you want to change.**

3. **Press Edit, and then use the numeric keypad or the rotary knob to select the appropriate value.**
   Press ENTER to continue setting other parameters.

4. **Press Apply.**
   A confirmation screen appears.

5. **Press ENTER.**
   The LAN interface restarts, and the settings are applied. To cancel, use the rotary knob to select NO, and then press ENTER.

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.

—Note—

To use the LAN interface, a “SYST:COMM:RLST REM” command must be sent to set the product to remote mode. To use remote programming, send “SYST:COMM:RLST REM” at the beginning of the program.

Service request

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

■ LAN function

Complies with LXI 1.5 Core 2016

Complies with the SCPI-Telnet, VXI-11, HiSLIP, and SCPI-RAW protocols

Baud rate: 100 Mbps maximum (auto negotiation)

AUTO MDIX

From your Web browser, you can:

Instrument information, network information, display of VISA resource information, checking the connected TOS9300, remote control from browser, changing network settings, license information, password setting

■ Restarting the LAN interface

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

1 **Press SYSTEM > Interface.**

2 **Press Modify.**

3 **Press Apply.**

A confirmation screen appears.

4 **Press ENTER.**

The LAN interface restarts.

Resetting or Initializing the LAN interface

You can use the SYSTEM settings to reset or initialize the LAN settings.

When reset or initialized, network settings are changed as follows.

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

Reset	default values, reset-ting to	Parameter	Default value
X	X	IP Address Assignment	Auto
	X	DNS Server Assignment	0.0.0.0
	X	WINS Server Assignment	0.0.0.0
	X	Desired Hostname	Model name and serial number
	X	Desired Description	KIKUSUI XXXX Electrical Safety Analyzer (XXXX is the model name) and serial num-ber
X	X	Enable Dynamic DNS	Enable
X	X	Enable mDNS	Enable
X	X	Enable NetBIOS Over TCP/IP	Enable
X	X	Password for the Web browser inter-face	Not set

Resetting

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

Returning to factory default settings (Initializing)

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

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

You can configure the LAN interface settings from your PC’s Web browser. Use the latest browser version.

The website URL is the IP address with http:// added in front of it.

Use SYSTEM settings to check the IP address, and enter the URL directly in the browser’s address bar.

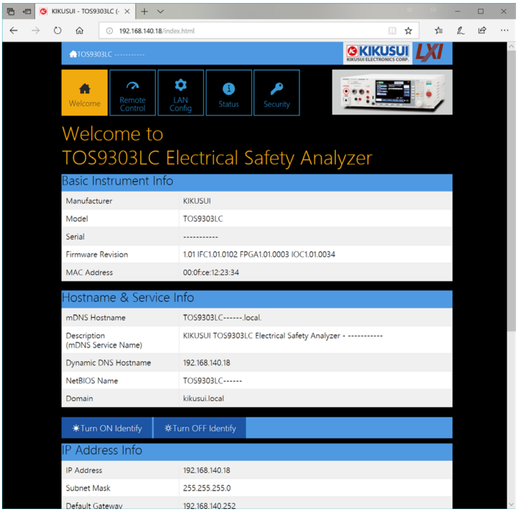
If a VISA library is in use, a function for searching the VXI-11 measurement instrument with the application supplied by the vendor (National Instruments NI-MAX, Keysight Connection Expert, Kikusui KI-VISA Instrument Explorer, or the like) is available. You can open the Web browser interface by simply searching for the instrument and clicking the Web link that appears in the search result.

Example: When the IP address is 169.254.7.8
http://169.254.7.8

■ WELCOME page

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

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



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

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

Remote Control page

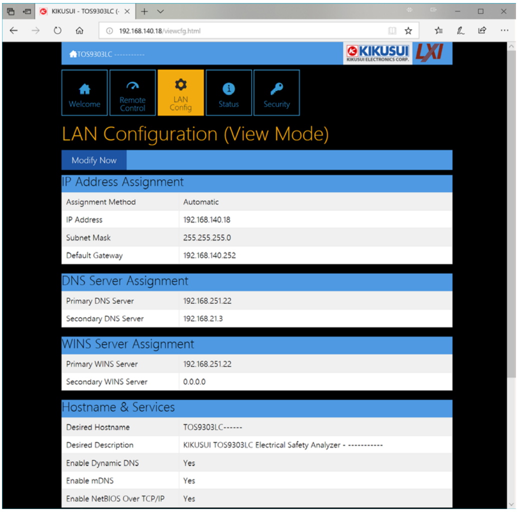
You can remotely control the TOS93 from a browser. The various buttons have the same functions as those on the front panel of the TOS93.

If you control the TOS93 from the Remote Control page, display updating slows down, but this does not affect the actual operation.

If you turn off the TOS93 while the Remote Control page is displayed, the settings will not be saved. To save the settings, close the browser, and then turn off the power.

LAN Configuration page

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



Navigation (View Mode)

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

Navigation (Modify Mode)

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

Apply: Applies the edited contents.

Reset: Resets the network settings.

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

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

IP Address Assignment

You can set the IP address. You can choose between automatic assignment and assignment of a fixed address.

In the case of automatic assignment of IP address, we recommend using the DHCP server function using a router as far as possible.

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

DNS Server Assignment

Sets the address of the DNS server.

WINS Server Assignment

Sets the address of the WINS server.

Hostname & Services

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

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

TCP Ports (View Mode)

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

Reset and factory default settings

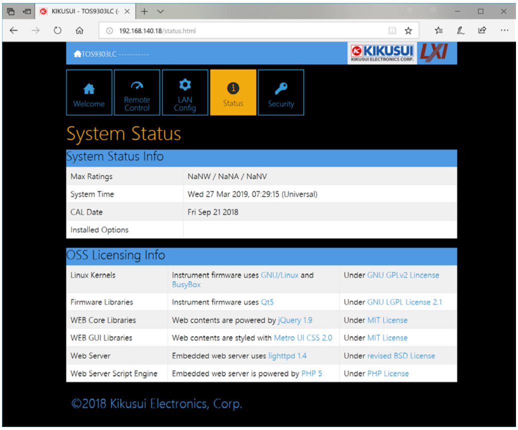
If you click Reset or Default, network settings are changed as follows.

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

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

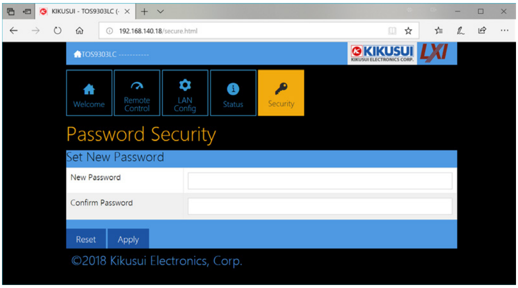
■ System Status page

This page shows the system information and the license information of the open-source software.



Password Security page

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



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

Remote control from Remote Control page

Editing of LAN Configuration page

Changing/deleting the password

Set New Password

Enter the password (4 to 15 characters).

You can use alphanumeric characters, hyphens, and underscores for the password.

Changing or deleting the password

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

To change the password, enter the present password in “Current Password”, enter the new password in “New Password” and “Confirm Password”, and then click “Apply”.

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

If you forget the password

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

About Commands

The information that is transferred between the controller (PC) and the device (TOS93 series) is referred to as messages.

This product uses the SCPI language for these messages.

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

Command Hierarchy

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

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

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

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

Command Syntax

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

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

SCPI commands are also available in the short form. In the short form, the lower-case characters in SCPI commands are omitted.

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

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

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

In the second command, VOLTage:STARt: is omitted. This is possible because that path is set to VOLTage:STARt by the first command (VOLTage:STARt:LEVel).

This compound command is equivalent to entering the following commands.

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

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

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

```
SOURce:FUNCtion ACW;:SENSe:CURRent:SECondary PHOLd
```

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

When the second command or later begins with a colon, the path that was specified by the previous command is cleared.

- The maximum length of a command that you can transmit on a single line is 512 bytes.

■ Special symbols

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

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

■ Query

You can query the device settings and status.

To make a query, append a question mark to the end of the program header section.

If the query has parameters, insert a space after the question mark, and then write the parameters.

```
VOLTage? MIN
```

Response

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

—Note—

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

Program terminator

All commands must be terminated with a valid terminator.

The terminator for reception and transmission is either LF (line feed, ASCII 0x0A) or EOI (end of identify, USB only).

When you terminate a command string, the path is reset to the root level.

—Note—

CR (ASCII 0x0D) is not a terminator.

Common Commands

There are commands that are common to the IEEE488.2 and SCPI standards for functions such as resetting devices and performing self-diagnoses. These common commands start with an asterisk (“*”). These commands may have one or multiple parameters.

Parameters

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

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

■ Non-numeric parameters

String data (String)

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

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

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

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

Character data (Character)

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

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

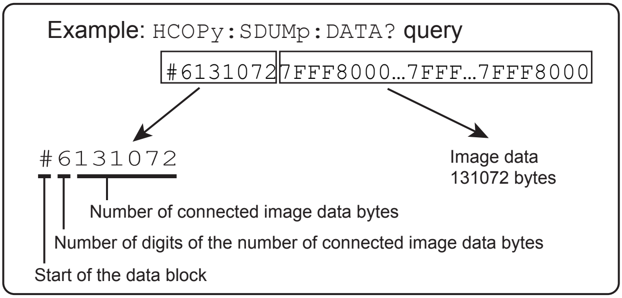
Boolean data (Boolean)

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

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

Block data (block)

Arbitrary block data that starts with #.



Numeric parameters

NR1

Represents an integer value.

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

If a 0 is returned in the response data, it is returned as +0.

NR2

Represents a real number in floating-point format.

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

NR3

Represents a real number in scientific notation.

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

If 380 is returned in the response data, it is returned as +3.80000E+02. Five decimal places are used.

NRf

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

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

Numeric

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

Numbers are expressed the same as NRf.

MINimum, MAXimum, and the like are available as substitutes for declaring certain values.

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

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

■ Special form numeric parameters

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

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

```
ACW:VOLTage MINimum
```

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

```
ACW:VOLTage? MAX
```

```
ACW:VOLTage? MIN
```

■ Measurement units

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

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

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

- G (giga)
- MA (mega)
- M (milli, mega)
- K (kilo)
- 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

*CLS

Clears all event registers including the status byte, event status, and error queue.

Clears the operation complete standby that was created by the *OPC or *OPC? command.

Command

```
*CLS
```

*ESE

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

Command

```
*ESE <NRf>
```

```
*ESE?
```

Parameter

Value: 0 to 255

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

Response: NR1

*ESR

Queries the event status register.

The event status register is cleared when read.

Command

```
*ESR?
```

Response: NR1

*IDN

Queries the model name and firmware version of the product.

Command

```
*IDN?
```

Response

Returns the following information in response to *IDN?.

Response example: For a TOS9301 with serial number AB123400 and firmware version IFO0.53.0086, FPGA0.126.0011, IOC0.07.0062

```
KIKUSUI,TOS9301,AB123400,IFO0.53.0086 FPGA0.126.0011 IOC0.07.0062
```

is returned.

*OPC

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

See IEEE 488.2-1992 section 12.5.3.

Command

```
*OPC
*OPC?
```

Response

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

*OPT

Queries the options that are installed in the product.

Command

```
*OPT?
```

Response

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

*PSC

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

Command

```
*PSC <boolean>
```

```
*PSC?
```

Parameter <boolean>

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

Example To enable the power-on SRQ function:

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

Response: NR1

*RCL

Recalls memory content.

Clears alarms.

Aborts the trigger subsystem operation.

Command

```
*RCL <NRf>
```

Parameter

Value: 0 to 50 memory number

Example

```
*RCL 1
```

*RST

Resets the panel settings (see the table below).

Clears alarms (if they cannot be cleared, alarms continue).

Aborts the trigger subsystem operation.

Clears the OPC bit (bit 0) of the status event register.

Command	*RST
ACW:VOLT	0V
ACW:VOLT:FREQ	50HZ
ACW:VOLT:PROT	5500V
ACW:VOLT:STAR	50PCT
ACW:VOLT:STAR:STAT	OFF
ACW:VOLT:SWE:FALL:TIM	0.1S
ACW:VOLT:SWE:FALL:TIM:STAT	OFF
ACW:VOLT:SWE:TIM	0.1S
ACW:VOLT:TIM	0.2S
ACW:VOLT:TIM:STAT	ON
CALC:ACW:SCAL	OFF
CALC:ACW:SCAL:OFFS	0A
CALC:ACW:SCAL:OFFS:IMAG	0A
CALC:DCW:SCAL	OFF
CALC:DCW:SCAL:OFFS	0A
CALC:EC:DC:SCAL	OFF
CALC:EC:DC:SCAL:OFFS	0OHM
CALC:EC:SCAL	OFF
CALC:EC:SCAL:OFFS	0OHM
CALC:IR:SCAL	OFF
CALC:IR:SCAL:OFFS	100MOHM
CALC:MET:SCAL	OFF
CALC:MET:SCAL:OFFS	0A
CALC:PAT:SCAL	OFF
CALC:PAT:SCAL:CONV	OFF
CALC:PAT:SCAL:CONV:VOLT	80V
CALC:PAT:SCAL:OFFS	0A
CALC:PCC:SCAL	OFF
CALC:PCC:SCAL:CONV	OFF
CALC:PCC:SCAL:CONV:VOLT	80V
CALC:PCC:SCAL:OFFS	0A
CALC:SCAL:OFFS:AUTO	OFF
CALC:TC:SCAL	OFF
CALC:TC:SCAL:CONV	OFF
CALC:TC:SCAL:CONV:VOLT	80V
CALC:TC:SCAL:OFFS	0A
DCW:VOLT	0V
DCW:VOLT:DISC:INT:STAT	ON

Command	*RST
DCW:VOLT:DISC:TIM	0S
DCW:VOLT:PROT	7500V
DCW:VOLT:STAR	50PCT
DCW:VOLT:STAR:STAT	OFF
DCW:VOLT:SWE:FALL:TIM	0.1S
DCW:VOLT:SWE:FALL:TIM:STAT	OFF
DCW:VOLT:SWE:TIM	0.1S
DCW:VOLT:TIM	0.2S
DCW:VOLT:TIM:STAT	ON
DISP:ACW:CURR:PHOL	OFF
DISP:DCW:CURR:PHOL	OFF
DISP:EC:CURR:PHOL	OFF
DISP:EC:DC:CURR:PHOL	OFF
DISP:IR:RES:PHOL	OFF
DISP:PAT:CURR:PHOL	OFF
DISP:PCC:CURR:PHOL	OFF
DISP:TC:CURR:PHOL	OFF
EC:AC:CURR	3A
EC:AC:CURR:PROT	42A
EC:AC:CURR:SWE:FALL:TIM	0.1S
EC:AC:CURR:SWE:FALL:TIM:STAT	OFF
EC:AC:CURR:SWE:TIM	0.1S
EC:AC:CURR:TIM	0.2S
EC:AC:CURR:TIM:STAT	ON
EC:CURR:FREQ	50HZ
EC:DC:CURR	3A
EC:DC:CURR:PROT	42A
EC:DC:CURR:SWE:FALL:TIM	0.1S
EC:DC:CURR:SWE:FALL:TIM:STAT	OFF
EC:DC:CURR:SWE:TIM	0.1S
EC:DC:CURR:TIM	0.2S
EC:DC:CURR:TIM:STAT	ON
FUNC	ACW
IR:VOLT	0V
IR:VOLT:DISC:INT:STAT	ON
IR:VOLT:DISC:TIM	0S
IR:VOLT:PROT	1020V
IR:VOLT:RANG	1000V

Command	*RST
IR:VOLT:STAR	50PCT
IR:VOLT:STAR:STAT	OFF
IR:VOLT:SWE:TIM	0.1S
IR:VOLT:TIM	0.2S
IR:VOLT:TIM:STAT	ON
OUTP	OFF
OUTP:110P	OFF
OUTP:110P:POL	NORM
PAT:110P:OUTP	OFF
PAT:110P:POL	NORM
PAT:POL	NORM
PCC:POL	NORM
PROG	""
ROUT:ACW:TERM	OPEN
ROUT:ACW:TERM:CCH	OFF
ROUT:DCW:TERM	OPEN
ROUT:DCW:TERM:CCH	OFF
ROUT:IR:TERM	OPEN
ROUT:IR:TERM:CCH	OFF
SENS:ACW:CURR:FILT:HPAS	SLOW
SENS:ACW:CURR:FILT:LPAS	SLOW
SENS:ACW:CURR:FILT:TYPE	LOW
SENS:ACW:CURR:MODE	RMS
SENS:ACW:JUDG	0.01MA
SENS:ACW:JUDG:LOW	0A
SENS:ACW:JUDG:LOW:STAT	OFF
SENS:ACW:TERM:GRO	LOW
SENS:ACW:VOLT:MODE	RMS
SENS:DCW:CURR:FILT:HPAS	SLOW
SENS:DCW:CURR:FILT:LPAS	SLOW
SENS:DCW:CURR:FILT:TYPE	LOW
SENS:DCW:JUDG	0.01MA
SENS:DCW:JUDG:DEL	0.1S
SENS:DCW:JUDG:DEL:AUTO	OFF
SENS:DCW:JUDG:LOW	0A
SENS:DCW:JUDG:LOW:STAT	OFF
SENS:DCW:TERM:GRO	LOW
SENS:DCW:VOLT:MODE	AVER
SENS:EC:DC:JUDG	0.0001OHM
SENS:EC:DC:JUDG:LOW	0OHM
SENS:EC:DC:JUDG:LOW:STAT	OFF
SENS:EC:DC:JUDG:STAT	ON
SENS:EC:DC:JUDG:TYPE	RES
SENS:EC:DC:JUDG:VOLT	2.5V
SENS:EC:DC:JUDG:VOLT:LOW	0V
SENS:EC:DC:JUDG:VOLT:LOW:STAT	OFF
SENS:EC:DC:JUDG:VOLT:STAT	ON

Command	*RST
SENS:EC:DC:TERM:CCH	OFF
SENS:EC:DC:TERM:WIRE	4
SENS:EC:JUDG	0.0001OHM
SENS:EC:JUDG:LOW	0OHM
SENS:EC:JUDG:LOW:STAT	OFF
SENS:EC:JUDG:STAT	ON
SENS:EC:JUDG:TYPE	RES
SENS:EC:JUDG:VOLT	2.5V
SENS:EC:JUDG:VOLT:LOW	0V
SENS:EC:JUDG:VOLT:LOW:STAT	OFF
SENS:EC:JUDG:VOLT:STAT	ON
SENS:EC:TERM:CCH	OFF
SENS:EC:TERM:WIRE	4
SENS:IR:CURR:FILT:LPAS:STAT	OFF
SENS:IR:JUDG	100MOHM
SENS:IR:JUDG:CURR	0.0001MA
SENS:IR:JUDG:CURR:LOW	0A
SENS:IR:JUDG:CURR:LOW:STAT	OFF
SENS:IR:JUDG:CURR:STAT	ON
SENS:IR:JUDG:DEL	0.1S
SENS:IR:JUDG:DEL:AUTO	OFF
SENS:IR:JUDG:LOW	1MOHM
SENS:IR:JUDG:LOW:STAT	ON
SENS:IR:JUDG:STAT	OFF
SENS:IR:JUDG:TYPE	RES
SENS:IR:TERM:GRO	LOW
SENS:MET:CURR:MODE	ACDC
SENS:MET:NETW	A
SENS:MET:RANG	42V
SENS:MET:RANG:AUTO	ON
SENS:MET:SELV	30V
SENS:MET:SELV:STAT	ON
SENS:MET:TERM	NETW
SENS:PAT:BAND	NORM
SENS:PAT:COND	NORM
SENS:PAT:COND:FAUL	NEUT
SENS:PAT:CURR:MODE	ACDC
SENS:PAT:JUDG	100UA
SENS:PAT:JUDG:DEL	1S
SENS:PAT:JUDG:DEL:STAT	OFF
SENS:PAT:JUDG:LOW	0.01MA
SENS:PAT:JUDG:LOW:STAT	OFF
SENS:PAT:JUDG:STAT	ON
SENS:PAT:NETW	I
SENS:PAT:NETW:PROB	PEAR
SENS:PAT:RANG:AUTO	ON
SENS:PAT:TIM	1S

Command	*RST
SENS:PAT:TIM:STAT	ON
SENS:PCC:BAND	NORM
SENS:PCC:COND	NORM
SENS:PCC:CURR:MODE	ACDC
SENS:PCC:JUDG	100UA
SENS:PCC:JUDG:DEL	1S
SENS:PCC:JUDG:DEL:STAT	OFF
SENS:PCC:JUDG:LOW	0.01MA
SENS:PCC:JUDG:LOW:STAT	OFF
SENS:PCC:JUDG:STAT	ON
SENS:PCC:NETW	PCC-1
SENS:PCC:RANG:AUTO	ON
SENS:PCC:TIM	1S
SENS:PCC:TIM:STAT	ON
SENS:TC:BAND	NORM
SENS:TC:COND	NORM

Command	*RST
SENS:TC:COND:FAUL	NEUT
SENS:TC:CURR:MODE	ACDC
SENS:TC:JUDG	100UA
SENS:TC:JUDG:DEL	1S
SENS:TC:JUDG:DEL:STAT	OFF
SENS:TC:JUDG:LOW	0.01MA
SENS:TC:JUDG:LOW:STAT	OFF
SENS:TC:JUDG:STAT	ON
SENS:TC:NETW	A
SENS:TC:NETW:PROB	PEAR
SENS:TC:RANG:AUTO	ON
SENS:TC:TIM	1S
SENS:TC:TIM:STAT	ON
TC:110P:OUTP	OFF
TC:110P:POL	NORM
TC:POL	NORM

Command

```
*RST
```

*SAV

Saves the panel settings to the setup memory.

Command

```
*SAV <NRf>
```

Parameter

Value: 0 to 50 memory number

Example

```
*SAV 1
```

*SRE

Sets the service request enable register.

The service request enable register can be used to select which summary messages in the status byte register will perform service requests.

To clear the service request enable register, send *SRE 0. If the register is cleared, service requests cannot be generated using status information.

Command

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

Parameter

Value: 0 to 255

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

Response: NR1

*STB

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

The response is the same as serial polling only with the exception that the MSS message appears in place of the RQS message in bit 6.

Command

```
*STB?
```

Response: NR1

*TRG

Trigger command.

Executes trigger on the TEST trigger group.

This is a substitute command for IEEE 488.1 get (Group Execute Trigger).

If the device is in a state in which it does not accept triggers, an SCPI error (-211, “Trigger ignored”) occurs.

See IEEE 488.2-1992 section 10.37.

Command

```
*TRG
```

*TST

Executes a self-test.

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

Command

```
*TST?
```

Response

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

*WAI

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

Command

```
*WAI
```

ABORt Command

This product has two trigger subsystems (ACQuire, TEST).

ACQuire is a measurement trigger subsystem.

TEST is a test trigger subsystem.

ABOR

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

The product's trigger state immediately after it turns on is the same as its trigger state after it receives an ABOR command.

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

You cannot specify a trigger subsystem with the ABOR command. It is always interpreted as ALL.

Command

```
ABORt[:ALL]
```

ABOR:ACQ

Aborts measurement operations.

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

Command

```
ABORt:ACQuire
```

ABOR:TEST

Stops the ongoing test. Clears the protection/ fail mode.

If you send an ABOR command without initiating, the test data is not discarded.

Command

```
ABORt:TEST
```

CALC:SCAL:OFFS:AUTO

Sets whether to automatically set the offset before testing.

Command

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

Parameter

Value:	ON(1)	Offset is set automatically.
	OFF(0)	Offset is not set automatically. (default)

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

Response: NR1

Example

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

CALC:ACW Command

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

The offset current is converted into resistance and sent to the TOS9300 series. The TOS9300 series calculates the current from the resistance and voltage and displays the result on the panel. Since the resistance resolution is 100 Ω , an error may occur between the offset current setting and panel reading.

CALC:ACW:SCAL

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

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

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

Command

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

Parameter

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

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

Response: NR1

Example

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

CALC:ACW:SCAL:OFFS

Sets the real part of the offset current in AC withstanding voltage tests.

This is valid when CALC:ACW:SCAL ON.

Command

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

Unit: A

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

Response: NR3

Example

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

CALC:ACW:SCAL:OFFS:IMAG

Sets the imaginary part of the offset current in AC withstanding voltage tests.

This is valid when CALC:ACW:SCAL ON.

Command

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

Unit: A

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

Response: NR3

Example

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

CALC:DCW Command

The offset current is converted into resistance and sent to the TOS9300 series. The TOS9300 series calculates the current from the resistance and voltage and displays the result on the panel. Since the resistance resolution is 100 Ω , an error may occur between the offset current setting and panel reading.

CALC:DCW:SCAL

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

Set the current with CALC:DCW:SCAL:OFFS.

Command

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

Parameter

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

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

Response: NR1

Example

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

CALC:DCW:SCAL:OFFS

Sets the offset current for DC withstanding voltage tests.

This is valid when CALC:DCW:SCAL ON.

Command

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

Unit: A

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

Response: NR3

Example

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

CALC:EC Command

CALC:EC:SCAL

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

Set the voltage with CALC:EC:SCAL:OFFS.

