HIOKI

REMOTE OPERATION MANUAL

3801-50
3802-50

DIGITAL HiTESTER

HIOKI E. E. CORPORATION

Contents

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Introduction

The Section describes how to operate the meter via an optical interface.

- It also explains the detail information of all interface command sets of Standard Commands for Programmable Instruments (SCPI) used in the meter.
- The remote control operation enables the user either to manually operate the meter via a terminal or to execute a host computer program automatically.

Trademars

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

Symbols

Safety Symbol

The following symbols in this manual indicate the relative importance of cautions and warnings.

NOTE	Indicates advisory items related to performance or correct operation of the instrument.

Other symbols

❖	Indicates the reference.
*	Iterminology explained at the bottom of the word.

2 Symbols

Remote Interface Overview

Chapter 1

Fig. 1 shows a connection between the 3801-50/ 3802-50 and a computer via an optical cable.
Either a USB or an RS-232C interface optical cable can be used for communication.

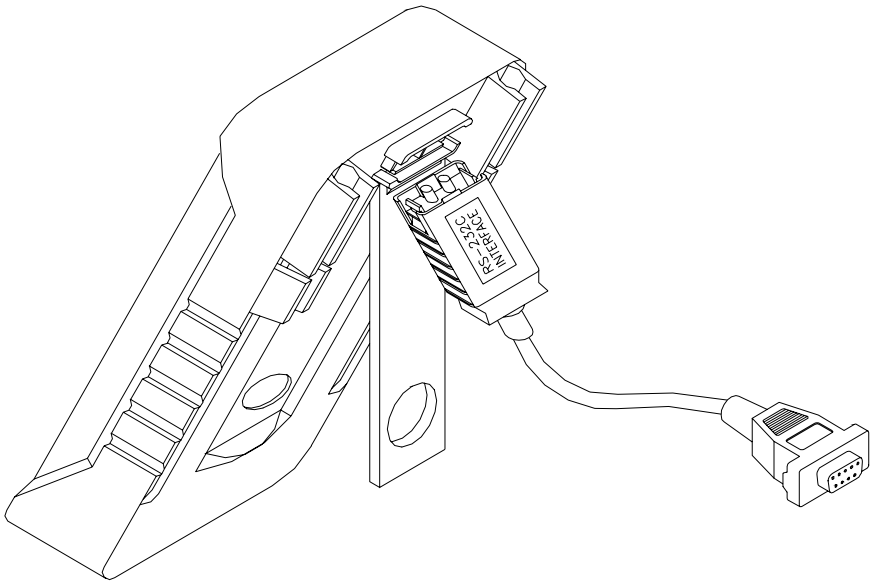
Procedure

1. Connect the cable to the connector or USB port.

RS-232C interface optical cable	to the 9-pin Type D male connector on the computer.
USB optical cable	Connect to the USB port on the computer.

2. Once the USB cable is connected and the USB driver is installed, a virtual RS-232COM port is created on the computer. (Only when using a USB optical cable)

- The remote interface is a serial binary data interchange, which operates from 2400 to 19200 baud rate.
- The communication port of the 3801-50, 3802-50 is designed in full duplex, which makes the meter more reliable and efficient in data taking.



Cable connection for Communication

NOTE When connecting the communication cable to the meter, ensure that the label RS-232C INTERFACE label faces upwards as shown in Fig. 1.

Setting Remote Interface Parameters Chapter 2

In order to operate the meter via a host computer or terminal, the parameters in interface within the 3801-50, 3802-50 have to match the parameters in the serial interface provided by the host or terminal.

The following procedures will guide the user to set up interface parameters within the 3801-50, 3802-50 to comply interface with the host.

The default settings of the meter at factory are 9600-baud rate, non-parity check , 8 data lengths, and 1 stop bit (9600, n, 8, 1).

The following table indicates the factory settings and user selectable communication parameters by using remote interface.

Remote Interface Parameters

Item	Parameter	Factory Setting	Selectable Parameter
1	Baud Rate	9600	2400, 4800, 9600, 19200
2	parity check	None	None, Odd or Even
3	data length	8	7 or 8
4	response	OFF	ON or OFF
5	data output	OFF	ON or OFF

response

With response ON, the meter responsees (returns) all the characters whatever it receives.

data output

- The remote indicator of the 3801-50, 3802-50 is flashing when the meter is set to data output ON.
- If the remote interface of the 3801-50, 3802-50 is under data output mode, the 3801-50, 3802-50 will print out the measured data when the measurement cycle is completed.
- The 3801-50, 3802-50 auto-sends the newest data to a host continuously.
- The 3801-50, 3802-50 doesn't accept any commands under data output mode.

Setup Procedures for Communication Parameter

To ensure the remote interface will operate appropriately, user may need to configure the remote interface parameters on power on option. Please