Command

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

Parameter

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

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

Response: NR1

Example

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

CALC:EC:SCAL:OFFS

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

This is valid when CALC:EC:SCAL ON.

Command

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

Unit: OHM

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

Response: NR3

Example

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

CALC:EC:DC:SCAL

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

Set the voltage with CALC:EC:DC:SCAL:OFFS.

Command

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

Parameter

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

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

Response: NR1

Example

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

CALC:EC:DC:SCAL:OFFS

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

This is valid when CALC:EC:DC:SCAL ON.

Command

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

Unit: OHM

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

Response: NR3

Example

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

CALC:IR Command

CALC:IR:SCAL

Sets whether to offset the resistance applied to the stray capacitance in insulation resistance tests.

Set the resistance with CALC:IR:SCAL:OFFS.

Command

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

Parameter

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

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

Response: NR1

Example

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

CALC:IR:SCAL:OFFS

Sets the offset resistance for insulation resistance tests.

This is valid when CALC:IR:SCAL ON.

Command

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

Unit: OHM

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

Response: NR3

Example

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

CALC:MET Command

CALC:MET:SCAL

Sets whether to offset the current in meter mode.

Set the current with CALC:MET:SCAL:OFFS.

Command

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

Parameter

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

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

Response: NR1

Example

```
CALC:MET:SCAL 1
```

CALC:MET:SCAL:OFFS

Sets the offset current for meter mode.

This is valid when CALC:MET:SCAL ON.

Command

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

Unit: A

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

Response: NR3

Example

```
CALC:MET:SCAL:OFFS 123MA
```

CALC:PAT Command

CALC:PAT:SCAL

Sets whether to offset the current in patient leakage current tests.

Set the current with CALC:PAT:SCAL:OFFS.

Command

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

Parameter

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

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

Response: NR1

Example

```
CALC:PAT:SCAL 1
```

CALC:PAT:SCAL:OFFS

Sets the offset current for patient leakage current tests.

This is valid when CALC:PAT:SCAL ON.

Command

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

Unit: A

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

Response: NR3

Example

```
CALC:PAT:SCAL:OFFS 123MA
```

CALC:PAT:SCAL:CONV

Sets whether to convert the current with the specified voltage in patient leakage current tests.

Set the voltage with CALC:PAT:SCAL:CONV:VOLT.

Command

```
CALCulat:PATient[:CURRent]:SCALe:CONVert[:STATe] <boolean>
CALCulat:PATient[:CURRent]:SCALe:CONVert[:STATe]?
```

Parameter

Value:	ON(1)	Conversion is applied.
	OFF(0)	Conversion is not applied. (default)

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

Response: NR1

Example

```
CALC:PAT:SCAL:CONV 1
```

CALC:PAT:SCAL:CONV:VOLT

Sets the conversion voltage for patient leakage current tests.

This is valid when CALC:PAT:SCAL:CONV ON.

Command

```
CALCulat:PATient[:CURRent]:SCALe:CONVert:VOLTage <numeric>
CALCulat:PATient[:CURRent]:SCALe:CONVert:VOLTage?
```

Unit: V

Settings are reset to default when the *RST command is sent. (80 V)

Response: NR3

Example

```
CALC:PAT:SCAL:CONV:VOLT 220V
```

CALC:PCC Command

CALC:PCC:SCAL

Sets whether to offset the current in protective conductor current tests.

Set the current with CALC:PCC:SCAL:OFFS.

Command

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

Parameter

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

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

Response: NR1

Example

```
CALC:PCC:SCAL 1
```

CALC:PCC:SCAL:OFFS

Sets the offset current for protective conductor current tests.

This is valid when CALC:PCC:SCAL ON.

Command

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

Unit: A

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

Response: NR3

Example

```
CALC:PCC:SCAL:OFFS 123MA
```

CALC:PCC:SCAL:CONV

Sets whether to convert the current with the specified voltage in protective conductor current tests.

Set the voltage with CALC:PCC:SCAL:CONV:VOLT.

Command

```
CALCulat:PCCurrent[:CURRent]:SCALe:CONVert[:STATe] <boolean>
CALCulat:PCCurrent[:CURRent]:SCALe:CONVert[:STATe]?
```

Parameter

Value:	ON(1)	Conversion is applied.
	OFF(0)	Conversion is not applied. (default)

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

Response: NR1

Example

```
CALC:PCC:SCAL:CONV 1
```

CALC:PCC:SCAL:CONV:VOLT

Sets the conversion voltage for protective conductor current tests.

This is valid when CALC:PCC:SCAL:CONV ON.

Command

```
CALCulat:PCCurrent[:CURRent]:SCALe:CONVert:VOLTage <numeric>
CALCulat:PCCurrent[:CURRent]:SCALe:CONVert:VOLTage?
```

Unit: V

Settings are reset to default when the *RST command is sent. (80 V)

Response: NR3

Example

```
CALC:PCC:SCAL:CONV:VOLT 220V
```

CALC:TC Command

CALC:TC:SCAL

Sets whether to offset the current in touch current tests.

Set the current with CALC:TC:SCAL:OFFS.

Command

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

Parameter

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

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

Response: NR1

Example

```
CALC:TC:SCAL 1
```

CALC:TC:SCAL:OFFS

Sets the offset current for touch current tests.

This is valid when CALC:TC:SCAL ON.

Command

```
CALCulat:TC[:CURRent]:SCALe:OFFSet[:REAL] <numeric>
CALCulat:TC[:CURRent]:SCALe:OFFSet[:REAL]?
```

Unit: A

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

Response: NR3

Example

```
CALC:TC:SCAL:OFFS 123MA
```

CALC:TC:SCAL:CONV

Sets whether to convert the current with the specified voltage in touch current tests.

Set the voltage with CALC:TC:SCAL:CONV:VOLT.

Command

```
CALCulat:TC[:CURRent]:SCALe:CONVert[:STATe] <boolean>
CALCulat:TC[:CURRent]:SCALe:CONVert[:STATe]?
```

Parameter

Value:	ON(1)	Conversion is applied.
	OFF(0)	Conversion is not applied. (default)

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

Response: NR1

Example

```
CALC:TC:SCAL:CONV 1
```

CALC:TC:SCAL:CONV:VOLT

Sets the conversion voltage for touch current tests.

This is valid when CALC:TC:SCAL:CONV ON.

Command

```
CALCulat:TC[:CURRent]:SCALe:CONVert:VOLTage <numeric>
CALCulat:TC[:CURRent]:SCALe:CONVert:VOLTage?
```

Unit: V

Settings are reset to default when the *RST command is sent. (80 V)

Response: NR3

Example

```
CALC:TC:SCAL:CONV:VOLT 220V
```

DISP:ACW:CURR:PHOL

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

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

Command

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

Parameter

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

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

Response: NR1

Example

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

DISP:DCW:CURR:PHOL

Displays the maximum current measurement from the start of the test in DC with-standing voltage tests.

Command

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

```
DISPlay:DCW:CURRent:PHOLd?
```

Parameter

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

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

Response: NR1

Example

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

DISP:EC:AC:CURR:PHOL

Displays the maximum resistance measurement from the start of the test in earth continuity tests (AC).

Command

```
DISPlay:EC[:AC]:CURRent:PHOLd <boolean>
```

```
DISPlay:EC[:AC]:CURRent:PHOLd?
```

Parameter

Value:	ON(1)	The maximum resistance measurement is displayed.
	OFF(0)	The maximum resistance measurement is not displayed. (default)

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

Response: NR1

Example

```
DISP:EC:AC:CURR:PHOL ON
```

DISP:EC:DC:CURR:PHOL

Displays the maximum resistance measurement from the start of the test in earth continuity tests (DC).

Command

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

Parameter

Value:	ON(1)	The maximum resistance measurement is displayed.
	OFF(0)	The maximum resistance measurement is not displayed. (default)

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

Response: NR1

Example

```
DISP:EC:DC:CURR:PHOL ON
```

DISP:IR:RES:PHOL

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

Command

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

```
DISPlay:IR:RESistance:PHOLd?
```

Parameter

Value:	ON(1)	The mnimum resistance measurement is displayed.
	OFF(0)	The minimum resistance measurement is not displayed. (default)

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

Response: NR1

Example

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

DISP:PAT:CURR:PHOL

Displays the maximum current measurement from the start of the test in patient leakage current tests.

Command

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

Parameter

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

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

Response: NR1

Example

```
DISP:PAT:CURR:PHOL ON
```

DISP:PCC:CURR:PHOL

Displays the maximum current measurement from the start of the test in protective conductor current tests.

Command

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

Parameter

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

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

Response: NR1

Example

```
DISP:PCC:CURR:PHOL ON
```

DISP:TC:CURR:PHOL

Displays the maximum current measurement from the start of the test in touch current tests.

Command

```
DISPlay:TC:CURRent:PHOLd <boolean>
```

```
DISPlay:TC:CURRent:PHOLd?
```

Parameter

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

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

Response: NR1

Example

```
DISP:TC:CURR:PHOL ON
```

HCOP:SDUM:DATA

Retrieves the screen capture of the present screen.

Command

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

Response

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

Example

```
HCOP:SDUM:DATA?
```

INITiate Command

INIT:ACQ

Starts a new measurement.

Command

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

INIT:TEST

Starts the test trigger function.

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

Command

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

FETC/ READ/ MEAS

Queries the measurement data (current, real part of the current, imaginary part of the current, voltage, resistance, elapsed time).

MEAS resets a portion of the setting conditions to their default values, makes a new measurement, and then queries the measurement data. The present valid measurement data is invalidated. This product has no settings that are reset to default values with the MEAS command. The operation is the same as READ.

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

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

Command

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

Response

The current, real part of the current, imaginary part of the current, voltage, resistance, and test time are returned in this order in nr3,nr3,nr3,nr3,nr3,nr3 format.

Unit: A (current), V (voltage), OHM (resistance), S (elapsed time)

FETC:CIM/ READ:CIM/ MEAS:CIM

Queries the imaginary part of the current .

MEAS:CIM resets a portion of the setting conditions to their default values, makes a new measurement, and then queries the measurement data. The present valid measurement data is invalidated. This product has no settings that are reset to default values with the MEAS command. The operation is the same as READ.

READ:CIM makes a new measurement and queries the imaginary part of the current . The present valid measurement data is invalidated.

FETC:CIM queries the imaginary part of the current that has already been measured. If there are multiple measurement data entries, the most recent imaginary part of the current is returned.

Command

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

Response: NR3

Unit: A

FETC:CRE/ READ:CRE/ MEAS:CRE

Queries the real part of the current.

MEAS:CRE resets a portion of the setting conditions to their default values, makes a new measurement, and then queries the measurement data. The present valid measurement data is invalidated. This product has no settings that are reset to default values with the MEAS command. The operation is the same as READ.

READ:CRE makes a new measurement and queries the real part of the current. The present valid measurement data is invalidated.

FETC:CRE queries the real part of the current that has already been measured. If there are multiple measurement data entries, the most recent real part of the current is returned.

Command

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

Response: NR3

Unit: A

FETC:CURR/ READ:CURR/ MEAS:CURR

Queries the current.

MEAS:CURR resets a portion of the setting conditions to their default values, makes a new measurement, and then queries the measurement data. The present valid measurement data is invalidated. This product has no settings that are reset to default values with the MEAS command. The operation is the same as READ.

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

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

Command

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

Response: NR3

Unit: A

FETC:ETIM/ READ:ETIM/ MEAS:ETIM

Queries the test time.

MEAS:ETIM resets a portion of the setting conditions to their default values, makes a new measurement, and then queries the measurement data. The present valid measurement data is invalidated. This product has no settings that are reset to default values with the MEAS command. The operation is the same as READ.

READ:ETIM makes a new measurement and queries the test time. The present valid measurement data is invalidated.

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

Command

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

Response: NR3

Unit: S

FETC:RES/ READ:RES/ MEAS:RES

Queries the resistance.

MEAS:RES resets a portion of the setting conditions to their default values, makes a new measurement, and then queries the measurement data. The present valid measurement data is invalidated. This product has no settings that are reset to default values with the MEAS command. The operation is the same as READ.

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

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

Command

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

Response: NR3

Unit: OHM

FETC:VOLT/ READ:VOLT/ MEAS:VOLT

Queries the voltage.

MEAS:VOLT resets a portion of the setting conditions to their default values, makes a new measurement, and then queries the measurement data. The present valid measurement data is invalidated. This product has no settings that are reset to default values with the MEAS command. The operation is the same as READ.

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

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

Command

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

Response: NR3

Unit: V

OUTP

Sets wheter to output the temporary voltage in leakage current (TC/PCC/Patient) tests.

Command

```
OUTPut[:LINE][:STATe] <boolean>
OUTPut[:LINE][:STATe]?
```

Parameter

Value:	ON(1)	Output on
	OFF(0)	Output off (default)

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

Response: NR1

Example

```
OUTP ON
```

OUTP:110P

Sets whether to output the voltage applied from the 110% terminal to the AC LINE IN inlet in meter tests.

Command

```
OUTPut[:TERMinal]:110Percent[:STATe] <boolean>
OUTPut[:TERMinal]:110Percent[:STATe]?
```

Parameter

Value:	ON(1)	Output on
	OFF(0)	Output off (default)

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

Response: NR1

Example

```
OUTP:110P ON
```

OUTP:110P:POL

Sets the polarity of the voltage applied from the 110 % terminal in meter tests.

Command

```
OUTPut[:TERMinal]:110Percent:POLarity <character>
OUTPut[:TERMinal]:110Percent:POLarity?
```

Parameter

Value:	NORMal	Normal phase (default)
	REVerse	Reverse phase

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

Response: character

Example

```
OUTP:110P:POL NORM
```

PROG

Sets the program to be edited.

Specifying a blank program name ("") clears the selection.

Command

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

```
PROGram[:SELected]?
```

Parameter

For tests other than an LC test, include “/BASIC/” before the program name. For an LC test, include “/LC/”.

When specifying a program in program memory, for tests other than an LC test, include “/SIGNAL IO/BASIC/” before the program name. For an LC test, include “/SIGNAL IO/LC/”.

Response: string

Example: When specifying a test other than an LC test with the name “My test program”

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

Example: When specifying an LC test 76

```
PROG "/SIGNAL IO/LC/76"
```

PROG:CRE

Creates a new program.

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

Command

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

Parameter

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

Up to 255 characters

For tests other than an LC test, include “/BASIC/” before the program name. For an LC test, include “/LC/”.

Example: When creating an LC test

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

PROG:DEL

Deletes a program.

Command

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

Example

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

PROG:INT:TIM

Sets the step interval time.

Command

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

```
PROGram[:SELected]:INTerval:TIMer?
```

Unit: S

Response: NR3

Example

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

PROG:FAIL:COUT

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

Command

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

```
PROGram[:SELected][:JUDGment]:FAIL:CONTinue?
```

Parameter

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

Response: NR1

Example

```
PROG:FAIL:COUT ON
```

PROG:LIST

Queries stored programs.

Command

```
PROGram:LIST?
```

Response: "string","string"...

Returns “” if no programs are stored.

PROG:REN

Changes the name of the selected program.

Command

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

Parameter

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

Up to 255 characters

For tests other than an LC test, include “/BASIC/” before the program name. For an LC test, include “/LC/”.

Example

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

PROG:SAVE

Saves the selected program.

Command

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

PROG:STEP<n>:<prog_item>

Sets the test condition indicated by <prog-item> to step n of the selected program.

For details on the parameters, see the test condition command of each test.

Use <n> to specify the step number. Step numbers start at 0.

Command

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

<prog-item> list

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

<prog-item>	Description	Parameter	Applicable tests*1
JUDGment:TYPE	Judgment type	character	IR/EC
JUDGment[:VOLTage]*2:LOWer	Lower limit	numeric	EC
JUDGment[:VOLTage]:LOWer:STATe	Lower limit on/off	boolean	EC
JUDGment[:VOLTage]*2[:UPPer]	Upper limit	numeric	EC
[LINE:]POLarity	Polarity of power supplied to EUT	character	TC/PCC/PAT
NETWork	Measurement circuit network	character	TC/PCC/PAT
NETWork:PROBe:A	A terminal probe connection destination	—	TC/PAT
NETWork:PROBe[:B]	B terminal probe connection destination	character	TC/PAT
SCALe[:STATe]	Offset on/off	boolean	ACW/DCW/IR/EC/TC/PCC/PAT
[RESistance:]*2SCALe:OFFSet[:REAL]	Offset resistance	numeric	IR/EC
[ROUTe:]TERMinals	Channel terminal connection	numeric, character	ACW/DCW/IR
[ROUTe:]TERMinals:CCHeck[:STATe]	Channel continuity check on/off	boolean	ACW/DCW/IR
[TERMinal:]110Percent:OUTPut	110 output terminal voltage output on/off	boolean	TC/PAT
[TERMinal:]110Percent:POLarity	110 output terminal power supply polarity	character	TC/PAT
TERMinals:CCHeck[:STATe]	Contact check	boolean	EC
TERMinals:GROund	Grounding mode	character	ACW/DCW/IR
TERMinals:WIRE	4-terminal/2-terminal measurement	NR1	EC
TIMer	Test time	numeric	TC/PCC/PAT
[VOLTage:][AC:]BANDwidth	Bandwidth	character	TC/PCC/PAT
[VOLTage:]DISCharge:TIMer[:MINimum]	Discharge time	numeric	DCW/IR
[VOLTage:]FREQuency	Test voltage frequency	numeric	ACW
[VOLTage:]*2[LEVel]	Test voltage	numeric	ACW/DCW/IR
VOLTage:MODE	Voltage measurement mode	character	ACW/DCW
[VOLTage:]RANGe	Output voltage range	numeric	IR
[VOLTage:]RANGe:AUTO	Output voltage range on/off	boolean	TC/PCC/PAT
[VOLTage:]STARt[:LEVel]	Start voltage	numeric	ACW/DCW/IR
[VOLTage:]STARt:STATe	Start voltage on/off	boolean	ACW/DCW/IR
[VOLTage:]SWEep:FALL:TIMer	Voltage fall time	numeric	ACW/DCW
[VOLTage:]SWEep:FALL:TIMer:STATe	Voltage fall time on/off	boolean	ACW/DCW
[VOLTage:]SWEep[:RISE]:TIMer	Voltage rise time	numeric	ACW/DCW/IR
[VOLTage:]TIMer	Test time	numeric	ACW/DCW/IR

*1. ACW: AC withstanding voltage, DCW: DC withstanding voltage, IR: insulation resistance, EC: earth continuity, TC: touch current, PCC: protective conductor current, PAT: patient leakage current

*2. Cannot be omitted when sending the command with a unit in the parameter.

PROG:STEPS:COUN

Sets the number of steps of the selected program.

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

Command

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

```
PROGram[:SELected]:STEPS:COUNt?
```

Value: 1 to 100

Response: NR1

Returns +0 when no program is selected.

Example

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

RES:FORM

Sets the response format to use when test results are queried.

The response format uses RES? or RES:REM?.

The same parameter cannot be specified twice.

Command

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

Parameter (1 minimum, 15 maximum)

Value:	NUMBer	Test number Incremented each time a test is performed. Cleared to 0 when the count exceeds 2147483647.
	STEP	Auto test step number
	FUNCtion	Test mode
	DATE	Test start time (RFC2822 format)
	YEAR	Test start date (year)
	MONTh	Test start date (month)
	DAY	Test start date (day)
	HOUR	Test start time (hour)
	MINute	Test start time (minute)
	SECond	Test start time (second)
	VOLTage	Voltage at the time of judgment
	CURRent	Current at the time of judgment
	CREal	Real part of the current at the time of judgment
	CIMaginary	Imaginary part of the current at the time of judgment
	RESistance	Resistance at the time of judgment
	ETIMe	Test time at the time of judgment
	JUDGment	Judgment result

Response: character,character,..

Example

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

Response example: When the test mode, test start time, and judgment result are set.

`FUNC,DATE,JUDG` is returned.

RES

Queries the previous test result.

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

Command

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

Response: Returns the item specified by RES:FORM in a comma-separated format.

Item	Description		Response
Test number	--		NR1
Auto test step number	1 for a single test		NR1
Test mode	ACW	AC withstanding voltage	character
	DCW	DC withstanding voltage	
	IR	Insulation resistance	
	ECAC	Earth continuity (AC)	
	ECDC	Earth continuity (DC)	
	TC-n[*1]	Touch current	
	PCC-n[*1]	Protective conductor current	
	PATIENT-n[*1]	Patient leakage current	
Test start time	RFC2822 format		"string"
Test start date (year)	--		NR1
Test start date (month)	--		NR1
Test start date (day)	--		NR1
Test start time (hour)	--		NR1
Test start time (minute)	--		NR1
Test start time (second)	--		NR1
Voltage at the time of judgment	--		NR3
Current at the time of judgment	--		NR3
Real part of the current at the time of judgment	--		NR3
Imaginary part of the current at the time of judgment	--		NR3
Resistance at the time of judgment	--		NR3
Test time at the time of judgment	--		NR3

Item	Description		Response
Judgment result	PASS	PASS judgment.	character
	U-FAIL	A value exceeding the upper limit was detected resulting in a FAIL judgment.	
	L-FAIL	A value less than the lower limit was detected resulting in a FAIL judgment.	
	PROT	A protection function was activated, and the test was stopped.	
	ABORT	The test was aborted with a STOP signal.	

*1. n is the network name.

Response exsample: When a test mode, test start time (month), test start time (day), and judgment result are selected, a touch current test is executed on October 23 (IEC60990 figure 3 U1 measurement), and the result is PASS.

`TC-A,10,23,PASS` is returned.

RES:COUN

Queries the number of test results stored in the product.

Command

```
RESult:COUNt?
```

Response：NR1

RES:REM

Queries the oldest test result.

The oldest test resurt is cleared when a query is made.

Use RES:FORM to specify the item to be queried.

Command

```
RESult:REMove?
```

Response Returns the item specified by RES:FORM in a comma-separated format.

Item	Description		Response
Test number	--		NR1
Auto test step number	1 for a single test		NR1
Test mode	ACW	AC withstanding voltage	character
	DCW	DC withstanding voltage	
	IR	Insulation resistance	
	ECAC	Earth continuity (AC)	
	ECDC	Earth continuity (DC)	
	TC-n*1	Touch current	
	PCC-n*1	Protective conductor current	
	PATIENT-n*1	Patient leakage current	
Test start time	RFC2822 format		"string"
Test start date (year)	--		NR1
Test start date (month)	--		NR1
Test start date (day)	--		NR1
Test start time (hour)	--		NR1
Test start time (minute)	--		NR1
Test start time (second)	--		NR1
Voltage at the time of judgment	--		NR3
Current at the time of judgment	--		NR3
Real part of the current at the time of judgment	--		NR3
Imaginary part of the current at the time of judgment	--		NR3
Resistance at the time of judgment	--		NR3
Test time at the time of judgment	--		NR3

Item	Description		Response
Judgment result	PASS	PASS judgment.	character
	U-FAIL	A value exceeding the upper limit was detected resulting in a FAIL judgment.	
	L-FAIL	A value less than the lower limit was detected resulting in a FAIL judgment.	
	PROT	A protection function was activated, and the test was stopped.	
	ABORT	The test was aborted with a STOP signal.	

*1. n is the network name.

ROUTe Command

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

ROUT:ACW:TERM

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

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

Command

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

Parameter <NRf>

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

Parameter <character>

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

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

Response: character

Example

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

ROUT:ACW:TERM:CCH

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

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

Command

```
ROUTe[:ACW]:TERMinals:CCHeck[:STATe] <boolean>
```

```
ROUTe[:ACW]:TERMinals:CCHeck[:STATe]?
```

Parameter

Value:	ON(1)	Enable.
	OFF(0)	Disable. (default)

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

Response: NR1

Example

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

ROUT:CAT

Queries the available scanner channels.

Command

```
ROUTe:CATalog?
```

Response: NR1,NR1,...

ResponseExample: When a scanner is not connected
Returns +0.

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

ROUT:DCW:TERM

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

Command

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

Parameter <NRf>

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

Parameter <character>

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

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

Response: character

Example

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

ROUT:DCW:TERM:CCH

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

Command

```
ROUTe:DCW:TERMinals:CCHeck[:STATe] <boolean>
```

```
ROUTe:DCW:TERMinals:CCHeck[:STATe]?
```

Parameter

Value:	ON(1)	Enable.
	OFF(0)	Disable. (default)

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

Response: NR1

Example

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

ROUT:IR:TERM

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

Command

```
ROUTe:IR:TERMinals <nrf>,<character>
```

```
ROUTe:IR:TERMinals? <NRf>
```

Parameter <NRf>

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

Parameter <character>

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

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

Response: character

Example

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

```
ROUT:IR:TERM? 202
```

ROUT:IR:TERM:CCH

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

Command

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

Parameter

Value:	ON(1)	Enable.
	OFF(0)	Disable.

Response: NR1

Example

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

SENS:ACW Command

This is a subsystem for setting the AC withstanding voltage test (ACW) conditions.

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

SENS:ACW:CURR:FILT:HPAS

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

Command

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

Parameter

Value:	SLOW	(default)
	FAST	

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

Response: character

Example

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

Related command

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

SENS:ACW:CURR:FILT:LPAS

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

Command

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

```
SENSe[:ACW]:CURRent:FILTer:LPASs?
```

Parameter

Value:	SLOW	(default)
	MEDium	
	FAST	

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

Response: character

Example

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

Related command

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

SENS:ACW:CURR:FILT:TYPE

Sets the filter type for AC withstanding voltage tests.

Command

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

```
SENSe[:ACW]:CURRent:FILTer:TYPE?
```

Parameter

Value:	LOW	Low-pass filter (default)
	HIGH	High-pass filter

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

Response: character

Example

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

SENS:ACW:CURR:MODE

Sets the current measurement mode in AC withstanding voltage tests.

Command

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

Parameter

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

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

Response: character

Example

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

SENS:ACW:JUDG

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

Command

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

```
SENSe[:ACW]:JUDGment[:CURRent][:UPPer]?
```

Unit: A

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

Response: NR3

Example

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

SENS:ACW:JUDG:LOW

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

This setting is enabled when SENS:JUDG:LOW:STAT is set to ON.

Command

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

Unit: A

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

Response: NR3

Example

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

SENS:ACW:JUDG:LOW:STAT

Sets whether to judge with the lower limit in AC withstanding voltage tests.

Use SENS:JUDG:LOW to set the lower limit.

Command

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

Parameter

Value:	ON(1)	Judge
	OFF(0)	Not judge (default)

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

Response: NR1

Example

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

SENS:ACW:TERM:GRO

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

Command

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

Parameter

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

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

Response: character

Example

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

SENS:ACW:VOLT:MODE

Sets the voltage measurement mode in AC withstanding voltage tests.

Command

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

Parameter

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

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

Response: character

Example

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

SENSe:DCW Command

This is a subsystem for setting the DC withstanding voltage test (DCW) conditions.

SENS:DCW:CURR:FILT:HPAS

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

Command

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

```
SENSe:DCW:CURRent:FILTer:HPASs?
```

Parameter

Value:	SLOW	(default)
	FAST	

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

Response: character

Example

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

Related command

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

SENS:DCW:CURR:FILT:LPAS

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

Command

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

Parameter

Value:	SLOW	(default)
	MEDium	
	FAST	

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

Response: character

Example

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

Related command

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

SENS:DCW:CURR:FILT:TYPE

Sets the filter type for DC withstanding voltage tests.

Command

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

Parameter

Value:	LOW	Low-pass filter (default)
	HIGH	High-pass filter

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

Response: character

Example

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

SENS:DCW:JUDG

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

Command

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

Unit: A

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

Response: NR3

Example

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

SENS:DCW:JUDG:DEL

Sets the delay time until starting upper limit judgment in DC withstanding voltage tests.

This setting is enabled when SENS:DCW:JUDG:DEL:AUTO is set to OFF.

Command

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

Unit: S

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

Response: NR3

Example

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

SENS:DCW:JUDG:DEL:AUTO

Sets whether to make the judgment delay automatic in DC withstanding voltage tests.

If you do not set it to automatic, set the time until starting judgment with SENS:D-CW:JUDG:DEL.

Command

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

Parameter

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

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

Response: NR1

Example

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

SENS:DCW:JUDG:LOW

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

This setting is enabled when SENS:DCW:JUDG:LOW:STAT is set to ON.

Command

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

Unit: A

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

Response: NR3

Example

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

SENS:DCW:JUDG:LOW:STAT

Sets whether to judge with the lower limit in DC withstanding voltage tests.

Use SENS:DCW:JUDG:LOW to set the lower limit.

Command

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

Parameter

Value:	ON(1)	Judge
	OFF(0)	Not judge (default)

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

Response: NR1

Example

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

SENS:DCW:TERM:GRO

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

Command

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

Parameter

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

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

Response: character

Example

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

SENS:DCW:VOLT:MODE

Sets the voltage measurement mode in DC withstanding voltage tests.

Command

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

Parameter

Value:	PEAK	Peak value
	AVERage	Mean value (default)

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

Response: character

Example

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

SENSe:EC Command

This is a subsystem for setting the earth continuity test (EC) conditions.

SENS:EC[:AC] Command

SENS:EC:JUDG

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

This setting is enabled when SENS:EC:JUDG:STAT is set to ON.

Command

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

Unit: OHM

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

Response: NR3

Example

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

SENS:EC:JUDG:STAT

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

This setting is enabled when SENS:EC:JUDG:TYPE is set to RES.

Use SENS:EC:JUDG:LOW to set the upper limit.

Command

```
SENSe:EC[:AC]:JUDGment[:RESistance][:UPPer]:STATe <bool-
    ean> SENSe:EC[:AC]:JUDGment[:RESistance][:UPPer]:STATe?
```

Parameter

Value:	ON(1)	Judge (default)
	OFF(0)	Not judge

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

Response: NR1

Example

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

SENS:EC:JUDG:LOW

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

This setting is enabled when SENS:EC:JUDG:LOW:STAT is set to ON.

Command

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

Unit: OHM

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

Response: NR3

Example

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

SENS:EC:JUDG:LOW:STAT

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

This setting is enabled when SENS:EC:JUDG:TYPE is set to RES.

Use SENS:EC:JUDG:LOW to set the lower limit.

Command

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

Parameter

Value:	ON(1)	Judge
	OFF(0)	Not judge (default)

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

Response: NR1

Example

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

SENS:EC:JUDG:TYPE

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

Command

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

```
SENSe:EC[:AC]:JUDGment:TYPE?
```

Parameter

Value:	RESistance	Judge using resistance (default)
	VOLTage	Judge using voltage

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

Response: character

Example

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

SENS:EC:JUDG:VOLT

Sets the reference voltage for upper limit judgment in earth continuity tests (AC).

This setting is enabled when SENS:EC:VOLT:JUDG:STAT is set to ON.

Command

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

Unit: V

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

Response: NR3

Example

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

SENS:EC:JUDG:VOLT:STAT

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

This setting is enabled when SENS:EC:JUDG:TYPE is set to VOLT.

Use SENS:EC:VOLT:JUDG to set the upper limit.

Command

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

Parameter

Value:	ON(1)	Judge (default)
	OFF(0)	Not judge

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

Response: NR1

Example

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

SENS:EC:JUDG:VOLT:LOW

Sets the reference voltage for lower limit judgment in earth continuity tests (AC).

This setting is enabled when SENS:EC:VOLT:JUDG:LOW:STAT is set to ON.

Command

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

Unit: V

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

Response: NR3

Example

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

SENS:EC:JUDG:VOLT:LOW:STAT

Sets whether to judge with the lower voltage limit in earth continuity tests (AC).

This setting is enabled when SENS:EC:JUDG:TYPE is set to VOLT.

Use SENS:EC:VOLT:JUDG:LOW to set the lower limit.

Command

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

Parameter

Value:	ON(1)	Judge
	OFF(0)	Not judge (default)

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

Response: NR1

Example

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

SENS:EC:TERM:CCH

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

Command

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

```
SENSe:EC[:AC]:TERMinals:CCHeck[:STATe]?
```

Parameter

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

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

Response: NR1

Example

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

SENS:EC:TERM:WIRE

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

Command

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

```
SENSe:EC[:AC]:TERMinals:WIRE?
```

Parameter

Value:	4	Four-terminal wiring (default)
	2	Two-terminal wiring

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

Response: NR1

Example

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

SENS:EC:DC Command

SENS:EC:DC:JUDG

Sets the reference resistance for upper limit judgment in earth continuity tests (DC).

This setting is enabled when SENS:EC:DC:JUDG:STAT is set to ON.

Command

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

Unit: OHM

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

Response: NR3

Example

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

SENS:EC:DC:JUDG:STAT

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

This setting is enabled when SENS:EC:DC:JUDG:TYPE is set to RES.

Use SENS:EC:DC:JUDG:LOW to set the upper limit.

Command

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

Parameter

Value:	ON(1)	Judge (default)
	OFF(0)	Not judge

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

Response: NR1

Example

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

SENS:EC:DC:JUDG:LOW

Sets the reference resistance for lower limit judgment in earth continuity tests (DC).

This setting is enabled when SENS:EC:DC:JUDG:LOW:STAT is set to ON.

Command

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

Unit: OHM

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

Response: NR3

Example

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

SENS:EC:DC:JUDG:LOW:STAT

Sets whether to judge with the lower resistance limit in earth continuity tests (DC).

This setting is enabled when SENS:EC:DC:JUDG:TYPE is set to RES.

Use SENS:EC:DC:JUDG:LOW to set the lower limit.

Command

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

Parameter

Value:	ON(1)	Judge
	OFF(0)	Not judge (default)

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

Response: NR1

Example

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

SENS:EC:DC:JUDG:TYPE

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

Command

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

```
SENSe:EC:DC:JUDGment:TYPE?
```

Parameter

Value:	RESistance	Judge using resistance (default)
	VOLTage	Judge using voltage

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

Response: character

Example

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

SENS:EC:DC:JUDG:VOLT

Sets the reference voltage for upper limit judgment in earth continuity tests (DC).

This setting is enabled when SENS:EC:DC:VOLT:JUDG:STAT is set to ON.

Command

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

Unit: V

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

Response: NR3

Example

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

SENS:EC:DC:JUDG:VOLT:STAT

Sets whether to judge with the upper voltage limit in earth continuity tests (DC).

This setting is enabled when SENS:EC:DC:JUDG:TYPE is set to VOLT.

Use SENS:DC:EC:VOLT:JUDG to set the upper limit.

Command

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

Parameter

Value:	ON(1)	Judge (default)
	OFF(0)	Not judge

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

Response: NR1

Example

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

SENS:EC:DC:JUDG:VOLT:LOW

Sets the reference voltage for lower limit judgment in earth continuity tests (DC).

This setting is enabled when SENS:EC:DC:VOLT:JUDG:LOW:STAT is set to ON.

Command

```
SENSe:EC:DC:JUDGment:VOLTage:LOWer <numeric>
SENSe:EC:DC:JUDGment:VOLTage:LOWer?
```

Unit: V

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

Response: NR3

Example

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

SENS:EC:DC:JUDG:VOLT:LOW:STAT

Sets whether to judge with the lower voltage limit in earth continuity tests (DC).

This setting is enabled when SENS:EC:DC:JUDG:TYPE is set to VOLT.

Use SENS:EC:DC:VOLT:JUDG:LOW to set the lower limit.

Command

```
SENSe:EC:DC:JUDGment:VOLTage:LOWer:STATe <boolean>
SENSe:EC:DC:JUDGment:VOLTage:LOWer:STATe?
```

Parameter

Value:	ON(1)	Judge
	OFF(0)	Not judge (default)

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

Response: NR1

Example

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

SENS:EC:DC:TERM:CCH

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

Command

```
SENSe:EC:DC:TERMinals:CCHeck[:STATe] <boolean>
SENSe:EC:DC:TERMinals:CCHeck[:STATe]?
```

Parameter

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

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

Response: NR1

Example

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

SENS:EC:DC:TERM:WIRE

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

Command

```
SENSe:EC:DC:TERMinals:WIRE {4|2}
SENSe:EC:DC:TERMinals:WIRE?
```

Parameter

Value:	4	Four-terminal wiring (default)
	2	Two-terminal wiring

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

Response: NR1

Example

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

SENSe:IR Command

This is a subsystem for setting the insulation resistance test (IR) conditions.

SENS:IR:CURR:FILT:LPAS:STAT

Enables or disables the low-pass filter for insulation resistance tests.

Command

```
SENSe:IR:CURRent:FILTer:LPASs:STATe <boolean>
```

```
SENSe:IR:CURRent:FILTer:LPASs:STATe?
```

Parameter

Value:	ON(1)	The low-pass filter is enabled.
	OFF(0)	The low-pass filter is disabled. (default)

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

Response: NR1

Example

```
SENS:IR:CURR:FILT:LPAS:STAT ON
```

SENS:IR:JUDG

Sets the reference resistance for upper limit judgment in insulation resistance tests.

This setting is enabled when SENS:IR:JUDG:STAT is set to ON.

Command

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

Unit: OHM

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

Response: NR3

Example

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

SENS:IR:JUDG:STAT

Sets whether to judge with the upper resistance limit in insulation resistance tests.

This setting is enabled when SENS:IR:JUDG:TYPE is set to RES.

Use SENS:IR:JUDG to set the upper limit.

Command

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

Parameter

Value:	ON(1)	Judge
	OFF(0)	Not judge (default)

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

Response: NR1

Example

```
SENS:IR:JUDG:STAT ON
```

SENS:IR:JUDG:CURR

Sets the reference current for upper limit judgment in insulation resistance tests.

This setting is enabled when SENS:IR:JUDG:CURR:STAT is set to ON.

Command

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

Unit: A

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

Response: NR3

Example

```
SENS:IR:JUDG:CURR 1MA
```

SENS:IR:JUDG:CURR:STAT

Sets whether to judge with the upper current limit in insulation resistance tests.

This setting is enabled when SENS:IR:JUDG:TYPE is set to CURR.

Use SENS:IR:JUDG:CURR to set the upper limit.

Command

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

Parameter

Value:	ON(1)	Judge (default)
	OFF(0)	Not judge

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

Response: NR1

Example

```
SENS:IR:JUDG:CURR:STAT ON
```

SENS:IR:JUDG:CURR:LOW

Sets the reference current for lower limit judgment in insulation resistance tests.

This setting is enabled when SENS:IR:JUDG:CURR:LOW:STAT is set to ON.

Command

```
SENSe:IR:JUDGment:CURRent:LOWer <numeric>
SENSe:IR:JUDGment:CURRent:LOWer?
```

Unit: A

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

Response: NR3

Example

```
SENS:IR:JUDG:CURR:LOW 1MA
```

SENS:IR:JUDG:CURR:LOW:STAT

Sets whether to judge with the lower current limit in insulation resistance tests.

This setting is enabled when SENS:IR:JUDG:TYPE is set to CURR.

Use SENS:IR:JUDG:CURR:LOW to set the lower limit.

Command

```
SENSe:IR:JUDGment:CURRent:LOWer:STATe <boolean>
SENSe:IR:JUDGment:CURRent:LOWer:STATe?
```

Parameter

Value:	ON(1)	Judge
	OFF(0)	Not judge (default)

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

Response: NR1

Example

```
SENS:IR:JUDG:CURR:LOW:STAT ON
```

SENS:IR:JUDG:DEL

Sets the time until starting upper limit judgment.

This setting is enabled when SENS:IR:JUDG:DEL:AUTO? is set to OFF.

Command

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

Unit: S

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

Response: NR3

Example

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

SENS:IR:JUDG:DEL:AUTO

Sets whether to make the judgment delay automatic.

If you do not set it to automatic, set the time until starting judgment with SENS:IR:-JUDG:DEL.

Command

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

Parameter

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

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

Response: NR1

Example

```
SENS:IR:JUDG:DEL:AUTO ON
```

SENS:IR:JUDG:LOW

Sets the reference resistance for lower limit judgment in insulation resistance tests.

This setting is enabled when SENS:IR:JUDG:LOW:STAT is set to ON.

Command

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

Unit: OHM

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

Response: NR3

Example

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

SENS:IR:JUDG:LOW:STAT

Sets whether to judge with the lower resistance limit in insulation resistance tests.

This setting is enabled when SENS:IR:JUDG:TYPE is set to RES.

Use SENS:IR:JUDG:LOW to set the lower limit.

Command

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

Parameter

Value:	ON(1)	Judge (default)
	OFF(0)	Not judge

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

Response: NR1

Example

```
SENS:IR:JUDG:LOW:STAT ON
```

SENS:IR:JUDG:TYPE

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

Command

```
SENSe:IR:JUDGment:TYPE <character>
```

```
SENSe:IR:JUDGment:TYPE?
```

Parameter

Value:	RESistance	Judge using resistance (default)
	CURRent	Judge using current

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

Response: character

Example

```
SENS:IR:JUDG:TYPE RES
```

SENS:IR:TERM:GRO

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

Command

```
SENSe:IR:TERMinals:GROund <character>
```

```
SENSe:IR:TERMinals:GROund?
```

Parameter

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

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

Response: character

Example

```
SENS:IR:TERM:GRO GUAR
```

SENSe:MET Command

This is a subsystem for setting the meter mode (MET) test conditions.

SENS:MET:CURR:MODE

Sets the current measurement mode in meter mode.

Command

```
SENSe:METer:CURRent:MODE <character>
```

```
SENSe:METer:CURRent:MODE?
```

Parameter

Value:	ACDC	Measures the DC component and AC component with true rms values (default)
	AC	Measures only the AC component with true rms values
	DC	Measures only the DC component
	PEAK	Measures waveform peak values

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

Response: character

Example

```
SENS:MET:CURR:MODE AC
```

SENS:MET:NETW

Sets the measurement circuit network to use in meter mode.

Command

```
SENSe:METer:NETWork <character>
SENSe:METer:NETWork?
```

Parameter

Value:	A	IEC60990 Fig. 3 U1 measurement (default)
	B-U1	IEC60990 Fig. 4 U2 measurement
	B-U2	IEC60990 Fig. 4 U1 measurement
	C	IEC60990 Fig. 5 U3 measurement
	D	Electrical Appliances and Materials Safety Act single frequency
	E	Electrical Appliances and Materials Safety Act multiple frequencies
	F	IEC61029, UL
	G	IEC60745
	H	IEC61010-1, IEC61010-1 Wet condition
	I	IEC60601-1
	J	For calibration. Do not use.

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

Response: character

Example

```
SENS:MET:NETW A
```

SENS:MET:RANG

Sets the meter mode measurement range.

When set, auto range is turned off (SENS:MET:RANG:AUTO OFF).

Command

```
SENSe:METer[:VOLTage]:RANGe <numeric>
SENSe:METer[:VOLTage]:RANGe?
```

Parameter

Value:	42mV	
	420mV	
	4.2V	
	42V	(default)
Unit:	V	

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

Response: NR3

Example

```
SENS:MET:RANG 420MV
```

SENS:MET:RANG:AUTO

Sets whether to set the meter mode measurement range to auto.

If set to off, use SENS:MET:RANG to set the measurement range.

Command

```
SENSe:METer[:VOLTage]:RANGe:AUTO <boolean>
```

```
SENSe:METer[:VOLTage]:RANGe:AUTO?
```

Parameter

Value:	ON(1)	Switches the range automatically according to the measured values (default)
	OFF(0)	Fixed measurement range

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

When you send the SENS:MET:RANG command, this setting is set to OFF.

Response: NR1

Example

```
SENS:MET:RANG:AUTO ON
```

SENS:MET:SELV

Sets the SELV voltage of meter mode.

This setting is enabled when SENS:MET:SELV:STAT is set to ON.

Command

```
SENSe:METer:SELVoltage <numeric>
SENSe:METer:SELVoltage?
```

Unit: V

Settings are reset to default when the *RST command is sent. (30 V)

Response：NR3

Example

```
SENS:MET:SELV 10
```

SENS:MET:SELV:STAT

Sets whether the SELV voltage is used.

Use SENS:MET:SELV to set the SELV voltage.

Command

```
SENSe:METer:SELVoltage:STATe <boolean>
SENSe:METer:SELVoltage:STATe?
```

Parameter

Value:	ON(1)	Set (default)
	OFF(0)	Not set

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

Response：NR1

Example

```
SENS:MET:SELV:STAT ON
```

SENS:MET:TERM

Sets the touch mode of meter mode.

Command

```
SENSe:METer:TERMinal[:AB] <character>
SENSe:METer:TERMinal[:AB]?
```

Parameter

Value:	NETWork	Measures the touch current across terminals A and B (default)
	VOLTmeter	Measures the voltage across terminals A and B

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

Response：character

Example

```
SENS:MET:TERM NETW
```

SENSe:PAT Command

This is a subsystem for setting the patient leakage current test (PAT) conditions.

SENS:PAT:BAND

Sets whether to expand the band of the internal voltmeter of this product in patient leakage current tests.

Command

```
SENSe:PATient[:VOLTage]:BANDwidth <character>
SENSe:PATient[:VOLTage]:BANDwidth?
```

Parameter

Value:	NORMal	Not expand (default)
	EXPand	Expand

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

Response：character

Example

```
SENS:PAT:BAND NORM
```

SENS:PAT:COND

Sets the single fault condition for patient leakage current tests.

Use SENS:PAT:COND:FAUL to set the disconnected condition.

Command

```
SENSe:PATient:CONDition <character>
```

```
SENSe:PATient:CONDition?
```

Parameter

Value:	NORMal	Normal condition (default)
	FAULt	Disconnected condition

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

Response: character

Example

```
SENS:PAT:COND NORM
```

SENS:PAT:COND:FAUL

Sets the disconnected condition at fault for patient leakage current tests.

Use SENS:PAT:COND to set the fault condition.

Command

```
SENSe:PATient:CONDition:FAULt <character>
```

```
SENSe:PATient:CONDition:FAULt?
```

Parameter

Value:	NEUTral	Disconnected power supply line (neutral) (default)
	PEARth	Disconnected earth line

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

Response: character

Example

```
SENS:PAT:COND:FAUL NEUT
```

SENS:PAT:CURR:MODE

Sets the current measurement mode in patient leakage current tests.

Command

```
SENSe:PATient:CURRent:MODE <character>
SENSe:PATient:CURRent:MODE?
```

Parameter

Value:	ACDC	Measures the DC component and AC component with true rms values (default)
	AC	Measures only the AC component with true rms values
	DC	Measures only the DC component
	PEAK	Measures waveform peak values

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

Response: character

Example

```
SENS:PAT:CURR:MODE AC
```

SENS:PAT:JUDG

Sets the reference current for upper limit judgment in patient leakage current tests.

This setting is enabled when SENS:PAT:JUDG:STAT is set to ON.

Command

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

Unit: A

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

Response: NR3

Example

```
SENS:PAT:JUDG 10UA
```

SENS:PAT:JUDG:STAT

Sets whether to judge with the upper current limit in patient leakage current tests.

Use SENS:PAT:JUDG to set the upper limit.

Command

```
SENSe:PATient:JUDGment[:CURRent][:UPPer]:STATe <boolean>
SENSe:PATient:JUDGment[:CURRent][:UPPer]:STATe?
```

Parameter

Value:	ON(1)	Judge (default)
	OFF(0)	Not judge

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

Response: NR1

Example

```
SENS:PAT:JUDG:STAT ON
```

SENS:PAT:JUDG:DEL

Set the time until starting judgments in patient leakage current tests.

This setting is enabled when SENS:PAT:JUDG:DEL:STAT is set to ON.

Command

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

Unit: S

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

Response: NR3

Example

```
SENS:PAT:JUDG:DEL 5S
```

SENS:PAT:JUDG:DEL:STAT

Sets whether to set the judgment delay in patient leakage current tests.

Use SENS:PAT:JUDG:DEL to set the judgment delay.

Command

```
SENSe:PATient:JUDGment:DELay:STATe <boolean>
SENSe:PATient:JUDGment:DELay:STATe?
```

Parameter

Value:	ON(1)	Set
	OFF(0)	Not set (default)

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

Response: NR1

Example

```
SENS:PAT:JUDG:DEL:STAT ON
```

SENS:PAT:JUDG:LOW

Sets the reference current for lower limit judgment in patient leakage current tests.

This setting is enabled when SENS:PAT:JUDG:LOW:STAT is set to ON.

Command

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

Unit: A

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

Response: NR3

Example

```
SENS:PAT:JUDG:LOW 10UA
```

SENS:PAT:JUDG:LOW:STAT

Sets whether to judge with the lower current limit in patient leakage current tests.

Use SENS:PAT:JUDG:LOW to set the lower limit.

Command

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

Parameter

Value:	ON(1)	Judge
	OFF(0)	Not judge (default)

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

Response: NR1

Example

```
SENS:PAT:JUDG:LOW:STAT ON
```

SENS:PAT:NETW

Sets the measurement circuit network that is compatible with the patient leakage current test standard.

The only network that can be used for patient leakage current tests is I (for IEC60601-1).

Command

```
SENSe:PATient:NETWork <character>
SENSe:PATient:NETWork?
```

Parameter

Value: I For IEC60601-1

Response: character

Example

```
SENS:PAT:NETW I
```

SENS:PAT:NETW:PROB

Sets the B terminal probe connection destination for patient leakage current tests.

The A terminal probe connection destination is a part applied to the patient.

Command

```
SENSe:PATient:NETWork:PROBe[:B] <character>
```

```
SENSe:PATient:NETWork:PROBe[:B]?
```

Parameter

Value:	PEARth	Measures the patient leakage current or the total patient leakage current across a part applied to the patient and earth. (default)
	T110pct	Measures the patient leakage current running across the F-type applied part and 110% terminal.
	PATient	Measures the patient measurement current across parts applied to the patient.

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

Response: character

Example

```
SENS:PAT:NETW:PROB PEAR
```

SENS:PAT:PROB:A

Queries the A terminal probe connection destination in patient leakage current tests.

Command

```
SENSe:PATient:NETWork:PROBe:A?
```

Response: character

Returns “PAT” (a part applied to the patient).

SENS:PAT:RANG:AUTO

Sets the measurement range for patient leakage current tests.

Command

```
SENSe:PATient[:VOLTage]:RANGe:AUTO <boolean>
```

```
SENSe:PATient[:VOLTage]:RANGe:AUTO?
```

Parameter

Value:	ON(1)	Switches the range automatically according to the measured values (default)
	OFF(0)	The measurement range is fixed Range 1 to 4 according to the Upper, and Measure Mode settings.

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

Response: NR1

Example

```
SENS:PAT:RANG:AUTO ON
```

SENS:PAT:TIM

Sets the test time for patient leakage current tests.

This setting is enabled when SENS:PAT:TIM:STAT is set to ON.

Command

```
SENSe:PATient:TIMer <numeric>
SENSe:PATient:TIMer?
```

Unit: S

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

Response: NR3

Example

```
SENS:PAT:TIM 10S
```

SENS:PAT:TIM:STAT

Sets whether to set the test time in patient leakage current tests.

Use SENS:PAT:TIM to set the test time.

Command

```
SENSe:PATient:TIMer:STATe <boolean>
SENSe:PATient:TIMer:STATe?
```

Parameter

Value:	ON(1)	Set (default)
	OFF(0)	Not set

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

Response: NR1

Example

```
SENS:PAT:TIM:STAT ON
```

SENSe:PCC Command

This is a subsystem for setting the protective conductor current test (PCC) conditions.

SENS:PCC:BAND

Sets whether to expand the band of the internal voltmeter of this product in protective conductor current tests.

Command

```
SENSe:PCCurrent[:VOLTage]:BANDwidth <character>
SENSe:PCCurrent[:VOLTage]:BANDwidth?
```

Parameter

Value:	NORMal	Not expand (default)
	EXPand	Expand

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

Response：character

Example

```
SENS:PCC:BAND NORM
```

SENS:PCC:COND

Sets the single fault mode for protective conductor current tests.

Command

```
SENSe:PCCurrent:CONDition <character>
```

```
SENSe:PCCurrent:CONDition?
```

Parameter

Value:	NORMal	Normal condition (default)
	FAULt	Disconnected power supply line (neutral)

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

Response: character

Example

```
SENS:PCC:COND FAUL
```

SENS:PCC:COND:FAUL

Queries the disconnected condition at fault for protective conductor current tests.

Command

```
SENSe:PCCurrent:CONDition:FAULt?
```

Response: character

Returns “NEUT” (disconnected condition of the power supply line (neutral)).

SENS:PCC:CURR:MODE

Sets the current measurement mode in protective conductor current tests.

Command

```
SENSe:PCCurrent:CURRent:MODE <character>
```

```
SENSe:PCCurrent:CURRent:MODE?
```

Parameter

Value:	ACDC	Measures the DC component and AC component with true rms values (default)
	AC	Measures only the AC component with true rms values
	DC	Measures only the DC component
	PEAK	Measures waveform peak values

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

Response: character

Example

```
SENS:PCC:CURR:MODE AC
```

SENS:PCC:JUDG

Sets the reference current for upper limit judgment in protective conductor current tests.

This setting is enabled when SENS:PCC:JUDG:STAT is set to ON.

Command

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

Unit: A

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

Response: NR3

Example

```
SENS:PCC:JUDG 10UA
```

SENS:PCC:JUDG:STAT

Sets whether to judge with the upper current limit in protective conductor current tests.

Use SENS:PCC:JUDG to set the upper limit.

Command

```
SENSe:PCCurrent:JUDGment[:CURRent][:UPPer]:STATe <boolean>
SSENSe:PCCurrent:JUDGment[:CURRent][:UPPer]:STATe?
```

Parameter

Value:	ON(1)	Judge (default)
	OFF(0)	Not judge

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

Response: NR1

Example

```
SENS:PCC:JUDG:STAT ON
```

SENS:PCC:JUDG:DEL

Sets the time until starting judgments in protective conductor current tests.

This setting is enabled when SENS:PCC:JUDG:DEL:STAT is set to ON.

Command

```
SENSe:PCCurrent:JUDGment:DELay <numeric>
```

```
SENSe:PCCurrent:JUDGment:DELay?
```

Unit: S

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

Response: NR3

Example

```
SENS:PCC:JUDG:DEL 5S
```

SENS:PCC:JUDG:DEL:STAT

Sets whether to set the judgment delay in protective conductor current tests.

Use SENS:PCC:JUDG:DEL to set the judgment delay.

Command

```
SENSe:PCCurrent:JUDGment:DELay:STATe <boolean>
```

```
SENSe:PCCurrent:JUDGment:DELay:STATe?
```

Parameter

Value:	ON(1)	Set
	OFF(0)	Not set (default)

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

Response: NR1

Example

```
SENS:PCC:JUDG:DEL:STAT ON
```

SENS:PCC:JUDG:LOW

Sets the reference current for lower limit judgment in protective conductor current tests.

This setting is enabled when SENS:PCC:JUDG:LOW:STAT is set to ON.

Command

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

Unit: A

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

Response: NR3

Example

```
SENS:PCC:JUDG:LOW 10UA
```

SENS:PCC:JUDG:LOW:STAT

Sets whether to judge with the lower current limit in protective conductor current tests.

Use SENS:PCC:JUDG:LOW to set the lower limit.

Command

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

Parameter

Value:	ON(1)	Judge
	OFF(0)	Not judge (default)

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

Response: NR1

Example

```
SENS:PCC:JUDG:LOW:STAT ON
```

SENS:PCC:NETW

Sets the measurement circuit network to use in protective conductor current tests.

Command

```
SENSe:PCCurrent:NETWork <character>
SENSe:PCCurrent:NETWork?
```

Parameter

Value:	I	Ground leakage current measurement of medical instruments
	PCC-1	Protective conductor current measurement (default)
	PCC-2	IEC60598-1

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

Response: character

Example

```
SENS:PCC:NETW 1
```

SENS:PCC:RANG:AUTO

Sets the measurement range for protective conductor current tests.

Command

```
SENSe:PCCurrent[:VOLTage]:RANGe:AUTO <boolean>
```

```
SENSe:PCCurrent[:VOLTage]:RANGe:AUTO?
```

Parameter

Value:	ON(1)	Switches the range automatically according to the measured values (default)
	OFF(0)	The measurement range is fixed Range 1 to 4 according to the Network, Upper, and Measure Mode settings.

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

Response: NR1

Example

```
SENS:PCC:RANG:AUTO ON
```

SENS:PCC:TIM

Sets the test time for protective conductor current tests.

This setting is enabled when SENS:PCC:TIM:STAT is set to ON.

Command

```
SENSe:PCCurrent:TIMer <numeric>
SENSe:PCCurrent:TIMer?
```

Unit: S

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

Response: NR3

Example

```
SENS:PCC:TIM 10S
```

SENS:PCC:TIM:STAT

Sets whether to set the test time in protective conductor current tests.

Use SENS:PCC:TIM to set the test time.

Command

```
SENSe:PCCurrent:TIMer:STATe <boolean>
SENSe:PCCurrent:TIMer:STATe?
```

Parameter

Value:	ON(1)	Set (default)
	OFF(0)	Not set

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

Response: NR1

Example

```
SENS:PCC:TIM:STAT ON
```

SENSe:TC Command

This is a subsystem for setting the touch current test (TC) conditions.

SENS:TC:BAND

Sets whether to expand the band of the internal voltmeter of this product in touch current tests.

Command

```
SENSe:TC[:VOLTage]:BANDwidth <character>
SENSe:TC[:VOLTage]:BANDwidth?
```

Parameter

Value:	NORMal	Not expand (default)
	EXPand	Expand

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

Response：character

Example

```
SENS:TC:BAND NORM
```

SENS:TC:COND

Sets the single fault condition for touch current tests.

Use SENS:TC:COND:FAUL to set the disconnected condition.

Command

```
SENSe:TC:CONDition <character>
SENSe:TC:CONDition?
```

Parameter

Value:	NORMal	Normal condition (default)
	FAULt	Disconnected condition

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

Response: character

Example

```
SENS:TC:COND NORM
```

SENS:TC:COND:FAUL

Sets the disconnected condition at fault for touch current tests.

Use SENS:TC:COND to set the fault condition.

Command

```
SENSe:TC:CONDition:FAULt <character>
SENSe:TC:CONDition:FAULt?
```

Parameter

Value:	NEUTral	Disconnected power supply line (neutral) (default)
	PEARth	Disconnected protective ground wire condition.

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

Response: character

Example

```
SENS:TC:COND:FAUL NEUT
```

SENS:TC:CURR:MODE

Sets the current measurement mode in touch current tests.

Command

```
SENSe:TC:CURRent:MODE <character>
```

```
SENSe:TC:CURRent:MODE?
```

Parameter

Value:	ACDC	Measures the DC component and AC component with true rms values (default)
	AC	Measures only the AC component with true rms values
	DC	Measures only the DC component
	PEAK	Measures waveform peak values

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

Response: character

Example

```
SENS:TC:CURR:MODE AC
```

SENS:TC:JUDG

Sets the reference current for upper limit judgment in touch current tests.

This setting is enabled when SENS:TC:JUDG:STAT is set to ON.

Command

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

Unit: A

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

Response: NR3

Example

```
SENS:TC:JUDG 10UA
```

SENS:TC:JUDG:STAT

Sets whether to judge with the upper current limit in touch current tests.

Use SENS:TC:JUDG to set the upper limit.

Command

```
SENSe:TC:JUDGment[:CURRent][:UPPer]:STATe <boolean>
SENSe:TC:JUDGment[:CURRent][:UPPer]:STATe?
```

Parameter

Value:	ON(1)	Judge (default)
	OFF(0)	Not judge

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

Response: NR1

Example

```
SENS:TC:JUDG:STAT ON
```

SENS:TC:JUDG:DEL

Set the time until starting judgments in touch current tests.

This setting is enabled when SENS:TC:JUDG:DEL:STAT is set to ON.

Command

```
SENSe:TC:JUDGment:DELay <numeric>
```

```
SENSe:TC:JUDGment:DELay?
```

Unit: S

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

Response: NR3

Example

```
SENS:TC:JUDG:DEL 5S
```

SENS:TC:JUDG:DEL:STAT

Sets whether to set the judgment delay in touch current tests.

Use SENS:TC:JUDG:DEL to set the judgment delay.

Command

```
SENSe:TC:JUDGment:DELay:STATe <boolean>
```

```
SENSe:TC:JUDGment:DELay:STATe?
```

Parameter

Value:	ON(1)	Set
	OFF(0)	Not set (default)

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

Response: NR1

Example

```
SENS:TC:JUDG:DEL:STAT ON
```

SENS:TC:JUDG:LOW

Sets the reference current for lower limit judgment in touch current tests.

This setting is enabled when SENS:TC:JUDG:LOW:STAT is set to ON.

Command

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

Unit: A

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

Response: NR3

Example

```
SENS:TC:JUDG:LOW 10UA
```

SENS:TC:JUDG:LOW:STAT

Sets whether to judge with the lower current limit in touch current tests.

Use SENS:TC:JUDG:LOW to set the lower limit.

Command

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

Parameter

Value:	ON(1)	Judge
	OFF(0)	Not judge (default)

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

Response: NR1

Example

```
SENS:TC:JUDG:LOW:STAT ON
```

SENS:TC:NETW

Sets the measurement circuit network to use in touch current tests.

Command

```
SENSe:TC:NETWork <character>
```

```
SENSe:TC:NETWork?
```

Parameter

Value:	A	IEC60990 Fig. 3 U1 measurement (default)
	B-U1	IEC60990 Fig. 4 U2 measurement
	B-U2	IEC60990 Fig. 4 U1 measurement
	C	IEC60990 Fig. 5 U3 measurement
	D	Electrical Appliances and Materials Safety Act single frequency
	E	Electrical Appliances and Materials Safety Act multiple frequencies
	F	IEC61029, UL
	G	IEC60745
	H	IEC61010-1, IEC61010-1 Wet condition
	I	IEC60601-1
	J	For calibration. Do not use.

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

Response: character

Example

```
SENS:TC:NETW A
```

SENS:TC:NETW:PROB

Sets the B terminal probe connection destination for touch current tests.

The A terminal probe connection destination is the enclosure.

Command

```
SENSe:TC:NETWork:PROBe[:B] <character>
```

```
SENSe:TC:NETWork:PROBe[:B]?
```

Parameter

Value:	PEARth	Measures across the enclosure and earth. (default)
	ENCLosure	Measures across two points on the enclosure.
	LIVe	Measures across the enclosure and power supply line (live).
	NEUTral	Measures across the enclosure and power supply line (neutral).

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

Response: character

Example

```
SENS:TC:NETW:PROB PEAR
```

SENS:TC:NETW:PROB:A

Queries the A terminal probe connection destination in touch current tests.

Command

```
SENSe:TC:NETWork:PROBe:A?
```

Response: character

ENCL (enclosure) is returned.

SENS:TC:RANG:AUTO

Sets the measurement range for touch current tests.

Command

```
SENSe:TC[:VOLTage]:RANGe:AUTO <boolean>
SENSe:TC[:VOLTage]:RANGe:AUTO?
```

Parameter

Value:	ON(1)	Switches the range automatically according to the measured values (default)
	OFF(0)	The measurement range is fixed Range 1 to 4 according to the Network, Upper, and Measure Mode settings.

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

Response: NR1

Example

```
SENS:TC:RANG:AUTO ON
```

SENS:TC:TIM

Sets the test time for touch current tests.

This setting is enabled when SENS:TC:TIM:STAT is set to ON.

Command

```
SENSe:TC:TIMer <numeric>
SENSe:TC:TIMer?
```

Unit: S

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

Response: NR3

Example

```
SENS:TC:TIM 10S
```

SENS:TC:TIM:STAT

Sets whether to set the test time in touch current tests.

Use SENS:TC:TIM to set the test time.

Command

```
SENSe:TC:TIMer:STATe <boolean>
SENSe:TC:TIMer:STATe?
```

Parameter

Value:	ON(1)	Set (default)
	OFF(0)	Not set

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

Response: NR1

Example

```
SENS:TC:TIM:STAT ON
```

[SOURce:] command

FUNC

Set the test mode.

You can only set the test mode to one of the test modes that is available on your model.

Command

```
[SOURce:]FUNCtion[:MODE] <character>
```

```
[SOURce:]FUNCtion[:MODE]?
```

Parameter

Value:	ACW	AC withstanding voltage (default)
	DCW	DC withstanding voltage
	IR	Insulation resistance
	ECac	Earth continuity (AC)
	ECDC	Earth continuity (DC)
	TC	Touch current
	PCC	Protective conductor current
	METer	Meter mode
	PATient	Patient leakage current
	PROGram	Auto test

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

Response: character

Example

```
FUNC ACW
```

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

ACW:VOLT

Sets the test voltage for AC withstanding voltage tests.

Command

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

Unit: V

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

Response: NR3

Example

```
ACW:VOLT 1000V
```

ACW:VOLT:FREQ

Sets the test voltage frequency for AC withstanding voltage tests.

Command

```
[SOURce:][ACW:]VOLTage:FREQuency <numeric>
[SOURce:][ACW:]VOLTage:FREQuency?
```

Unit: Hz

Settings are reset to default when the *RST command is sent. (50 HZ)

Response: NR3

Example

```
ACW:VOLT:FREQ 50HZ
```

ACW:VOLT:PROT

Sets the limit voltage for AC withstanding voltage tests.

Command

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

Unit: V

Settings are reset to default when the *RST command is sent. (5500 V)

Response: NR3

Example

```
ACW:VOLT:PROT 1.5KV
```

ACW:VOLT:STAR

Sets the start voltage as a percentage for AC withstanding voltage tests.

This setting is enabled when VOLT:STAR:STAT is set to ON.

Command

```
[SOURce:][ACW:]VOLTage:STARt[:LEVel] <numeric>
[SOURce:][ACW:]VOLTage:STARt[:LEVel]?
```

Unit: PCT

Settings are reset to default when the *RST command is sent. (50 PCT)

Response: NR3

Example

```
ACW:VOLT:STAR 50PCT
```

ACW:VOLT:STAR:STAT

Sets whether to set the start voltage for AC withstanding voltage tests.

Use VOLT:STAR to set the start voltage.

Command

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

Parameter

Value:	ON(1)	Set
	OFF(0)	Not set (default)

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

Response: NR1

Example

```
ACW:VOLT:STAR:STAT ON
```

ACW:VOLT:SWE:FALL:TIM

Sets the voltage fall time for AC withstanding voltage tests.

This setting is enabled when VOLT:SWE:FALL:TIM:STAT is set to ON.

Command

```
[SOURce:][ACW:]VOLTage:SWEep:FALL:TIMer <numeric>
[SOURce:][ACW:]VOLTage:SWEep:FALL:TIMer?
```

Unit: S

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

Response: NR3

Example

```
ACW:VOLT:SWE:FALL:TIM 0.1S
```

ACW:VOLT:SWE:FALL:TIM:STAT

Sets whether to set the voltage fall time for AC withstanding voltage tests.

Use VOLT:SWE:FALL:TIM to set the voltage fall time.

Command

```
[SOURce:][ACW:]VOLTage:SWEep:FALL:TIMer:STATe <boolean>
[SOURce:][ACW:]VOLTage:SWEep:FALL:TIMer:STATe?
```

Parameter

Value:	ON(1)	Set
	OFF(0)	Not set (default)

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

Response: NR1

Example

```
ACW:VOLT:SWE:FALL:TIM:STAT ON
```

ACW:VOLT:SWE:TIM

Sets the voltage rise time for AC withstanding voltage tests.

Command

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

```
[SOURce:][ACW:]VOLTage:SWEep[:RISE]:TIMer?
```

Unit: S

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

Response: NR3

Example

```
ACW:VOLT:SWE:TIM 1S
```

ACW:VOLT:TIM

Sets the test time for AC withstanding voltage tests.

This setting is enabled when VOLT:TIM:STAT is set to ON.

Command

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

Unit: S

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

Response: NR3

Example

```
ACW:VOLT:TIM 60S
```

ACW:VOLT:TIM:STAT

Sets whether to set the test time for AC withstanding voltage tests.

Use VOLT:TIM to set the test time.

Command

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

Parameter

Value:	ON(1)	Set (default)
	OFF(0)	Not set

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

Response: NR1

Example

```
ACW:VOLT:TIM:STAT ON
```

[SOURce:]DCW Command

DCW:VOLT

Sets the test voltage for DC withstanding voltage tests.

Command

```
[SOURce:]DCW:VOLTage[:LEVel][:IMMediate][:AMPlitude] <numeric>
[SOURce:]DCW:VOLTage[:LEVel][:IMMediate][:AMPlitude]?
```

Unit: V

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

Response: NR3

Example

```
DCW:VOLT 750V
```

DCW:VOLT:DISC:INT:STAT

Sets whether to discharge when interlock is activated in DC withstanding voltage tests.

Command

```
[SOURce:]DCW:VOLTage:DISCharge:INTerlock:STATe <boolean>
[SOURce:]DCW:VOLTage:DISCharge:INTerlock:STATe?
```

Parameter

Value:	ON(1)	Discharge (default)
	OFF(0)	Not discharge

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

Response：NR1

Example

```
DCW:VOLT:DISC:INT:STAT ON
```

DCW:VOLT:DISC:TIM

Sets the discharge time for DC withstanding voltage tests.

Command

```
[SOURce:]DCW:VOLTage:DISCharge:TIMer[:MINimum] <numeric>
```

```
[SOURce:]DCW:VOLTage:DISCharge:TIMer[:MINimum]?
```

Unit: S

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

Response: NR3

Example

```
DCW:VOLT:DISC:TIM 10S
```

DCW:VOLT:PROT

Sets the limit voltage for DC withstanding voltage tests.

Command

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

Unit: V

Settings are reset to default when the *RST command is sent. (7500 V)

Response: NR3

Example

```
DCW:VOLT:PROT 1500V
```

DCW:VOLT:STAR

Sets the start voltage as a percentage for DC withstanding voltage tests.

This setting is enabled when DCW:VOLT:STAR:STAT is set to ON.

```
[SOURce:]DCW:VOLTage:STARt[:LEVel] <numeric>
```

```
[SOURce:]DCW:VOLTage:STARt[:LEVel]?
```

Unit: PCT

Settings are reset to default when the *RST command is sent. (50 PCT)

Response: NR3

Example

```
DCW:VOLT:STAR 50PCT
```

DCW:VOLT:STAR:STAT

Sets whether to set the start voltage for DC withstanding voltage tests.

Use DCW:VOLT:STAR to set the start voltage.

Command

```
[SOURce:]DCW:VOLTage:STARt:STATe <boolean>
```

```
[SOURce:]DCW:VOLTage:STARt:STATe?
```

Parameter

Value:	ON(1)	Set
	OFF(0)	Not set (default)

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

Response：NR1

Example

```
DCW:VOLT:STAR:STAT ON
```

DCW:VOLT:SWE:FALL:TIM

Sets the voltage fall time for DC withstanding voltage tests.

This setting is enabled when DCW:VOLT:SWE:FALL:STAT is set to ON.

Command

```
[SOURce:]DCW:VOLTage:SWEep:FALL:TIMer <numeric>
[SOURce:]DCW:VOLTage:SWEep:FALL:TIMer?
```

Unit: S

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

Response: NR3

Example

```
DCW:VOLT:SWE:FALL:TIM 0.1S
```

DCW:VOLT:SWE:FALL:TIM:STAT

Sets whether to set the voltage fall time for DC withstanding voltage tests.

Use DCW:VOLT:SWE:FALL to set the voltage fall time.

Command

```
[SOURce:]DCW:VOLTage:SWEep:FALL:TIMer:STATe <boolean>
[SOURce:]DCW:VOLTage:SWEep:FALL:TIMer:STATe?
```

Parameter

Value:	ON(1)	Set
	OFF(0)	Not set (default)

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

Response: NR1

Example

```
DCW:VOLT:SWE:FALL:TIM:STAT ON
```

DCW:VOLT:SWE:TIM

Sets the voltage rise time for DC withstanding voltage tests.

Command

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

```
[SOURce:]DCW:VOLTage:SWEep[:RISE]:TIMer?
```

Unit: S

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

Response: NR3

Example

```
DCW:VOLT:SWE:TIM 0.1
```

DCW:VOLT:TIM

Sets the test time for DC withstanding voltage tests.

This setting is enabled when DCW:VOLT:TIM:STAT is set to ON.

Command

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

Unit: S

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

Response: NR3

Example

```
DCW:VOLT:TIM 500MS
```

DCW:VOLT:TIM:STAT

Sets whether to set the test time for DC withstanding voltage tests.

Use DCW:VOLT:TIM to set the test time.

Command

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

Parameter

Value:	ON(1)	Set (default)
	OFF(0)	Not set

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

Response: NR1

Example

```
DCW:VOLT:TIM:STAT ON
```

EC:AC:CURR

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

Command

```
[SOURce:]EC:AC:CURRent[:LEVel][:IMMediate][:AMPlitude] <numeric>
[SOURce:]EC:AC:CURRent[:LEVel][:IMMediate][:AMPlitude]?
```

Unit: A

Settings are reset to default when the *RST command is sent. (3 A)

Response: NR3

Example

```
EC:AC:CURR 5
```

EC:AC:CURR:PROT

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

Command

```
[SOURce:]EC:AC:CURRent:PROTection[:LEVel][:UPPer] <numeric>
[SOURce:]EC:AC:CURRent:PROTection[:LEVel][:UPPer]?
```

Unit: A

Settings are reset to default when the *RST command is sent. (42 A)

Response: NR3

Example

```
EC:AC:CURR:PROT 40
```

EC:AC:CURR:SWE:FALL:TIM

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

This setting is enabled when EC:AC:CURR:SWE:FALL:TIM:STAT is set to ON.

Command

```
[SOURce:]EC:AC:CURRent:SWEep:FALL:TIMer <numeric>
```

```
[SOURce:]EC:AC:CURRent:SWEep:FALL:TIMer?
```

Unit: S

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

Response: NR3

Example

```
EC:AC:CURR:SWE:FALL:TIM 0.1S
```

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

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

EC:AC:CURR:SWE:FALL:TIM to set the current fall time.

Command

```
[SOURce:]EC:AC:CURRent:SWEep:FALL:TIMer:STATe <boolean>
```

```
[SOURce:]EC:AC:CURRent:SWEep:FALL:TIMer:STATe?
```

Parameter

Value:	ON(1)	Set
	OFF(0)	Not set (default)

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

Response: NR1

Example

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

EC:AC:CURR:SWE:TIM

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

Command

```
[SOURce:]EC:AC:CURRent:SWEep[:RISE]:TIMer <numeric>
[SOURce:]EC:AC:CURRent:SWEep[:RISE]:TIMer?
```

Unit: S

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

Response: NR3

Example

```
EC:AC:CURR:SWE:TIM 1
```

EC:AC:CURR:TIM

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

This setting is enabled when EC:AC:CURR:TIM:STAT is set to ON.

Command

```
[SOURce:]EC:AC:CURRent:TIMer <numeric>
[SOURce:]EC:AC:CURRent:TIMer?
```

Unit: S

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

Response: NR3

Example

```
EC:AC:CURR:TIM 5
```

EC:AC:CURR:TIM:STAT

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

Use EC:AC:CURR:TIM to set the test time.

Command

```
[SOURce:]EC:AC:CURRent:TIMer:STATe <boolean>
[SOURce:]EC:AC:CURRent:TIMer:STATe?
```

Parameter

Value:	ON(1)	Set (default)
	OFF(0)	Not set

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

Response: NR1

Example

```
EC:AC:CURR:TIM:STAT ON
```

EC:CURR:FREQ

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

Command

```
[SOURce:]EC[:AC]:CURRent:FREQuency <numeric>
```

```
[SOURce:]EC[:AC]:CURRent:FREQuency?
```

Unit: HZ

Settings are reset to default when the *RST command is sent. (50 HZ)

Response: NR3

Example

```
EC:CURR:FREQ 50HZ
```

EC:DC:CURR

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

Command

```
[SOURce:]EC:DC:CURRent[:LEVel][:IMMediate][:AMPlitude] <numeric>
```

```
[SOURce:]EC:DC:CURRent[:LEVel][:IMMediate][:AMPlitude]?
```

Unit: A

Settings are reset to default when the *RST command is sent. (3 A)

Response: NR3

Example

```
EC:DC:CURR 40
```

EC:DC:CURR:PROT

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

Command

```
[SOURce:]EC:DC:CURRent:PROTection[:LEVel][:UPPer] <numeric>
[SOURce:]EC:DC:CURRent:PROTection[:LEVel][:UPPer]?
```

Unit: A

Settings are reset to default when the *RST command is sent. (42 A)

Response: NR3

Example

```
EC:DC:CURR:PROT 40
```

EC:DC:CURR:SWE:FALL:TIM

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

This setting is enabled when EC:DC:CURR:SWE:FALL:TIM:STAT is set to ON.

Command

```
[SOURce:]EC:DC:CURRent:SWEep:FALL:TIMer <numeric>
[SOURce:]EC:DC:CURRent:SWEep:FALL:TIMer?
```

Unit: S

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

Response: NR3

Example

```
EC:DC:CURR:SWE:FALL:TIM 0.1S
```

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

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

EC:DC:CURR:SWE:FALL:TIM to set the current fall time.

Command

```
[SOURce:]EC:DC:CURRent:SWEep:FALL:TIMer:STATe <boolean>
[SOURce:]EC:DC:CURRent:SWEep:FALL:TIMer:STATe?
```

Parameter

Value:	ON(1)	Set
	OFF(0)	Not set (default)

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

Response: NR1

Example

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

EC:DC:CURR:SWE:TIM

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

Command

```
[SOURce:]EC:DC:CURRent:SWEep[:RISE]:TIMer <numeric>
```

```
[SOURce:]EC:DC:CURRent:SWEep[:RISE]:TIMer?
```

Unit: S

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

Response: NR3

Example

```
EC:DC:CURR:SWE:TIM 1
```

EC:DC:CURR:TIM

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

This setting is enabled when EC:DC:CURR:TIM:STAT is set to ON.

Command

```
[SOURce:]EC:DC:CURRent:TIMer <numeric>
[SOURce:]EC:DC:CURRent:TIMer?
```

Unit: S

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

Response: NR3

Example

```
EC:DC:CURR:TIM 500S
```

EC:DC:CURR:TIM:STAT

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

Use EC:DC:CURR:TIM to set the test time.

Command

```
[SOURce:]EC:DC:CURRent:TIMer:STATe <boolean>
[SOURce:]EC:DC:CURRent:TIMer:STATe?
```

Parameter

Value:	ON(1)	Set (default)
	OFF(0)	Not set

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

Response: NR1

Example

```
EC:DC:CURR:TIM:STAT ON
```

IR:TERM:POL

Queries the polarity of the power supplied to the output terminals in insulation resistance tests.

Command

```
[SOURce:]IR:TERMinal:POLarity?
```

Response: character

NORM	Supplies power with normal phase
REV	Supplies power with reversed phase

Example

```
IR:TERM:POL?
```

Related command

```
IR:VOLT:RANG
```

IR:VOLT

Sets the test voltage for insulation resistance tests.

Command

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

```
[SOURce:]IR:VOLTage[:LEVel][:IMMediate][:AMPlitude]?
```

Unit: V

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

Response: NR3

Example

```
IR:VOLT 500
```

IR:VOLT:DISC:INT:STAT

Sets whether to discharge when interlock is activated in insulation resistance tests.

Command

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

Parameter

Value:	ON(1)	Discharge (default)
	OFF(0)	Not discharge

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

Response：NR1

Example

```
IR:VOLT:DISC:INT:STAT ON
```

IR:VOLT:DISC:TIM

Sets the discharge time for insulation resistance tests.

Command

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

Unit: S

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

Response: NR3

Example

```
IR:VOLT:DISC:TIM 10S
```

IR:VOLT:PROT

Sets the limit voltage for insulation resistance tests.

Command

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

Unit: V

Settings are reset to default when the *RST command is sent. (1020 V)

Response: NR3

Example

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

IR:VOLT:RANG

Sets the output voltage range for insulation resistance tests.

The power supply line polarity is set to normal when 7500 V is specified and reverse when 1000 V is specified.

On the TOS9300 and TOS9302, the range is fixed to 1000 V (reverse polarity).

Command

```
[SOURce:]IR:VOLTage:RANGe <numeric>
```

```
[SOURce:]IR:VOLTage:RANGe?
```

Parameter

Value:	7200	Normal polarity (NORMal)
	1000	Reverse polarity (REVerse) (default)
Unit:	V	

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

Response: NR3

Example

```
IR:VOLT:RANG 1000
```

Related command

```
IR:TERM:POL
```

IR:VOLT:STAR

Sets the start voltage as a percentage for insulation resistance tests.

This setting is enabled when IR:VOLT:STAR:STAT is set to ON.

Command

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

Unit: PCT

Settings are reset to default when the *RST command is sent. (50 PCT)

Response: NR3

Example

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

IR:VOLT:STAR:STAT

Sets whether to set the start voltage for insulation resistance tests.

Use IR:VOLT:STAR to set the start voltage.

Command

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

Parameter

Value:	ON(1)	Set
	OFF(0)	Not set (default)

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

Response：NR1

Example

```
IR:VOLT:STAR:STAT ON
```

IR:VOLT:SWE:TIM

Sets the voltage rise time for insulation resistance tests.

Command

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

```
[SOURce:]IR:VOLTage:SWEep[:RISE]:TIMer?
```

Unit: S

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

Response: NR3

Example

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

IR:VOLT:TIM

Sets the test time for insulation resistance tests.

This setting is enabled when IR:VOLT:TIM:STAT is set to ON.

Command

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

```
[SOURce:]IR:VOLTage:TIMer?
```

Unit: S

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

Response: NR3

Example

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

IR:VOLT:TIM:STAT

Sets whether to set the test time for insulation resistance tests.

Use IR:VOLT:TIM to set the test time.

Command

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

```
[SOURce:]IR:VOLTage:TIMer:STATe?
```

Parameter

Value:	ON(1)	Set (default)
	OFF(0)	Not set

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

Response: NR1

Example

```
IR:VOLT:TIM:STAT ON
```

PAT:110P:OUTP

Sets whether to apply the voltage applied from the 110% terminal to the AC LINE IN inlet in patient leakage current tests.

Command

```
[SOURce:]PATient[:TERMinal]:110Percent:OUTPut <boolean>
[SOURce:]PATient[:TERMinal]:110Percent:OUTPut?
```

Parameter

Value:	ON(1)	Apply
	OFF(0)	Not apply (default)

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

Response: NR1

Example

```
PAT:110P:OUTP ON
```

PAT:110P:POL

Sets the polarity of the voltage applied from the 110% terminal in patient leakage current tests.

This setting is enabled when PAT:110P:OUTP is set to ON.

Command

```
[SOURce:]PATient[:TERMinal]:110Percent:POLarity <character>
[SOURce:]PATient[:TERMinal]:110Percent:POLarity?
```

Parameter

Value:	NORMal	Apply with normal phase (default)
	REVerse	Apply with reversed phase

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

Response: character

Example

```
PAT:110P:POL NORM
```

PAT:POL

Sets the polarity of the power supply line supplied to the EUT for patient leakage current tests.

Command

```
[SOURce:]PATient[:LINE]:POLarity  <character>
[SOURce:]PATient[:LINE]:POLarity
```

Parameter

Value:	NORMal	Supply power with normal phase (default)
	REVerse	Supply power with reversed phase

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

Response: character

Example

```
PAT:POL NORM
```

PCC:POL

Sets the polarity of the power supply line for protective conductor current tests.

Command

```
[SOURce:]PCCurrent[:LINE]:POLarity <character>
```

```
[SOURce:]PCCurrent[:LINE]:POLarity?
```

Parameter

Value:	NORMal	Supply power with normal phase (default)
	REVerse	Supply power with reversed phase

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

Response: character

Example

```
PCC:POL NORM
```

[SOURce:]TC Command

TC:110P:OUTP

Sets whether to apply the voltage applied from the 110% terminal to the AC LINE IN inlet in touch current tests.

Command

```
[SOURce:]TC[:TERMinal]:110Percent:OUTPut <boolean>
[SOURce:]TC[:TERMinal]:110Percent:OUTPut?
```

Parameter

Value:	ON(1)	Apply
	OFF(0)	Not apply (default)

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

Response: NR1

Example

```
TC:110P:OUTP ON
```

TC:110P:POL

Sets the polarity of the voltage applied from the 110% terminal in touch current tests.

This setting is enabled when TC:110P:OUTP is set to ON.

Command

```
[SOURce:]TC[:TERMinal]:110Percent:POLarity <character>
[SOURce:]TC[:TERMinal]:110Percent:POLarity?
```

Parameter

Value:	NORMal	Apply with normal phase (default)
	REVerse	Apply with reversed phase

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

Response: character

Example

```
TC:110P:POL NORM
```

TC:POL

Sets the polarity of the power supply line supplied to the EUT for touch current tests.

Command

```
[SOURce:]TC[:LINE]:POLarity <character>
```

```
[SOURce:]TC[:LINE]:POLarity?
```

Parameter

Value:	NORMal	Supply power with normal phase (default)
	REVerse	Supply power with reversed phase

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

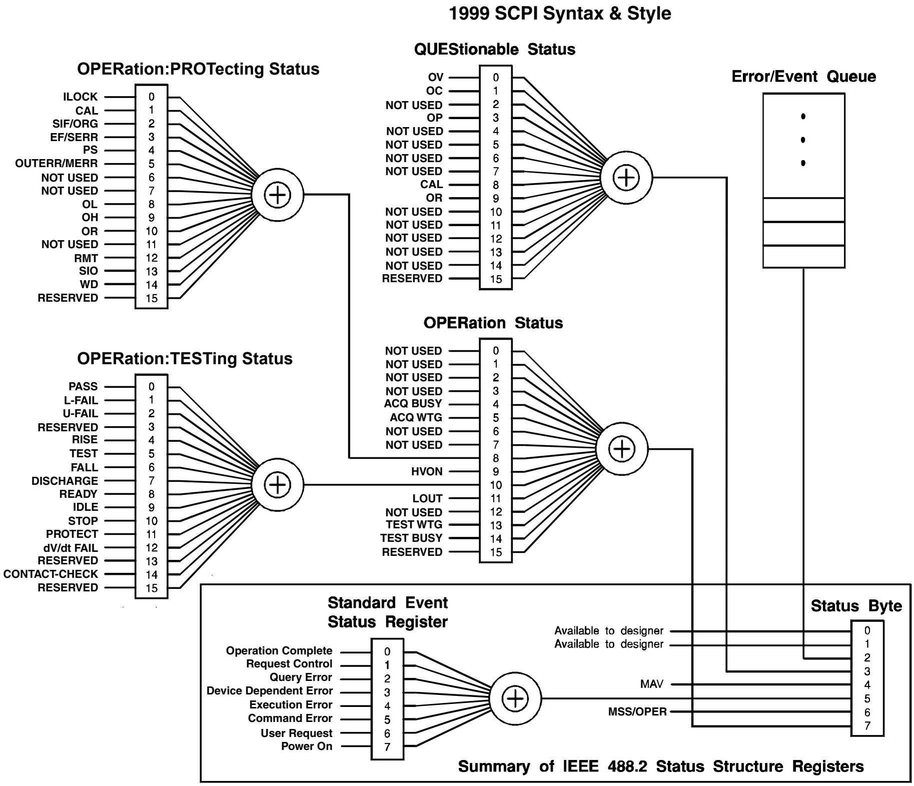
Response: character

Example

```
TC:POL NORM
```

Status Report Structure

A "+" represents the logical OR of the register bits.



Architecture

IEEE 488.2 and SCPI registers are used for status reports.

In each SCPI status register, there are the following sub registers: the CONDition register, the EVENt register, the ENABle register, the PTRansition filter, and the NTRansition filter.

-> “Status Monitoring”(p. 333)

CONDition register

Transitions of the CONDition register are automatic and reflect the condition of the product in real time. Reading this register does not affect its contents.

EVENt register

The EVENt register bits are automatically set according to the changes in the CONDition register. The rule for setting the bits varies depending on the positive and negative transition registers (PTRansition and NTRansition). The EVENt register is reset when it is read.

ENABle register

The ENABle register enables reports to the summary bit or status bit of the event bits.

Transition filters

Use the PTRansition (positive transition) filter to report events when the condition changes from false to true.

Use the NTRansition (negative transition) filter to report events when the condition changes from true to false.

If both the positive filter and negative filter are set to true, events can be reported each time the status changes.

If both filters are cleared, event reporting is disabled.

Status byte register

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

When the controller executes serial polling, bit 6 responds with request service (RQS). The status byte value is not changed by serial polling.

*STB? makes the device transmit the contents of the status byte register and the master status summary (MSS) message.

*STB? does not change the status byte, MSS, and RQS.

Bit	Bit weight	Bit name	Description
0	1	Reserved	Reserved for future use by IEEE 488. The bit value is notified as zero.
1	2	Reserved	
2	4	Error/Event Queue	If data exists in the error or event queue, this bit is set to true.
3	8	Questionable Status Register (QUES)	This bit is set to true when a bit is set in the QUEStionable event status register and the corresponding bit in the QUEStionable status enable register is true.
4	16	Message Available (MAV)	This bit is set to true when a request is received from the digital programming interface and the product is ready to generate the data byte.
5	32	Standard Event Status Bit Summary (ESB)	This bit is set to true when a bit is set in the event status register.
6	64	Request Service (RQS)	This bit is set to true when a bit is set in the service request enable register and the corresponding bit exists in the status byte. The SRQ line of the GPIB is set.
		Master Status Summary (MSS)	This bit is set to true when any bit in the status byte register is set to 1 and the corresponding bit in the service request enable register is set to 1.
7	128	Operation Status Register (OPER)	This bit is set to true when a bit is set in the OPERation event status register and the corresponding bit in the OPERation status enable register is set.
8-15		Not Used	Not used

Event status register

The event status register bits are set when certain events occur during product operation. All the event status register bits are set by the error event queue.

This register is defined by the IEEE 488.2 standard and is controlled using the IEEE 488.2 common commands *ESE, *ESE?, and *ESR?.

You can check the error content with SYST:ERR?.

Bit	Bit weight	Bit name	Description	Error number
0	1	Operation Complete(OPC)	Set when an *OPC command is received and all operations in standby have been completed.	-800 to -899
1	2	Request Control (RQC)	Not used	--
2	4	Query Error(QYE)	Set when an attempt is made to read data from the output queue when there is no data or when the output queue is not in the wait state. This indicates that there is no data in the output queue.	-400 to -499
3	8	Device Dependent Error(DDE)	Set when there is a device-specific error.	-300 to -399 100 to 999
4	16	Execution Error(EXE)	Set when the product evaluates that the program data after the header is outside the formal input range or does not match the specifications of the product. This indicates that a valid SCPI command may not be executed correctly depending on the state of the product.	-200 to -299
5	32	Command Error(CME)	Set when an IEEE 488.2 syntax error is detected by the parser, when an unidentifiable header is received, or when a group execution trigger enters the internal IEEE 488.2 SCPI command input buffer.	-100 to -199
6	64	User Request(URQ)	Not used	--
7	128	Power On(PON)	Not used	--
8-15		Reserved	Not used	--

OPERation status register

The OPERation status register is a 16-bit register that contains information about the normal operating conditions of the product.

Bit	Bit weight	Bit name	Description
0	1	NOT USED	Not used
1	2	NOT USED	Not used
2	4	NOT USED	Not used
3	8	NOT USED	Not used
4	16	MEASuring(ACQ BUSY)	Measurement is in progress.
5	32	ACQuire Waiting for TRIG-ger(ACQ WTG)	The product is waiting for a measurement trigger.
6	64	NOT USED	Not used
7	128	NOT USED	Not used
8	256	RROTecting(PROT)	The PROTecting status register bit is set.
9	512	Voltage ON(HVON)	Test in progress or voltage remaining across the output terminals
10	1024	TESTing(TEST)	The TESTing status register bit is set.
11	2048	Line Output(LOUT)	Line output or 110% terminal output in progress during an LC test
12	4096	NOT USED	Not used
13	8192	READY(TEST WTG)	The product is waiting for a test trigger.
14	16384	TEST is running(TEST BUSY)	Waiting for test execution or test in progress
15	32768	RESERVED	Always 0.

STAT:OPER

Queries the event of the OPERation status register.

A query clears the contents of the register.

Command

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

Response: NR1

STAT:OPER:COND

Queries the condition of the OPERation status register.

A query does not clear the contents of the register.

Command

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

Response: NR1

STAT:OPER:ENAB

Sets the enable register of the OPERation status register.

Command

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

Parameter

Value: 0 to 32767

Response: NR1

STAT:OPER:NTR

Sets the negative transition filter of the OPERation status register.

Command

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

Parameter

Value: 0 to 32767

Response: NR1

STAT:OPER:PTR

Sets the positive transition filter of the OPERation status register.

Command

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

Parameter

Value: 0 to 32767

Response: NR1

OPERation:PROTecting Status Register

The OPERation:PROTecting status register is a 16-bit register that contains information about the status of the product's protection functions.

Bit	Bit weight	Bit name	Description
0	1	Interlock(ILOCK)	Interlock signal input detected.
1	2	Calibration(CAL)	The set calibration date has passed.
2	4	SCAN IF(SIF)/ Over Range(ORG)	Scanner cable disconnection/connection detected. The measurement upper limit was exceeded in LC current measurement mode.
3	8	Earth Fault(EF)	Ground current error detected.
4	16	Power Supply(PS)	Power supply problem detected.
5	32	Output Error(OUTERR)/ Measure Erro(MERR)	The output voltage exceeded the rated limits. Measurement check error in an LC test
6	64	Short Error(SERR)	Relay operation error in an LC test
7	128	NOT USED	Not used
8	256	Over Load(OL)	The output power exceeded the output limit.
9	512	Over Heat(OH)	The internal temperature of the product has become abnormally high.
10	1024	Over Rating(OR)	An output current was generated for a length of time that exceeds the rated time.
11	2048	NOT USED	Not used
12	4096	Remote(RMT)	A connection or disconnection of the remote control connector was detected.
13	8192	SIGNAL I/O(SIO)	A change in the SIGNAL I/O connector's ENABLE signal was detected.
14	16384	Watchdog(WD)	Watchdog protection function was detected. Internal communication error detected
15	32768	RESERVED	Always 0.

STAT:OPER:PROT

Queries the event of the OPERation:PROTecting status register.

A query clears the contents of the register.

Command

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

Response: NR1

STAT:OPER:PROT:COND

Queries the condition of the OPERation:PROTecting status register.

A query does not clear the contents of the register.

Command

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

Response: NR1

STAT:OPER:PROT:ENAB

Sets the enable register of the OPERation:PROTecting status register.

Command

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

Parameter

Value: 0 to 32767

Response: NR1

STAT:OPER:PROT:NTR

Sets the negative transition filter of the OPERation:PROTecting status register.

Command

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

Parameter

Value: 0 to 32767

Response: NR1

STAT:OPER:PROT:PTR

Sets the positive transition filter of the OPERation:PROTecting status register.

Command

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

Parameter

Value: 0 to 32767

Response: NR1

OPERation:TESTing Status Register

The OPERation:TESTing status register is a 16-bit register that contains information about the status of tests on the product.

Bit	Bit weight	Bit name	Description
0	1	PASS	PASS judgment
1	2	L-FAIL	L-FAIL judgment, C-FAIL judgment[*1]
2	4	U-FAIL	U-FAIL judgment, C-FAIL judgment[*1]
3	8	RESERVED	Used for internal processing
4	16	RISE	Voltage rising
5	32	TEST	Testing
6	64	FALL	Voltage falling
7	128	DISCHARGE	Discharging
8	256	READY	Waiting for testing to start
9	512	IDLE	Standby
10	1024	STOP	Stopping testing
11	2048	PROTECT	Protection activated
12	4096	dV/dt FAIL	dV/dt FAIL judgment
13	8192	RESERVED	Not used
14	16384	CONTACT-CHECK	Checking contact
15	32768	RESERVED	Always 0.

*1. Bits 1 and 2 are set when C-FAIL (CONTACT FAIL) is detected.

STAT:OPER:TEST

Queries the event of the OPERation:TESTing status register.

A query clears the contents of the register.

Command

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

Response: NR1

STAT:OPER:TEST:COND

Queries the condition of the OPERation:TESTing status register.

A query does not clear the contents of the register.

Command

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

Response: NR1

STAT:OPER:TEST:ENAB

Sets the enable register of the OPERation:TESTing status register.

Command

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

Parameter

Value: 0 to 32767

Response: NR1

STAT:OPER:TEST:NTR

Sets the negative transition filter of the OPERation:TESTing status register.

Command

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

Parameter

Value: 0 to 32767

Response: NR1

STAT:OPER:TEST:PTR

Sets the positive transition filter of the OPERation:TESTing status register.

Command

```
STATus:OPERation:TESTing:PTRansition <NRf>
STATus:OPERation:TESTing:PTRansition?
```

Parameter

Value: 0 to 32767

Response: NR1

QUEStionable status register

The QUEStionable status register is a 16-bit register that stores information related to the product's status and the questionable events that occur during product operation.

The QUEStionable status register bits may indicate that there are problems with the product's measured data.

Bit	Bit weight	Bit name	Description
0	1	Over Voltage(OV)	Voltage measurement over-range
1	2	Over Current(OC)	Current measurement over-range
2	4	NOT USED	Not used
3	8	Over Power(OP)	Power measurement over-range
4	16	NOT USED	Not used
5	32	NOT USED	Not used
6	64	NOT USED	Not used
7	128	NOT USED	Not used
8	256	CALibration(CAL)	The calibration date has passed.
9	512	Over Resistance(OR)	Resistance measurement over-range
10	1024	NOT USED	Not used
11	2048	NOT USED	Not used
12	4096	NOT USED	Not used
13	8192	NOT USED	Not used
14	16384	NOT USED	Not used
15	32768	RESERVED	Always 0.

STAT:QUES

Queries the event of the QUEStionable status register.

A query clears the contents of the register.

Command

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

Response: NR1

STAT:QUES:COND

Queries the condition of the QUEStionable status register.

A query does not clear the contents of the register.

Command

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

Response: NR1

STAT:QUES:ENAB

Sets the enable register of the QUEStionable status register.

Command

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

Parameter

Value: 0 to 32767

Response: NR1

STAT:QUES:NTR

Sets the negative transition filter of the QUEStionable status register.

Command

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

Parameter

Value: 0 to 32767

Response: NR1

STAT:QUES:PTR

Sets the positive transition filter of the QUEStionable status register.

Command

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

Parameter

Value: 0 to 32767

Response: NR1

Preset status

STAT:PRES

Resets the ENABle, PTRansition, and NTRansition filter registers of all status registers (including sub registers) to their default values.

Default values:

STATus:ENABle = 0x0000

STATus:PTRansition = 0x7FFF

STATus:NTRansition = 0x0000

Command

```
STATus:PRESet
```

SYST:BEEP

Turns all buzzers on and off.

Command

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

```
SYSTem:BEEPer[:ALL][:STATe]?
```

Parameter

Value:	ON(1)	Buzzer on (default)
	OFF(0)	Buzzer off

The setting may change when a SYST:BEEP:KEY, SYST:BEEP:PROT, or SYST:BEEP:SCPI is sent.

Response: NR1

Returns 1 when any buzzer is on when an invalid operation is executed, a protection function is activated, or an SCPI error occurs.

Returns 0 when all settings are off.

Example

```
SYST:BEEP OFF
```

SYST:BEEP:KEY

Turns on or off the buzzer that sounds when an invalid key is pressed.

Command

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

```
SYSTem:BEEPer:KEY[:STATe]?
```

Parameter

Value:	ON(1)	Buzzer on (default)
	OFF(0)	Buzzer off

The setting may change when a SYST:BEEP is sent.

Response: NR1

Example

```
SYST:BEEP:KEY ON
```

SYST:BEEP:PROT

Turns on or off the buzzer that sounds when a protection function is activated.

Command

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

```
SYSTem:BEEPer:PROTection[:STATe]?
```

Parameter

Value:	ON(1)	Buzzer on (default)
	OFF(0)	Buzzer off

The setting may change when a SYST:BEEP is sent.

Response: NR1

Example

```
SYST:BEEP:PROT ON
```

SYST:BEEP:SCPI

Turns on or off the buzzer that sounds when an SCPI error occurs.

Command

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

```
SYSTem:BEEPer:SCPI[:STATe]?
```

Parameter

Value:	ON(1)	Buzzer on (default)
	OFF(0)	Buzzer off

The setting may change when a SYST:BEEP is sent.

Response: NR1

Example

```
SYST:BEEP:SCPI ON
```

SYST:COMM:PROT:WDOG

Enables or disables the communication monitoring (WATCHDOG) timer.

Use SYST:COMM:PROT:WDOG:DEL to set the delay time of the communication monitoring (WATCHDOG) timer.

Command

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

Parameter

Value:	ON(1)	Enables the communication monitoring timer
	OFF(0)	Disables the communication monitoring timer

Response: NR1

Example

```
SYST:COMM:PROT:WDOG ON
```

SYST:COMM:PROT:WDOG:DEL

Sets the delay time of the communication monitoring (WATCHDOG) timer.

This command is valid when the communication monitoring timer is enabled (SYST:COMM:PROT WDOG ON)

Command

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

Unit: S

Response: NR3

Example

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

SYST:COMM:RLST

Switches the TOS93 to local or remote mode.

Command

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

Parameter

Value:	LOCal	Sets the product to local mode (Remote Disable; the RMT turns off). This enables both panel operations and commands. This is a substitute command for IEEE488.1 ren FALSE (Remote Disable).
	REMote	Switches the product to remote mode. All panel operations, except those of the LOCAL key, the START switch and the STOP switch, are locked. This is a substitute command for IEEE 488.1 ren (Remote Enable). This is also the substitute command for address specification.
	RWLock	Switches the product to remote mode. All panel controls are locked except the START switch and the STOP switch. This is a substitute command for IEEE 488.1 llo (Local Lock Out).

Response: character

Example

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

SYST:DATE

Sets the date.

Also set the time (SYST:TIME).

If you specify a day that does not exist (for example, February 30), the settings are changed to the first day of the following month.

Command

```
SYSTem:DATE <year_NR1>,<month_NR1>,<day_NR1>
```

```
SYSTem:DATE?
```

Parameter <year_NR1>

Value 2016 to 2037 Year

Parameter <month_NR1>

Value 1 to 12 Month

Parameter <day_NR1>

Value 1 to 31 Day

Response

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

Example

```
SYST:DATE 2015,4,14
```

SYST:ERR

Reads the oldest error information or event information from the error queue.

The error/event queue can hold up to 16 errors.-> "Error Checking"(p. 335)

The error queue is cleared if a *CLS command is sent.

Command

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

Response

Returns the oldest error or event from the error/event queue in the following format, in response to SYST:ERR?.

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

Example: If a command that cannot be executed in the present operating state is received
This command returns -221, "Settings conflict."

SYST:ERR:COUN

Returns the number of unread errors in the error queue.

Command

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

Response: NR1

SYST:KLOC

Sets or releases panel control lock.

Invalid in remote mode (RMT lit).

Command

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

```
SYSTem:KLOCk?
```

Parameter

Value:	ON(1)	Set the panel control lock
	OFF(0)	Release the panel control lock

Response: NR1

Example

```
SYSTem:KLOC ON
```

SYST:KLOC:LEV

Sets the panel control lock level.

Invalid in remote mode (RMT lit).

Command

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

```
SYSTem:KLOCk:LEVel?
```

Parameter

Value:	1	Low
	2	Medium
	3	High (default)

Response: NR1

Example

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

SYST:PASS

Enables a password-protected command.

Command

```
SYSTem:PASSword[:CENable] "<string>"
SYSTem:PASSword[:CENable]?
```

Parameter

Value: The password set by SYST:PASS:NEW

Response: string

Example

```
SYST:PASS "password"
```

SYST:PASS:CDIS

Disables the password-protected command.

Command

```
SYSTem:PASSword:CDISable "<string>"
```

Parameter

Value: The password set by SYST:PASS:NEW

Example

```
SYST:PASS:CDIS "password"
```

SYST:PASS:NEW

Sets the password.

Command

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

Parameter “<string_exist>": existing password, "<string_new>": new password

Naming convention: alphanumeric characters (A-Z, a-z, 0-9), underscore, hyphen

Number of characters: 4 to 15

The factory default password is “”.

Example

```
SYST:PASS:NEW "existing password", "new password"
SYST:PASS:NEW "", "new password"
```

SYST:PASS:STAT

Queries the enabled/disabled state of the password-protected command.

Command

```
SYSTem:PASSword[:CENable]:STATe?
```

Response: NR1

Example

```
SYST:PASS:STAT?
```

SYST:LOC/ SYST:REM/ SYST:RWL

This is an old style command.

Use SYST:COMM:RLST(p. 269) when creating new programs.

Command

```
SYSTem:LOCal

SYSTem:REMote

SYSTem:RWLock
```

SYST:SEC:IMM

Sanitizes all contents stored in memory and initializes the panel settings to their factory default conditions.

This command is valid when password protection is set (SYST:PASS).

Command

```
SYSTem:SECurity:IMMediate
```

SYST:SSAV

Enables or disables the screen saver.

Use SYST:SSAV:DEL to set the time until the screen saver starts.

Command

```
SYSTem:SSAVer[:STATe] <boolean>
SYSTem:SSAVer[:STATe]?
```

Parameter

Value:	ON(1)	Enables the screen saver
	OFF(0)	Disables the screen saver (default)

Response: NR1

Example

```
SYST:SSAV ON
```

SYST:SSAV:DEL

Sets the time until the screen saver starts.

This command is valid when SYST:SSAV is set to ON.

Command

```
SYSTem:SSAVer:DELay <numeric>
```

```
SYSTem:SSAVer:DELay?
```

Parameter

Unit: S

Default: 60 S

Response: NR3

Example

```
SYST:SSAV:DEL 3600S
```

SYST:TIME

Sets the time.

Also set the date (using SYST:DATE).

Command

```
SYSTem:TIME <hour_NR1>,<min_NR1>,<sec_NR1>
```

```
SYSTem:TIME?
```

Parameter <hour_NR1>

Value 0 to 23 Hour

Parameter <min_NR1>

Value 0 to 59 Minutes

Parameter <sec_NR1>

Value 0 to 59 second

Response

Returns the hour, minute, and second in NR1 format.

Example

```
SYST:TIME 23,0,0
```

SYST:TIME:ADJ

Automatically synchronizes the system clock using the NTP server on the network.

Command

```
SYSTem:TIME:ADJust
```

SYST:TZON

Sets the time zone of the system clock.

Use SYST:TZON:CAT? to check the time zone ID.

Command

```
SYSTem:TZONe "<string>"
```

```
SYSTem:TZONe?
```

Parameter

Value: Time zone ID or UTC (The default value is “UTC”)

Response: “string”

Example

```
SYST:TZON "Asia/Tokyo"
```

SYST:TZON:CAT

Queries the time zone IDs that can be used.

Command

```
SYSTem:TZONe:CATalog?
```

Response: Comma-separated character string

SYST:VERS

Queries the version of the SCPI specifications that the product complies with.

Command

```
SYSTem:VERSion?
```

Response

Returns 1999.0.

SYST:CONF:BEEP:VOL

Sets the volume level of the buzzer that is sounded when a FAIL judgment occurs.

Command

```
SYSTem:CONFigure:BEEPer:VOLume[:FAIL] <NRf>
SYSTem:CONFigure:BEEPer:VOLume[:FAIL]?
```

Parameter

Value: 0 to 10 (5 by default)

Response: NR1

Example

```
SYST:CONF:BEEP:VOL 5
```

SYST:CONF:BEEP:VOL:PASS

Sets the volume level of the buzzer that is sounded when a PASS judgment occurs.

Command

```
SYSTem:CONFigure:BEEPer:VOLume:PASS <NRf>
SYSTem:CONFigure:BEEPer:VOLume:PASS?
```

Parameter

Value: 0 to 10 (3 by default)

Response: NR1

Example

```
SYST:CONF:BEEP:VOL:PASS 5
```

SYST:CONF:CAL:DUE:CONT

Sets the calibration period.

Command

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

```
SYSTem:CONFigure:CALibration:DUE:CONTrol?
```

Parameter

Value: 0 to 24 (Calibration period is not monitored when 0 is specified.)
(12 by default)

Unit: Month

Response: NR1

Example

```
SYST:CONF:CAL:DUE:CONT 5
```

SYST:CONF:CAL:PROT:STAT

Sets whether to activate the protection function and switch to protection mode when the calibration period is expired.

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

Command

```
SYSTem:CONFigure:CALibration:PROTection:STATe <boolean>
SYSTem:CONFigure:CALibration:PROTection:STATe?
```

Parameter

Value:	ON(1)	The product switches to protection mode.
	OFF(0)	The product does not switch to protection mode. (default)

Response: NR1

Example

```
SYST:CONF:CAL:PROT:STAT ON
```

SYST:CONF:DACT:STAT

Enables or disables the double action function.

Command

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

```
SYSTem:CONFigure:DACTion:STATe?
```

Parameter

Value:	ON(1)	Enables double action
	OFF(0)	Disables double action (default)

Response: NR1

Example

```
SYST:CONF:DACT:STAT ON
```

SYST:CONF:FMOD:STAT

Enables or disables the fail mode.

Command

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

```
SYSTem:CONFigure:FMODe:STATe?
```

Parameter

Value:	ON(1)	Enables fail mode
	OFF(0)	Disables fail mode (default)

Response: NR1

Example

```
SYST:CONF:FMOD:STAT ON
```

SYST:CONF:MOM:STAT

Enables/disables momentary.

Command

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

```
SYSTem:CONFigure:MOMentary:STATe?
```

Parameter

Value:	ON(1)	Enables momentary
	OFF(0)	Disables momentary (default)

Response: NR1

Example

```
SYST:CONF:MOM:STAT ON
```

SYST:CONF:PHOL

Sets the length of time that a PASS judgment result will be held.

Command

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

Parameter

Value:	0.05 to 10	(0.2 by default)
	INFinity	Pass judgment results are displayed until you press STOP.
Unit:	S	

Response: NR3 or characters

Example

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

SYST:CONF:PON:STAT

Sets the condition panel setting state when the POWER switch is turned on.

Command

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

Parameter

Value:	RST	Reset the panel settings
	RCL0	Settings stored in memory 0
	AUTO	The previous state before the POWER switch was turned off.

Response: characters

Example

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

SYST:CONF:SIO:JUDG:STAT

Turns on or off the judgment result output at STEP END of the SIGNAL I/O connector.

Command

```
SYSTem:CONFigure:SIO[:SEND]:JUDGment:STATe <boolean>
SYSTem:CONFigure:SIO[:SEND]:JUDGment:STATe?
```

Parameter

Value:	ON(1)	Output
	OFF(0)	Not output (default)

Response: NR1

Example

```
SYST:CONF:SIO:JUDG:STAT ON
```

SYST:CONF:SLPR:STAT

Enables/disables the start long function.

Command

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

```
SYSTem:CONFigure:SLPRess:STATe?
```

Parameter

Value:	ON(1)	Enables the start long function
	OFF(0)	Disables the start long function (default)

Response: NR1

Example

```
SYST:CONF:SLPR:STAT ON
```

SYST:CONF:SOUT:FAIL:LOW:STAT

Sets whether to output a signal from the STATUS OUT connector during “L-FAIL.”

Command

```
SYSTem:CONFigure:SOUTput:FAIL:LOWer:STATe <boolean>
SYSTem:CONFigure:SOUTput:FAIL:LOWer:STATe?
```

Parameter

Value:	ON(1)	Output
	OFF(0)	Not output (default)

Response: NR1

Example

```
SYST:CONF:SOUT:FAIL:LOW:STAT ON
```

SYST:CONF:SOUT:FAIL:UPP:STAT

Sets whether to output a signal from the STATUS OUT connector during “U-FAIL.”

Command

```
SYSTem:CONFigure:SOUTput:FAIL:UPPer:STATe <boolean>
SYSTem:CONFigure:SOUTput:FAIL:UPPer:STATe?
```

Parameter

Value:	ON(1)	Output
	OFF(0)	Not output (default)

Response: NR1

Example

```
SYST:CONF:SOUT:FAIL:UPP:STAT ON
```

SYST:CONF:SOUT:HVON:STAT

Sets whether to output a signal from the STATUS OUT connector while voltage is residing or while a test is in progress.

Command

```
SYSTem:CONFigure:SOUTput:HVON:STATe <boolean>
SYSTem:CONFigure:SOUTput:HVON:STATe?
```

Parameter

Value:	ON(1)	Output
	OFF(0)	Not output (default)

Response: NR1

Example

```
SYST:CONF:SOUT:HVON:STAT ON
```

SYST:CONF:SOUT:PASS:STAT

Sets whether to output a signal from the STATUS OUT connector during “PASS.”

Command

```
SYSTem:CONFigure:SOUTput:PASS:STATe <boolean>
```

```
SYSTem:CONFigure:SOUTput:PASS:STATe?
```

Parameter

Value:	ON(1)	Output
	OFF(0)	Not output (default)

Response: NR1

Example

```
SYST:CONF:SOUT:PASS:STAT ON
```

SYST:CONF:SOUT:PON:STAT

Sets whether to output a signal from the STATUS OUT connector while the POWER switch is turned on.

Command

```
SYSTem:CONFigure:SOUTput:PON:STATe <boolean>
```

```
SYSTem:CONFigure:SOUTput:PON:STATe?
```

Parameter

Value:	ON(1)	Output
	OFF(0)	Not output (default)

Response: NR1

Example

```
SYST:CONF:SOUT:PON:STAT ON
```

SYST:CONF:SOUT:PROT:STAT

Sets whether to output a signal from the STATUS OUT connector during protection mode.

Command

```
SYSTem:CONFigure:SOUTput:PROTection:STATe <boolean>
```

```
SYSTem:CONFigure:SOUTput:PROTection:STATe?
```

Parameter

Value:	ON(1)	Output
	OFF(0)	Not output (default)

Response: NR1

Example

```
SYST:CONF:SOUT:PROT:STAT ON
```

SYST:CONF:SOUT:READ:STAT

Sets whether to output a signal from the STATUS OUT connector during “READY.”

Command

```
SYSTem:CONFigure:SOUTput:READy:STATe <boolean>
```

```
SYSTem:CONFigure:SOUTput:READy:STATe?
```

Parameter

Value:	ON(1)	Output
	OFF(0)	Not output (default)

Response: NR1

Example

```
SYST:CONF:SOUT:READ:STAT ON
```

SYST:CONF:SOUT:TEST:STAT

Sets whether to output a signal from the STATUS OUT connector while the test voltage is at the set value.

Command

```
SYSTem:CONFigure:SOUTput:TEST:STAT <boolean>
SYSTem:CONFigure:SOUTput:TEST:STAT?
```

Parameter

Value:	ON(1)	Output
	OFF(0)	Not output (default)

Response: NR1

Example

```
SYST:CONF:SOUT:TEST:STAT ON
```

TRIGger Command

TRIG:TEST

Executes a software trigger on the TEST trigger subsystem.

Command

```
TRIGger:TEST[:IMMediate]
```

TRIG:TEST:SOUR

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

Command

```
TRIGger:TEST:SOURce <character>
TRIGger:TEST:SOURce?
```

Parameter

Value:	IMMediate	Immediately start the auto test
	BUS	Execute the auto test when a software trigger (TRIG:TEST) is received. In the case of FUNC PROG, the test pauses when a step is completed and resumes when a software trigger is received.
	EXTernal	Execute the auto test with a start operation on the TOS93. Pauses when a step is completed and resumes when a start operation is performed.
	ONCE	Execute the auto test with a start operation on the TOS93.

Response: character

Example

```
TRIG:TEST:SOUR BUS
```

Withstanding voltage and insulation resistance test settings

■ Test condition setting commands for AC withstanding voltage tests (ACW)

Test condition	Command	Default
Test voltage	ACW:VOLT	0V
Limit voltage	ACW:VOLT:PROT	5500V
Start voltage	ACW:VOLT:STAR:STAT ACW:VOLT:STAR	OFF 50PCT
Frequency	ACW:VOLT:FREQ	50HZ
Upper limit	SENS:ACW:JUDG	0.01MA
Lower limit	SENS:ACW:JUDG:LOW:STAT SENS:ACW:JUDG:LOW	OFF 0A
Test time	ACW:VOLT:TIM:STAT ACW:VOLT:TIM	ON 0.2S
Voltage rise time	ACW:VOLT:SWE:TIM	0.1S
Voltage fall time	ACW:VOLT:SWE:FALL:TIM:STAT ACW:VOLT:SWE:FALL:TIM	OFF 0.1S
Current detection response speed	SENS:ACW:CURR:FILT:TYPE SENS:ACW:CURR:FILT:LPAS SENS:ACW:CURR:FILT:HPAS	LOW SLOW SLOW
Grounding mode	SENS:ACW:TERM:GRO	LOW
Current measurement mode	SENS:ACW:CURR:MODE	RMS
Voltage measurement mode	SENS:ACW:VOLT:MODE	RMS
Offset	CALC:ACW:SCAL CALC:ACW:SCAL:OFFS CALC:ACW:SCAL:OFFS:IMAG	OFF 0A 0A
Scanner setting	ROUT:ACW:TERM	*1,OPEN

*1. Specify the scanner and channel to set.

Test condition setting commands for DC withstanding voltage tests (DCW)

Test condition	Command	Default
Test voltage	DCW:VOLT	0V
Limit voltage	DCW:VOLT:PROT	7500V
Start voltage	DCW:VOLT:STAR:STAT DCW:VOLT:STAR	OFF 50PCT
Upper limit	SENS:DCW:JUDG	0.01MA
Lower limit	SENS:DCW:JUDG:LOW:STAT SENS:DCW:JUDG:LOW	OFF 0A
Auto setting of the judgment delay	SENS:DCW:JUDG:DEL:AUTO SENS:DCW:JUDG:DEL	OFF 0.1S
Test time	DCW:VOLT:TIM:STAT DCW:VOLT:TIM	ON 0.2S
Voltage rise time	DCW:VOLT:SWE:TIM	0.1S
Voltage fall time	DCW:VOLT:SWE:FALL:TIM:STAT DCW:VOLT:SWE:FALL:TIM	OFF 0.1S
Discharge time	DCW:VOLT:DISC:TIM	0S
Discharge when interlock is activated	DCW:VOLT:DISC:INT:STAT	ON
Current detection response speed	SENS:DCW:CURR:FILT:TYPE SENS:DCW:CURR:FILT:LPAS SENS:DCW:CURR:FILT:HPAS	LOW SLOW SLOW
Grounding mode	SENS:DCW:TERM:GRO	LOW
Voltage measurement mode	SENS:DCW:VOLT:MODE	AVER
Offset	CALC:DCW:SCAL CALC:DCW:SCAL:OFFS	OFF 0A
Scanner setting	ROUT:DCW:TERM	*1,OPEN

*1. Specify the scanner and channel to set.

Test condition setting commands for insulation resistance tests (IR)

Test condition	Command	Default
Test voltage	IR:VOLT	0V
Limit voltage	IR:VOLT:PROT	1020V
Start voltage	IR:VOLT:STAR:STAT IR:VOLT:STAR	OFF 50PCT
Upper limit	SENS:IR:JUDG:TYPE SENS:IR:JUDG:STAT SENS:IR:JUDG SENS:IR:JUDG:CURR:STAT SENS:IR:JUDG:CURR	RES OFF 100MOHM ON 0.0001MA
Lower limit	SENS:IR:JUDG:TYPE SENS:IR:JUDG:LOW:STAT SENS:IR:JUDG:LOW SENS:IR:JUDG:CURR:LOW:STAT SENS:IR:JUDG:CURR:LOW	RES ON 1MOHM OFF 0A
Auto setting of the judgment delay	SENS:IR:JUDG:DEL:AUTO SENS:IR:JUDG:DEL	OFF 0.1S
Test time	IR:VOLT:TIM:STAT IR:VOLT:TIM	ON 0.2S
Voltage rise time	IR:VOLT:SWE:TIM	0.1S
Discharge time	IR:VOLT:DISC:TIM	0S
Discharge when interlock is activated	IR:VOLT:DISC:INT:STAT	ON
Grounding mode	SENS:IR:TERM:GRO	LOW
Low-pass filter use	SENS:IR:CURR:FILT:LPAS:STAT	OFF
Offset	CALC:IR:SCAL CALC:IR:SCAL:OFFS	OFF 100MOHM
Scanner setting	ROUT:IR:TERM	*1,OPEN

*1. Specify the scanner and channel to set.

■ Set test conditions.

First, switch to remote mode.

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

We recommend you perform a reset.

```
*RST
```

Next, select the test mode.

AC withstanding voltage test

```
FUNC ACW
```

The DC withstanding voltage test parameter is DCW, and the insulation resistance test parameter is IR.

Next, set the test conditions.

When performing an AC withstanding voltage test with the test voltage set to 1500 V, the upper limit set to 10 mA, the test time set to 60 s, the voltage rise time set to 5 s, and the rest of the settings set to default

```
ACW:VOLT 1500
SENS:ACW:JUDG 10MA
ACW:VOLT:TIM 60
ACW:VOLT:SWE:TIM 5
```

The test time can be set to off. When set to off, the test continues until you press STOP or send ABOR.

```
ACW:VOLT:TIM:STAT OFF
```

When set to off, the test time set with ACW:VOLT:TIM is invalid. If you want to set the test time again, set it to on.

```
ACW:VOLT:TIM:STAT ON
```

In an AC withstanding voltage test, the default start voltage, lower limit, voltage fall time, and offset are off.

In a DC withstanding voltage test, the default start voltage, lower limit, auto setting of the judgment delay, voltage fall time, and offset are off.

In an insulation resistance test, the default start voltage, upper limit, auto setting of the judgment delay, and offset are off.

If you want to set them, set them to on and then set the values.

Start voltage in an AC withstanding voltage test

```
ACW:VOLT:STAR:STAT ON
ACW:VOLT:STAR 50PCT
```

In an AC withstanding voltage test or DC withstanding voltage test, the current detection response speed can be set. The default value is LPF slow.

Select whether to use the LPF or HPF, and then set the speed.

When using HPF fast in an AC withstanding voltage test

```
SENS:ACW:CURR:FILT:TYPE HIGH
SENS:ACW:CURR:FILT:HPAS FAST
```

In an insulation resistance test, you can set the upper limit and lower limit using a resistance or current. The default settings is resistance with the upper limit set to off and lower limit set to on.

When judging based on current

```
SENS:IR:JUDG:TYPE CURR
SENS:IR:JUDG:CURR:STAT ON
SENS:IR:JUDG:CURR 0.01MA
SENS:IR:JUDG:CURR:LOW 0.001MA
```

You can set the lower limit to off.

```
SENS:IR:JUDG:CURR:LOW:STAT OFF
```

If an optional high voltage scanner is connected, set the connection of each channel of the scanner.

You can query the available scanner channels.

```
ROUT:CAT?
```

Returns the available scanner channel in <NR1>,<NR1>... format. If scanner 1 (channels 1 to 4) is connected, +101,+102,+103,+104 is returned.

Specify the scanner channel, and then set the connection.

When setting scanner 1 channel 2 to LOW (DC withstanding voltage test)

```
ROUT:DCW:TERM 102,LOW
```

When you are done with the settings, start the test.

Earth continuity test (EC) settings

■ Test condition setting commands for earth continuity (AC) tests

Test condition	Command	Default
Test current	EC:AC:CURR	3A
Limit current	EC:AC:CURR:PROT	42A
Frequency	EC:CURR:FREQ	50
Upper limit	SENS:EC:AC:JUDG:TYPE SENS:EC:AC:JUDG:STAT SENS:EC:AC:JUDG SENS:EC:AC:JUDG:VOLT:STAT SENS:EC:AC:JUDG:VOLT	RES ON 0.0001OHM ON 2.5V
Lower limit	SENS:EC:AC:JUDG:TYPE SENS:EC:AC:JUDG:LOW:STAT SENS:EC:AC:JUDG:LOW SENS:EC:AC:JUDG:VOLT:LOW:STAT SENS:EC:AC:JUDG:VOLT:LOW	RES OFF 0OHM OFF 0V
Test time	EC:AC:CURR:TIM:STAT EC:AC:CURR:TIM	ON 0.2S
Current rise time	EC:AC:CURR:SWE:TIM	0.1S
Current fall time	EC:AC:CURR:SWE:FALL:TIM:STAT EC:AC:CURR:SWE:FALL:TIM	OFF 0.1S
Terminal wiring method	SENS:EC:AC:TERM:WIRE	4
Offset	CALC:EC:AC:SCAL CALC:EC:AC:SCAL:OFFS	OFF 0OHM
Contact check	SENS:EC:AC:TERM:CCH	OFF

Test condition setting commands for earth continuity (DC) tests

Test condition	Command	Default
Test current	EC:DC:CURR	3A
Limit current	EC:DC:CURR:PROT	42A
Upper limit	SENS:EC:DC:JUDG:TYPE SENS:EC:DC:JUDG:STAT SENS:EC:DC:JUDG SENS:EC:DC:JUDG:VOLT:STAT SENS:EC:DC:JUDG:VOLT	RES ON 0.0001OHM ON 2.5V
Lower limit	SENS:EC:DC:JUDG:TYPE SENS:EC:DC:JUDG:LOW:STAT SENS:EC:DC:JUDG:LOW SENS:EC:DC:JUDG:VOLT:LOW:STAT SENS:EC:DC:JUDG:VOLT:LOW	RES OFF 0OHM OFF 0V
Test time	EC:DC:CURR:TIM:STAT EC:DC:CURR:TIM	ON 0.2S
Current rise time	EC:DC:CURR:SWE:TIM	0.1S
Current fall time	EC:DC:CURR:SWE:FALL:TIM:STAT EC:DC:CURR:SWE:FALL:TIM	OFF 0.1S
Terminal wiring method	SENS:EC:DC:TERM:WIRE	4
Offset	CALC:EC:DC:SCAL CALC:EC:DC:SCAL:OFFS	OFF 0OHM
Contact check	SENS:EC:DC:TERM:CCH	OFF

Set test conditions.

First, switch to remote mode.

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

We recommend you perform a reset.

```
*RST
```

Next, select the test mode.

Earth continuity (AC) test

```
FUNC EC
```

The earth continuity (DC) test parameter is ECDC.

Next, set the test conditions.

An earth continuity (AC) test will be used as an example to explain the steps.

In the case of DC, replace AC in the node to DC.

When performing a test with the test voltage set to 25 A, the upper limit set to 0.1 Ω, the test time set to 60 s, and the rest of the settings set to default

```
EC:AC:CURR 25
SENS:EC:AC:JUDG 0.1
EC:AC:CURR:TIM 60
```

The test time can be set to off. When set to off, the test continues until you press STOP or send ABOR.

```
EC:AC:CURR:TIM:STAT OFF
```

When set to off, the test time set with EC:AC:CURR:TIM is invalid. If you want to set the test time again, set it to on.

```
EC:AC:CURR:TIM:STAT ON
```

The default lower limit, current fall time, and offset are off.

If you want to set them, set them to on and then set the values.

Current fall time

```
EC:AC:CURR:SWE:FALL:TIM:STAT ON
EC:AC:CURR:SWE:FALL:TIM 0.1
```

You can set the upper limit and lower limit using a resistance or voltage.

The default settings is resistance with the upper limit set to on and lower limit set to off.

When judging based on voltage

```
SENS:EC:AC:JUDG:TYPE VOLT
SENS:EC:AC:JUDG:VOLT:STAT ON
SENS:EC:AC:JUDG:VOLT 2.5V
SENS:EC:AC:JUDG:VOLT:LOW 0.1V
```

You can set the upper limit to off.

```
SENS:EC:AC:JUDG:VOLT:STAT OFF
```

When you are done with the settings, start the test.

Leakage current test settings

Test condition setting commands for touch current tests (TC)

Test condition	Command	Default
Network	SENS:TC:NETW	A
Power supply line polarity	TC:POL	NORM
Single fault mode	SENS:TC:COND SENS:TC:COND:FAUL	NORM NEUT
Probe connection destination	SENS:TC:NETW:PROB	PEAR
Output from the 110% terminal	TC:110P:OUTP TC:110P:POL	OFF NORM
Upper limit	SENS:TC:JUDG:STAT SENS:TC:JUDG	ON 100UA
Lower limit	SENS:TC:JUDG:LOW:STAT SENS:TC:JUDG:LOW	OFF 0.01MA
Judgment delay	SENS:TC:JUDG:DEL:STAT SENS:TC:JUDG:DEL	OFF 1S
Test time	SENS:TC:TIM:STAT SENS:TC:TIM	ON 1S
Voltage conversion	CALC:TC:SCAL:CONV CALC:TC:SCAL:CONV:VOLT	OFF 80V
Measurement mode	SENS:TC:CURR:MODE	ACDC
Measurement range	SENS:TC:RANG:AUTO	ON
Voltmeter band expansion	SENS:TC:BAND	NORM
Offset	CALC:TC:SCAL CALC:TC:SCAL:OFFS	OFF 0A

Test condition setting commands for protective conductor current test (PCC)

Test condition	Command	Default
Network	SENS:PCC:NETW	PCC-1
Power supply line polarity	PCC:POL	NORM
Single fault mode	SENS:PCC:COND	NORM
Upper limit	SENS:PCC:JUDG:STAT SENS:PCC:JUDG	ON 100UA
Lower limit	SENS:PCC:JUDG:LOW:STAT SENS:PCC:JUDG:LOW	OFF 0.01MA
Judgment delay	SENS:PCC:JUDG:DEL:STAT SENS:PCC:JUDG:DEL	OFF 1S
Test time	SENS:PCC:TIM:STAT SENS:PCC:TIM	ON 1S
Voltage conversion	CALC:PCC:SCAL:CONV CALC:PCC:SCAL:CONV:VOLT	OFF 80V
Measurement mode	SENS:PCC:CURR:MODE	ACDC
Measurement range	SENS:PCC:RANG:AUTO	ON
Voltmeter band expansion	SENS:PCC:BAND	NORM
Offset	CALC:PCC:SCAL CALC:PCC:SCAL:OFFS	OFF 0A

Test condition setting commands for patient leakage current tests (PAT)

Test condition	Command	Default
Power supply line polarity	PAT:POL	NORM
Single fault mode	SENS:PAT:COND SENS:PAT:COND:FAUL	NORM NEUT
Probe connection destination	SENS:PAT:NETW:PROB	PEAR
Output from the 110% terminal	PAT:110P:OUTP PAT:110P:POL	OFF NORM
Upper limit	SENS:PAT:JUDG:STAT SENS:PAT:JUDG	ON 0.1MA
Lower limit	SENS:PAT:JUDG:LOW:STAT SENS:PAT:JUDG:LOW	OFF 0.01MA
Judgment delay	SENS:PAT:JUDG:DEL:STAT SENS:PAT:JUDG:DEL	OFF 1S
Test time	SENS:PAT:TIM:STAT SENS:PAT:TIM	ON 1S
Voltage conversion	CALC:PAT:SCAL:CONV CALC:PAT:SCAL:CONV:VOLT	OFF 80V
Measurement mode	SENS:PAT:CURR:MODE	ACDC
Measurement range	SENS:PAT:RANG:AUTO	ON
Voltmeter band expansion	SENS:PAT:BAND	NORM
Offset	CALC:PAT:SCAL CALC:PAT:SCAL:OFFS	OFF 0A

Test condition setting commands for meter mode (MET)

Test condition	Command	Default
Network	SENS:MET:NETW	A
Touch mode	SENS:MET:TERM	NETW
SELV setting	SENS:MET:SELV:STAT SENS:MET:SELV	ON 30V
Measurement mode	SENS:MET:CURR:MODE	ACDC
Measurement range	SENS:MET:RANG:AUTO SENS:MET:RANG	ON 42V
Offset	CALC:MET:SCAL CALC:MET:SCAL:OFFS	OFF 0A
Output from the 110% terminal	OUTP:110P OUTP:110P:POL	OFF NORM

Set test conditions.

First, switch to remote mode.

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

We recommend you perform a reset.

```
*RST
```

Next, select the test mode.

Touch current test

```
FUNC TC
```

The protective conductor current test parameter is PCC, the patient leakage current test parameter is PAT, and meter mode is MET.

Next, set the test conditions.

When performing a touch current test with the network set to B-U1, the upper limit set to 0.5 mA, the test time set to 10 s, and the rest of the settings set to default

```
SENS:TC:NETW B-U1
SENS:TC:JUDG 0.5MA
SENS:TC:TIM 10
```

The test time can be set to off. When set to off, the test continues until you press STOP or send ABOR.

```
SENS:TC:TIM:STAT OFF
```

When set to off, the test time set with SENS:TC:TIM is invalid. If you want to set the test time again, set it to on.

```
SENS:TC:TIM:STAT ON
```

You can also set the upper limit to off.

```
SENS:TC:JUDG:STAT OFF
```

In a touch current test, protective conductor current test, or patient leakage current test, the default lower limit, judgment delay, voltage conversion, and offset are off.

In meter mode, the default offset is off.

If you want to set them, set them to on and then set the values.

Judgment delay in a touch current test

```
SENS:TC:JUDG:DEL:STAT ON
SENS:TC:JUDG:DEL 1S
```

In a touch current test or patient leakage current test, you can set the disconnected condition of single fault mode to power supply line or protective ground wire. The default is normal (NORM).

When setting the disconnected condition to protective ground wire in a touch current test

```
SENS:TC:COND FAUL
SENS:TC:COND:FAUL PEAR
```

When you are done with the settings, start the test.

Trigger Subsystem

This product has two different trigger subsystems.

- TEST
  Executes a test/ auto test.
- ACQuire
  Measures the voltage, current, resistance, and elapsed test time.

The trigger subsystems have three states (IDLE state, INITiated state, WTG state).

- IDLE state
  When the product is turned on, all trigger subsystems are in the IDLE state. In this state, the trigger subsystem ignores all triggers. If you send any of the following commands, the trigger subsystem is switched to the IDLE state, regardless of its current state.

  ABORt

  *RST

  *RCL

  IEEE488.1 sdc (Selected Device Clear) or dcl (Device Clear)
- INITiated state
  When you send the INIT command while the product is in the IDLE state, the trigger function begins operating, and the tester switches to the INITiated state.
  If the trigger source is set to IMMediate, the test, the auto test, or the measurement immediately.
  If the trigger source is set to BUS, the product switches to the WTG (Waiting for Trigger) state. If the trigger source is set to EXT/ ONCE, the product switches to WTG (Waiting for Trigger) state, which causes the product to wait for a start operation to take place on the TOS.
- WTG (Waiting for Trigger) state
  When you send a trigger or perform a start operation on the TOS93 in the WTG state, test, auto test, or measurement starts.

Executing tests

Tests use the TEST trigger subsystem.

First, set the test conditions.

■ Before starting a test

In a withstanding voltage test or insulation resistance test, you can check the continuity between the test leads connected to the scanner and the EUT.

AC withstanding voltage test

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

DC withstanding voltage test

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

Insulation resistance test

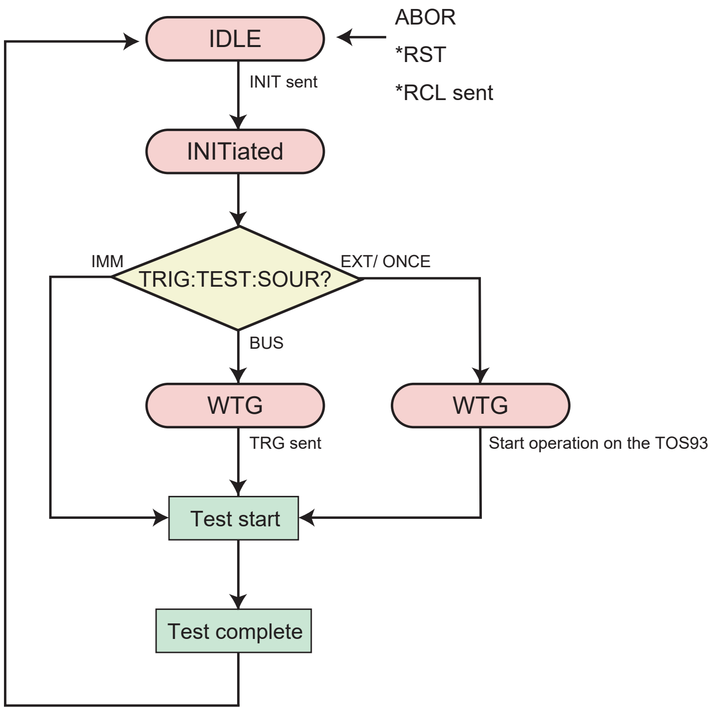
```
ROUT:IR:TERM:CCH ON
```

In a touch current test, protective conductor current test, or patient leakage current test, a current can be output temporarily from AC LINE OUT for checking the operation of the EUT.

```
OUTP ON
```

■ Starting a test

The TEST trigger subsystem has three states: IDLE, INITiated, and WTG.



To start a test immediately, set the trigger source to IMM, and then use the INIT command.

```
TRIG:TEST:SOUR IMM
INIT:TEST
```

To start a test with a software trigger, change the trigger source to BUS. When you send INIT:TEST, the trigger subsystem switches to the WTG (Waiting For Trigger) state. When a software trigger is received through TRIG:TEST or *TRG, the test starts.

```
TRIG:TEST:SOUR BUS
INIT:TEST
TRIG:TEST
```

To start a test from the TOS93, change the trigger source to EXT. When you send INIT:TEST, the trigger subsystem switches to the WTG (Waiting For Trigger) state. The test starts when you perform a start operation on the unit.

```
TRIG:TEST:SOUR EXT
INIT:TEST
```

When the test finishes, the trigger subsystem returns to the IDLE state again. If the ABOR command or an equivalent command is received in the WTG state or when a test is being executed, the test is canceled, and the trigger subsystem returns to the IDLE state.

Send an *RST command to reset all the test condition parameters.

TRIG:TEST applies a software trigger only to the TEST trigger subsystem.

You can also use the *TRG command or the IEEE488.1 get (Group Execute Trigger) command for the same purpose. This command applies a software trigger to all trigger subsystems, if there are other trigger subsystems in the initiated state, their trigger operations will also be executed at the same time. The TEST subsystem and the PROG subsystem cannot be executed simultaneously. The trigger operation of the item selected with FUNC is executed.

Configuring and executing auto tests

Auto tests use the TEST trigger subsystem.

■ Setting the step and program conditions

First, switch to remote mode.

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

We recommend you perform a reset.

```
*RST
```

Next, set the test mode to auto test.

```
FUNC PROG
```

To create a new program, specify a program name. If you are using a program in program memory, you do not need to create a program.

For tests other than an LC test, include “/BASIC/” before the program name. For an LC test, include “/LC/”.

When creating a test other than an LC test

```
PROG:CRE "/BASIC/MY TEST"
```

After creating the program, specify the program to set the steps.

Specifying the aforementioned program

```
PROG "/BASIC/MY TEST"
```

When specifying a program in program memory, for tests other than an LC test, include “/SIGNAL IO/BASIC/” before the program name. For an LC test, include “/ SIGNAL IO/LC/”.

When specifying 51 (other than an LC test)

```
PROG "/SIGNAL IO/BASIC/51"
```

Set the number of steps of the specified program.

```
PROG:STEPS:COUN 2
```

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

Next, set the steps.

Step 1: AC withstanding voltage test, test voltage 1500 V, current upper limit

10 mA, current lower limit 1 mA, test time 60 s, rest of the settings at default

Step 2: DC withstanding voltage test, test voltage 1800 V, current upper limit 1 mA, current lower limit 0.1 mA, test time 60 s, rest of the settings at default

```
PROG:STEP1:FUNC ACW
PROG:STEP1 1500
PROG:STEP1:JUDG:CURR 10MA
PROG:STEP1:JUDG:CURR:LOW 1MA
PROG:STEP1:JUDG:LOW:STAT ON
PROG:STEP1:TIM 60
PROG:STEP2:FUNC DCW
PROG:STEP2 1800
PROG:STEP2:JUDG:CURR 1MA
PROG:STEP2:JUDG:CURR:LOW 0.1MA
PROG:STEP2:JUDG:LOW:STAT ON
PROG:STEP2:TIM 60
```

For the following commands, CURRent, VOLTage, or RESistance cannot be omitted when a unit is used in the parameter.

```
PROGram[:SELected]:STEP<n>:[CURRent:][LEVel]
PROGram[:SELected]:STEP<n>:[CURRent:]SCALe:OFFSet:IMAGinary
PROGram[:SELected]:STEP<n>:[CURRent:]SCALe:OFFSet[:REAL]
PROGram[:SELected]:STEP<n>:JUDGment[:CURRent]:LOWer
PROGram[:SELected]:STEP<n>:JUDGment[:CURRent][:UPPer]
PROGram[:SELected]:STEP<n>:JUDGment[:VOLTage]:LOWer
PROGram[:SELected]:STEP<n>:JUDGment[:VOLTage][:UPPer]
PROGram[:SELected]:STEP<n>:[RESistance:]SCALe:OFFSet[:REAL]
PROGram[:SELected]:STEP<n>:[VOLTage:][LEVel]
```

Example when a unit is used

```
PROG:STEP1:JUDG:CURR 10MA
```

Example when a unit is not used

```
PROG:STEP1:JUDG 0.01
```

For details on step setting commands, see -> “PROG:STEP<n>:<prog_item>”(p.

114).

Next, set the program conditions.

Set the step interval time to 10 s.

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

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

To end the step in execution when a FAIL occurs, start the next step after the step interval elapses, and produce a FAIL judgment when all steps are completed

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

To end the auto test when a FAIL occurs and produce a FAIL judgment

```
PROG:FAIL:CONT OFF
```

Save the program.

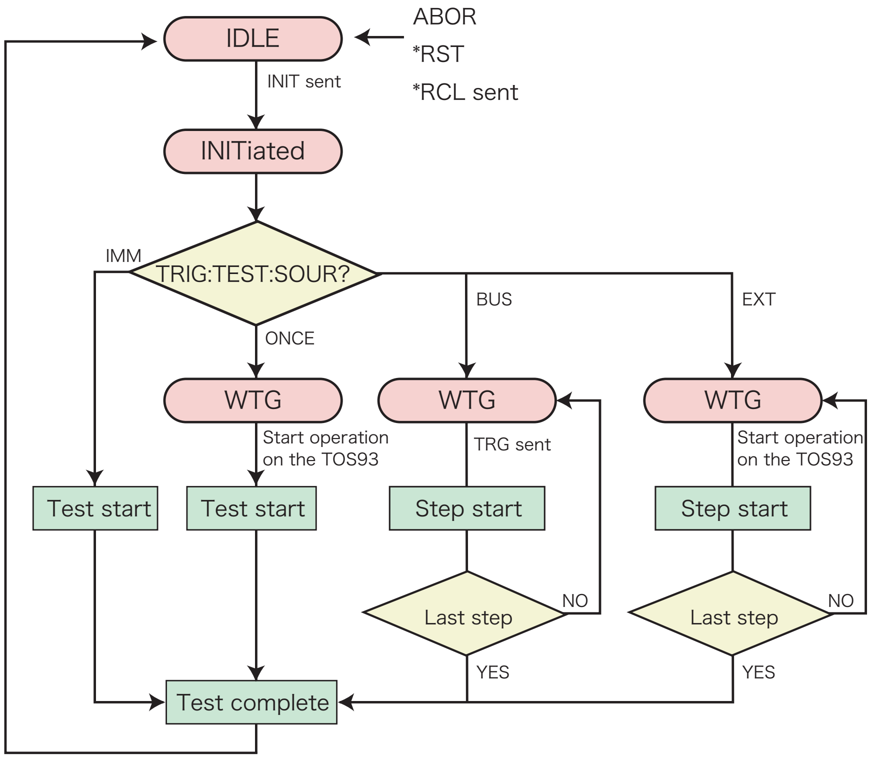
```
PROG:SAVE
```

You can start the auto test without saving the program, but the program will be erased if you turn off the POWER switch.

When you are done with the settings, start the auto test.

■ Starting an auto test

The TEST trigger subsystem has three states: IDLE, INITiated, and WTG.



First, reset the TEST trigger subsystem.

```
ABOR:TEST
```

To start a sequence operation immediately, set the trigger source to IMM, and then use the INIT command.

```
TRIG:TEST:SOUR IMM
INIT:TEST
```

To start an auto test with a software trigger, change the trigger source to BUS

When you send INIT:TEST, the trigger subsystem switches to the WTG (Waiting For Trigger) state. When a software trigger is received through TRIG:TEST or *TRG, the test starts. When a step is completed, the product pauses and switches to the WTG (Waiting For Trigger) state. When a software trigger is received through TRIG:TEST or *TRG, the test resumes, and the next step starts.

```
TRIG:TEST:SOUR BUS
INIT:TEST
TRIG:TEST
```

TRIG:TEST applies a software trigger only to the TEST trigger subsystem.

You can also use the *TRG command or the IEEE488.1 get (Group Execute Trigger) command for the same purpose. This command applies a software trigger to all trigger subsystems, if there are other trigger subsystems in the initiated state, their trigger operations will also be executed at the same time.

To start an auto test from the TOS93, change the trigger source to EXT or ONCE.

With ONCE, when an auto test is started once on the TOS93, all steps are executed. With EXT, when a step is completed, the product pauses and switches to the WTG (Waiting For Trigger) state. When you start an auto test on the TOS93 again, the next step starts.

When you send INIT:TEST, the trigger subsystem switches to the WTG (Waiting For Trigger) state. The test starts when you perform a start operation on the unit.

```
TRIG:TEST:SOUR EXT
INIT:TEST
```

When the auto test finishes, the trigger subsystem returns to the IDLE state again. If the ABOR command or an equivalent command is received in the WTG state or when an auto test is being executed, the test is canceled, and the trigger subsystem returns to the IDLE state.

Querying measured values

Measurement value queries use the ACQ subsystem.

There are simple measurements and advanced measurements.

■ Simple measurement

This product has functions for returning the measured voltage, current, resistance, and elapsed test time. The easiest measurement method is using the MEAS command.

The MEAS command starts a new measurement. Because this query starts a new measurement each time that it is sent, you cannot use it to synchronize the measurement of multiple items. The measurement method explained in “Advanced measurement” allows you to separate the measurement start operation and the data query operation.

Voltage query

```
MEAS:VOLT?
```

Current query

```
MEAS:CURR?
```

Resistance query

```
MEAS:RES?
```

Elapsed test time query

```
MEAS:ETIM?
```

These values can also be queried collectively.

Returns the measured current, voltage, resistance, and test time in response to MEAS?.

Normally, it takes approximately 200 ms for a single measurement to complete.

If you send the MEAS query multiple times, data acquisition will take a long time. If you want to acquire the data of multiple parameters, query using MEAS?.

This product also supports the READ command, which starts a new measurement and queries the data.

Because this product has no settings that are reset to default values with MEAS, READ and MEAS perform the same operation.

Advanced measurement

In advanced measurement, you can separate and control the starting of measurement and the referencing of data.

To start a new measurement, use the INIT command.

```
INIT:ACQ
```

When you send INIT:ACQ, measurement data already acquired is invalidated. When the measurement finishes, you can use the FETC query to retrieve the measured data.

```
FETC:VOLT?
FETC:CURR?
FETC:RES?
FETC:ETIM?
```

These values can also be queried collectively.

By using the *OPC command, you can obtain correct measurement data.-> "Waiting for Operation Complete"(p. 405)

When waiting for the completion of a measurement of the ACQuire trigger subsystem

```
INIT:ACQ;*OPC
```

The ABOR command and IEEE488.1 sdc/dcl commands abort measurements that are in progress.

These commands do not invalidate measured data that has already been acquired. On the other hand, the *RST and *RCL common commands not only abort a measurement that is in progress but also invalidate the acquired measured data.

If you send *RST;:FETC:VOLT?, an error will occur because there is no measured data that the FETC query can retrieve and there is no new measurement that is going to be performed.

The difference between the MEASure (or READ) command and the FETC command is as follows. The MEAS command starts a new measurement and then queries the measured data. The FETC command queries the measured data without first starting a new measurement. The valid measurement parameters are exactly the same between MEAS and FETC.

Querying test results

You can query test results.

The product holds the 1000 latest test results. The data is cleared when the power is turned off.

The items that can be queried are the test number, auto test step number, test mode, test start time (RFC2822 format), test start date (year), test start date (month), test start date (day), test start time (hour), test start time (minute), test start time (second), voltage at the time of judgment, current at the time of judgment, resistance at the time of judgment, test time at the time of judgment, and test result.

First specify the item you want to query using the parameters of the RES:FORM command (1 minimum, 15 maximum).

Parameter:	NUMBer	Test number
	STEP	Auto test step number
	FUNCtion	Test mode
	DATE	Test start time (RFC2822 format)
	YEAR	Test start date (year)
	MONTh	Test start date (month)
	DAY	Test start date (day)
	HOUR	Test start time (hour)
	MINute	Test start time (minute)
	SECond	Test start time (second)
	VOLTage	Voltage at the time of judgment
	CURRent	Current at the time of judgment
	CREal	Real part of the current at the time of judgment
	CIMaginary	Imaginary part of the current at the time of judgment
	RESistance	Resistance at the time of judgment
	ETIMe	Test time at the time of judgment
	JUDGment	Judgment result

The test number is incremented each time a test is performed. After 4294967295, the count returns to 0.After 2147483647, the count returns to 0.

When querying the test mode, test start time, voltage, current, test time, and test result

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

When you perform an auto test, we recommend that you also query the step number.

```
RES:FORM STEP,FUNC,DATE,VOLT,CURR,RES,ETIM,JUDG
```

When you are done setting the parameters, make a query.

There are two query commands. RES? queries the latest test result. This query does not delete the test result. RES:REM? queries the oldest test result. After the query, the result is deleted.

<table>
<tr><th>Item</th><th colspan="2">Description</th><th>Response format</th></tr>
<tr><td>Test number</td><td colspan="2">---</td><td>NR1</td></tr>
<tr><td>Auto test step number</td><td colspan="2">1 for a single test</td><td>NR1</td></tr>
<tr><td rowspan="8">Test mode</td><td>ACW</td><td>AC withstanding voltage</td><td rowspan="8">character</td></tr>
<tr><td>DCW</td><td>DC withstanding voltage</td></tr>
<tr><td>IR</td><td>Insulation resistance</td></tr>
<tr><td>ECAC</td><td>Earth continuity (AC)</td></tr>
<tr><td>ECDC</td><td>Earth continuity (DC)</td></tr>
<tr><td>TC-n[*1]</td><td>Touch current</td></tr>
<tr><td>PCC-n[*1]</td><td>Protective conductor current</td></tr>
<tr><td>PATIENT-n[*1]</td><td>Patient leakage current</td></tr>
<tr><td>Test start time</td><td colspan="2">RFC2822 format</td><td>"string"</td></tr>
<tr><td>Test start date (year)</td><td colspan="2">---</td><td>NR1</td></tr>
<tr><td>Test start date (month)</td><td colspan="2">---</td><td>NR1</td></tr>
<tr><td>Test start date (day)</td><td colspan="2">---</td><td>NR1</td></tr>
<tr><td>Test start time (hour)</td><td colspan="2">---</td><td>NR1</td></tr>
<tr><td>Test start time (minute)</td><td colspan="2">---</td><td>NR1</td></tr>
<tr><td>Test start time (second)</td><td colspan="2">---</td><td>NR1</td></tr>
<tr><td>Voltage at the time of judgment</td><td colspan="2">---</td><td>NR3</td></tr>
<tr><td>Current at the time of judgment</td><td colspan="2">---</td><td>NR3</td></tr>
<tr><td>Real part of the current at the time of judgment</td><td colspan="2">--</td><td>NR3</td></tr>
<tr><td>Imaginary part of the current at the time of judgment</td><td colspan="2">--</td><td>NR3</td></tr>
<tr><td>Resistance at the time of judgment</td><td colspan="2">---</td><td>NR3</td></tr>
<tr><td>Test time at the time of judgment</td><td colspan="2">---</td><td>NR3</td></tr>
<tr><td rowspan="5">Judgment result</td><td>PASS</td><td>PASS judgment.</td><td rowspan="5">character</td></tr>
<tr><td>U-FAIL</td><td>A value exceeding the upper limit was detected resulting in a FAIL judgment.</td></tr>
<tr><td>L-FAIL</td><td>A value less than the lower limit was detected resulting in a FAIL judgment.</td></tr>
<tr><td>PROT</td><td>A protection function was activated, and the test was stopped.</td></tr>
<tr><td>ABORT</td><td>The test was aborted with a STOP signal.</td></tr>
</table>

*1. n is the network name.

In a leakage current test, the network is returned along with the test mode.

```
RES?
```

If you want to check the test result in order from the first step, such as when you perform an auto test, use RES:REM?.

```
RES:REM?
```

<Reads the response>

```
RES:REM?
```

<Reads the response>

In this case, when you query the oldest test result with RES:REM?, the oldest test result is deleted, so when you query again with RES:REM?, the next test result is returned.

The test start time in RFC2822 format returns the day of the week (abbreviation), day, month (abbreviation), year, hour:minute:second, and time zone.

```
Wed, 24 Oct 2018 08:14:02 +0000
```

Waiting for Operation Complete

The *OPC command has a function for waiting for operations to complete. Operation complete means that there are no operations that are waiting for a response from the TOS93. Measurement completion requires about 200 ms. The TOS93 is not in the operation complete state while a measurement is ongoing. When the measurement completes, if there are no other operations waiting to be completed, the TOS93 enters the operation complete state

When an *OPC command is received, the product transitions to the Operation Complete Command Active State (OCAS). If a measurement is completed and there are no operations standing by, the product returns to the Operation Complete Command Idle State (OCIS) and sets the OPC bit (bit 0) of the event status register to TRUE (1). This information can be determined by checking the OPC bit (bit 0) of the *ESR? query.

Next, we will show an example that starts a new measurement and sends an *OPC command. Because the event status enable register and service request enable register are configured to generate a service request (SRQ) in response to an operation complete event, an SRQ is generated when a measurement is completed. The SRQ function cannot be used if you are using the RS232 interface

```
*ESE 1;*SRE 32;*CLS;:INITiate:IMMediate:ACQuire;*OPC
```

<Generates a service request>

If you use the *OPC? query command in place of the *OPC command, the product transitions to the Operation Complete Query Active State (OQAS). If a measurement is completed and there are no operations standing by, the product returns to the Operation Complete Query Idle State (OQIS) and sets response data “1” (in NR1 format) in the output queue.

```
INITiate:IMMediate:ACQuire;*OPC?
```

<Reads the response>

At power-on, if you send an IEEE488 sdc/dcl, *RST, or *RCL, this product switches to the OCIS and OQIS states.

Status Monitoring

The product has two mandatory SCPI standard registers, STATus:OPERation and STATus:QUEStionable, in addition to the IEEE488.2 standard registers.

■ Register basics

All SCPI registers have a standard architecture that uses events/filters. CONDition, EVENt, and ENABle and optionally PTRansition and NTRansition can be used. CONDition and EVENt are read-only registers working as status indicators. ENABle, PTRansition and NTRansition are read-write registers working as event and summary filters.

■ STATus:OPERation

The OPERation Status register is used to record events and notifications that occur during normal operations.

To check whether CV output is being performed, check the CV bit (bit 8) of the STATus:OPERation register.

```
STATus:OPERation?
```

■ STATus:QUEStionable

The QUEStionable Status register is used to record events and notifications that occur during abnormal operations.

To check whether a protection function has been activated, check the OV bit (bit 0) of the STATus:QUEStionable register.

```
STATus:QUEStionable?
```

■ PON (Power ON) bit

The PON bit (bit 7) of the event status register is always set when the product is turned on. To generate a power-on SRQ to track power failures and power supply line errors, use PON as follows.

1. **Set *PSC (Power-on Status Clear) to 0 (or OFF).**
   Enable the backup functions for event status enable register and service request enable register settings. (*PSC 0)

2. **Set the PON bit (bit 7) of the event status enable register.**
   This enables the transmission of power-on events to the higher layer. (*ESE 128)

3. **Set the ESB bit (bit 5) of the status byte enable register.**
   This enables the generation of SRQs based on standard events. (*SRE 32)

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

When you use the RS232C interface, the PON bit cannot be assigned to a service request because SRQs are not generated.

When you use the USB or LAN (VXI-11/HiSLIP) interface, even though the SRQ function itself is supported by the communication protocol, a connection lost error occurs in the VISA I/O session immediately before the power-on event. It appears that handling PON events would be difficult.

Error Checking

■ Error/event queue

The SCPI specifications define a standard error reporting scheme, Error/Event Queue This is a FIFO (First In First Out) queue, which records errors and events. The maximum number of errors/events that the product can record is 16. Each error/event can be read with the SYSTem:ERRor query.

```
SYSTem:ERRor?
```

The response to this query contains a numeric part (error/event number) and a textual description, such as:

-222,"Data out of range"

The error/event queue becomes empty when the *CLS common command is sent, when the last item in the queue is read, and when the product is turned on. When the error/event queue is empty, the query returns the following:

0,"No error"

■ Displaying communication errors

The product has a debug trace function.

The product can display the oldest item among the errors and events (if there are errors or events). This is convenient for debugging remote control.

When an error or event item is displayed on the panel, the normal voltmeter and ammeter are void.

When the error/event queue is empty, the debug trace function does not display communication errors.* When you send a CLS command, the communication error display clears.

In local mode, the debug trace function is temporarily disabled.

Use the SYSTem:ERRor:TRACe command to enable or disable the communication error display.

```
SYSTem:ERRor:TRACe {ON|OFF}
```

When using commands on a PLC (sequencer, controller)

These are notes for when using commands on a PLC (sequencer, controller).

- Append a delimiter (ASCII 0x0A) to each command.
- When using RS232C, match the protocol with the sequencer setting.
- Return values vary in length. Because exponential (NR3) queries are also available, processing using functions is necessary on the sequencer side.

Visual Basic 2017

■ Project settings

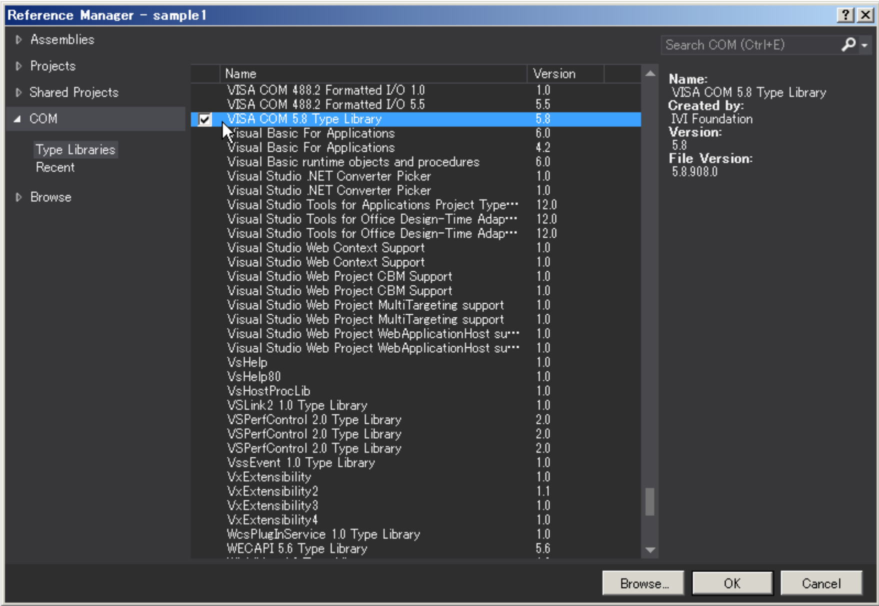
First, add the communication middleware (VISA library) to the project.

Click References on the Project menu to open the Reference Manager window.

On the navigation pane, click COM and then Type Libraries.

From the list in the center of the window, select “VISA COM *.* Type Library” (where *.* is the VISA library version number), and select the check box.

Click OK to close the dialog box.



Communicating via RS232C, USB, LAN

Opening VISA

Before you can use the VISA library to communicate with RS232C, USB, and LAN devices, you have to open VISA. Specify an I/O resource to open VISA.

Example: Opening VISA when using USB on the TOS93

```
Set rm = CreateObject("VISA.GlobalRM")
Set msg = rm.Open("USB::0x0B3E::0x104F::00000001::INSTR", NO_LOCK, 0, "")
```

"USB::0x0B3E::0x104F::00000001::INSTR" is an I/O resource.

The I/O resource syntax is shown below. The parts surrounded by square brackets ([ ]) can be omitted. Enter the appropriate values in the parts written in italics.

Serial (RS232C)		ASRL[*board*][::INSTR] Example: A measuring instrument connected to serial port COM1 ASRL1::INSTR
USB		USB[*board*]::*VendorID*::*ProductID*::*SerialNumber*[::*InterfaceNumber*][::INSTR] Example: A USBTMC measuring instrument whose vendor ID (VID) is 2878, product ID (PID) is 4175, and serial number is 00000001 USB0::0x0B3E::0x104F::00000001::INSTR
LAN[*1]	VXI-11	TCPIP[*board*]::*hostname*[::inst*0*][::INSTR] Example: Measuring instrument whose IP address (hostname) is 169.254.7.8 TCPIP::169.254.7.8::INSTR You can also specify the host name for the hostname parameter.
	HiSLIP	TCPIP[*board*]::*hostname*::hislip0[::INSTR] Example: Measuring instrument whose IP address (hostname) is 169.254.7.8 TCPIP::169.254.7.8::hislip0::INSTR You can also specify the host name for the hostname parameter.
	SCPI-RAW	TCPIP[*board*]::*hostname*::*portno*::SOCKET Example: Measuring instrument whose IP address (hostname) is 169.254.7.8 (the product's port number is fixed to 5025) TCPIP::169.254.7.8::5025::SOCKET You can also specify the host name for the hostname parameter.

[*1]: The hostname must be a valid mDNS hostname (a Bonjour hostname that ends in ".local") or a DNS hostname that is managed by an external DNS server (a full-qualified domain name—FQDN). If you are using an mDNS hostname, Apple Bonjour (alternatively, iTunes or Safari) must be installed on your PC.

In VISA, you can use aliases for I/O resources.

If you use an alias for an I/O resource, even if the alias name is hard-coded in the application, the I/O resource name can still be changed to an appropriate value when the application runs.

Example: Using an alias (MYDEV1) for an I/O resource

```
Set msg = rm.Open("MYDEV1", NO_LOCK, 0, "")
```

When you use aliases, specify the actual I/O resources through an external configuration table or similar tool. Refer to the VISA manual.

Controlling the instrument

Next, we will use commands such as read and write commands to control the instrument. You must include line-feed codes in the command strings.

Examples:

```
msg.WriteString ("FUNC MET" & vbLF)                  'Set to meter mode
msg.WriteString ("SENS:MET:RANG:AUTO ON" & vbLF)     'Set to auto range
```

Closing VISA

Finally, close VISA.

In a sequence of operations, you only have to open and close VISA once.

```
msg.Close
```

■ Sample program

```
Imports Ivi.Visa.Interop


Public Class Form1


    Dim rm As ResourceManager
    Dim msg As IMessage


    Sub Form1_Load(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles MyBase.Load
      rm = CreateObject("VISA.GlobalRM")
      'Version using USB
      'msg = rm.Open("USB0::0x0B3E::0x104F::00000001::INSTR", AccessMode.NO_LOCK, 0, "")
      'Version using a VISA alias
      'msg = rm.Open("MYDEV1", AccessMode.NO_LOCK, 0, "")


      'Version using LAN (SCPI-RAW)
      msg = rm.Open("TCPIP::169.254.7.8::5025::SOCKET", AccessMode.NO_LOCK, 0, "")


      msg.TerminationCharacterEnabled = True
    End Sub


    'Query the ID
    Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles Button1.Click
      msg.WriteString("SYST:COMM:RLST REM" & vbLf)
```

```
    msg.WriteString("*IDN?" & vbLf)
    TextBox1.Text = msg.ReadString(256)
End Sub
```

‘Configure the AC withstanding voltage test

```
Private Sub Button2_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles Button2.Click
    msg.WriteString("*RST" & vbLf)
    msg.WriteString("FUNC ACW" & vbLf)
    msg.WriteString("ACW:VOLT 1500" & vbLf)
    msg.WriteString("SENS:JUDG 10MA" & vbLf)
    msg.WriteString("ACW:VOLT:TIM 60" & vbLf)
End Sub
```

'Execute the test

```
Private Sub Button3_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles Button3.Click
    msg.WriteString("TRIG:TEST:SOUR IMM" & vbLf)
    msg.WriteString("INIT:TEST" & vbLf)
    TextBox1.Text = msg.ReadString(256)
End Sub

Private Sub Form1_Disposed(ByVal sender As Object, ByVal e As System.EventArgs) Handles Me.Disposed
    msg.Close()
End Sub

End Class
```

List of Errors

Command errors

An error in the range [-199, -100] indicates that an IEEE 488.2 syntax error has been detected by the instrument’s parser. The occurrence of any error in this class causes the Command Error bit (bit 5) in the event status register to be set.

Error code		Error message description
-100	Command error	Command error. Generic syntax error.
-101	Invalid character	An invalid character exists. A data element different than those allowed was recognized.
-102	Syntax error	Syntax error. An unrecognized command or data type was encountered.
-103	Invalid separator	Invalid separator The parser was expecting a separator and encountered an illegal character.
-104	Data type error	Data type error. The parser recognized a data element different than one allowed.
-105	GET not allowed	Get not allowed. A Group Execute Trigger was received in a program message.
-108	Parameter not allowed	Parameter 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. Inappropriate for the product.
-114	Header suffix out of range	Invalid suffix exists in the header.
-115	Unexpected number of parameters	Unexpected parameters were received in the header.
-120	Numeric data error	Numeric data error. Generated when parsing a data element which appears to be numeric, including the nondecimal numeric types.
-128	Numeric data not allowed	Numeric data is not allowed.
-130	Suffix error	Suffix error. Generated when parsing a suffix.
-131	Invalid suffix	A suffix is invalid. The suffix does not follow the syntax, or the suffix is inappropriate for the product.
-134	Suffix too long	Suffix too long. The suffix contains too many characters.
-138	Suffix not allowed	A suffix was encountered after a numeric parameter that does not allow suffixes.
-140	Character data error	Character data error. Generated when parsing a character data element.
-141	Invalid character data	Either the character data element contains an invalid character, or the element is not valid.
-144	Character data too Long	Character data too long. The character data element contains too many characters.
-148	Character data not allowed	Character data is not allowed.
-150	String data error	String data error. Generated when parsing a string data element.

Error code		Error message description
-151	Invalid string data	Invalid string data.
-158	String data not allowed	String data is not allowed.
-160	Block data error	Block data error. Generated when parsing a block data element.
-170	Expression error	Expression error. Generated when parsing an expression data element.
-180	Macro error	Generated when defining a macro or executing a macro.

Execution errors

An error in the range [-299, -200] indicates that an error has been detected by the instrument's execution control block. The occurrence of any error in this class causes the Execution Error bit (bit 4) in the event status register to be set.

Error code		Error message description
-200	Execution error (generic)	Execution error. A generic product error.
-203	Command protected	Password protected program or query command cannot be executed.
-210	Trigger error	Trigger error.
-211	Trigger ignored	A trigger was received but ignored.
-213	Init ignored	A measurement initiate operation was ignored because measurement is in progress.
-214	Trigger deadlock	A deadlock occurred because a query was received before the software trigger.
-220	Parameter error	Invalid parameter.
-221	Settings conflict	A command was received that the product cannot execute in its present condition.
-222	Data out of range	Parameter was out of range.
-223	Too much data	Too many parameters were received for the requirements.
-224	Illegal parameter value	Received invalid parameter data.
-230	Data corrupt or stale	Received a data query before the measurement completed.
-241	Hardware missing	Cannot be executed because the optional hardware is not installed.

Product-specific errors

An error in the range [-399, -300] indicates that an error other than command error, query error, or execution error was detected. The occurrence of any error in this class causes the Device Dependent Error bit (bit 3) in the event status register to be set.

Error code		Error message description
-310	System error	System error
-311	Memory error	Memory error. Physical damage to the device memory.
-313	Calibration memory lost	Calibration memory lost.* Damage to nonvolatile calibration data by CAL?.
-314	Save/recall memory lost	Memory data lost.* Damage to nonvolatile data by SAV?.
-315	Configuration memory lost	Configuration data lost. Damage to nonvolatile panel settings.
-330	Self-test failed	Self-test failed.
-350	Queue overflow	Queue overflow.

Error code		Error message description
-360	Communication error	Communication error that occurs when flow control is off. This is an error when using RS232C.
-362	Framing error in program message	Framing error. This is an error when using RS232C.
-363	Input buffer overrun	Buffer overflow error. This is an error when using RS232C.
-365	Time out error	Time out error. This is an error when using RS232C.

■ Query errors

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 IEEE 488.2, chapter 6. The occurrence of any error in this class causes the Query Error bit (bit 2) in the event status register to be set.

Error code		Error message description
-400	Query error (generic)	Query error. A generic product error.
-410	Query INTERRUPTED	Received a new command after the query was received and before the response was read.
-420	Query UNTERMINATED	The controller attempted to read the response after the device received an unsupported query or did not received a query. The “-100 COMMAND ERROR” and this error are stored in the error queue. The controller will time out.
-430	Query DEADLOCKED	The error queue, input buffer, and output buffer are full when sending large binary data as a response, and the transmission timing is off.
-440	Query UNTERMINATED after indefinite response	Received a separate query in semicolon-delimited format after a query that returns a response in an indefinite form. (Example: A compound command such as *IDN?;SYST:ERR?)

■ Operation complete event errors

An error in the range [-899, -800] is used when the product wants to report an IEEE 488.2 operation complete event. This event occurs when the instrument’s synchronization protocol, having been enabled by an *OPC command, completes all selected pending operations.

The occurrence of any error in this class causes the Operation Complete bit (bit 0) in the event status register to be set.

Error code		Error message description
-800	Operation complete	All selected pending operations in accordance with the IEEE 488.2, 12.5.2 synchronization protocol have completed.

■ Product-dependent errors

The occurrence of any error in this class causes the Device Dependent Error bit (bit 3) in the event status register to be set.

Configuration conflict errors and configuration change rejection errors

These errors occur when the specified configuration changes cannot be permitted.

Error code	
+101	Setting conflicts due to PROTection state
+102	Setting conflicts while TEST is running
+106	Setting conflicts due to invalid FUNCtion:MODE
+108	Wrong password given
+109	Illegal password format
+112	Setting conflicts while MEASure is in progress
+113	Setting conflicts due to RISE state

Out of range setting errors

These errors occur when invalid or incorrect settings are specified.

Error code	
+201	Illegal buffers size due to not in 2^N
+202	Same items is specified more than once
+203	NONE is invalid in multiple item settings
+204	IMMediate is invalid in multiple item settings
+205	BUS is invalid in multiple item settings

Auto test execution and trigger function execution errors

Error code	
+301	Illegal PROGram name
+302	PROGram name already exists
+303	PROGram not found
+304	PROGram not selected
+305	Selected PROGram cannot be deleted
+306	Recursive PROGram specified
+307	STEP number out of range
+308	Execution error due to non-existing PROGrtam specified
+309	Illegal PROGram file
+310	TRANsient not operating
+311	TRANsient not suspending

Command processing time

A certain amount of time is required before the commands shown in the following table are received by the product.

The processing times shown here are standard values, not guaranteed values.

The processing times vary depending on the settings and the measurement conditions

The values shown below do not include hardware response times

Command	USB processing time(ms)	RS232C[*1] processing time(ms)	LAN[*2] (VXI-11) processing time(ms)	LAN[*2] (HiSLIP) processing time(ms)
SOUR:FUNC:MODE	1.4	1.7	0.8	0.03
SOUR:VOLT	1.5	1.2	1.0	0.03
SOUR:VOLT:TIM	1.7	1.5	0.8	0.03
SENS:ACW:JUDG	1.5	1.6	0.8	0.03
MEAS:VOLT?	203	203	203	203
STAT:OPER:TEST:COND	2.7	3.5	2.5	1.4

[*1]: Baud rate setting: 115200 bps
[*2]: 100BASE-TX Ethernet

Legacy Commands

This product also runs on legacy commands used in the TOS9200 series. When creating a new program, use the new commands.

For details on the settings and responses of legacy commands, see the TOS9200 series GPIB/RS-232C interface operation manual.

Basic operation of legacy commands has been verified on the TOS9200 series, no guarantee is provided for complete operation of the TOS9200 series.

Legacy command	New command	Description
FUN	FUNC	Sets the test mode Only FUN is valid, not FUNCTION. Only parameters 0 to 3 are valid. Anything other than ACW, DCW, or IR returns -1.
Acw:TEStv	ACW:VOLT	Test voltage (ACW)
Acw:FREQuency	ACW:VOLT:FREQ	Test voltage frequency (ACW)
Acw:TIMer	ACW:VOLT:TIM ACW:VOLT:TIM:STAT	Test time (ACW)
Acw:RiseTIMe	ACW:VOLT:SWE:TIM	Voltage rise time (ACW)
Acw:UPPer	SENS:ACW:JUDG	Upper limit judgment current (ACW)
Acw:LOWer	SENS:ACW:JUDG:LOW SENS:ACW:JUDG:LOW:STAT	Lower limit judgment current (ACW)
Dcw:TEStv	DCW:VOLT	Test voltage (DCW)
Dcw:TIMer	DCW:VOLT:TIM DCW:VOLT:TIM:STAT	Test time (DCW)
Dcw:RiseTIMe	DCW:VOLT:SWE:TIM	Voltage rise time (DCW)
Dcw:UPPer	SENS:DCW:JUDG	Upper limit judgment current (DCW)
Dcw:LOWer	SENS:DCW:JUDG:LOW SENS:DCW:JUDG:LOW:STAT	Lower limit judgment current (DCW)
Ir:TEStv	IR:VOLT	Test voltage (IR)
Ir:TIMer	IR:VOLT:TIM IR:VOLT:TIM:STAT	Test time (IR)
Ir:RiseTIMe	IR:VOLT:SWE:TIM	Voltage rise time (IR)
Ir:WaitTIMe	SENS:IR:JUDG:DEL	Time until starting upper limit judgment (IR)
Ir:UPPer	SENS:IR:JUDG SENS:IR:JUDG:STAT	Upper limit judgment resistance (IR)
Ir:LOWer	SENS:IR:JUDG:LOW SENS:IR:JUDG:LOW:STAT	Lower limit judgment resistance (IR)
STARt	TRIG:TEST:SOUR IMM INIT:TEST	Starts a test
STOP	ABOR:TEST	Stops a test
LOCAL	SYST:COMM:RLST LOC	Switches to local mode
REMote	SYST:COMM:RLST REM	Switches to remote mode

Legacy command	New command	Description
MeasMODe	なし	Sets the display mode for measured currents and resistances
MON?	MEAS?	Queries the measurement data
IDAT?	MEAS:CURR?	Queries the measured current
RDAT?	MEAS:RES?	Queries the measured resistance
DSR?	STAT:OPER:TEST:COND? STAT:OPER:COND?	Queries the content of the device status register

DSR? checks the OPER status register and the OPER:TEST status register of the TOS93 series and returns the content in terms of the device status register bits of the TOS9200 series.

KIKUSUI ELECTRONICS CORP.

1-1-3 Higashiyamata, Tsuzuki-ku, Yokohama,
224-0023, Japan

Tel: +81-45-482-6353
Fax: +81-45-482-6261

www.kikusui.co.jp/en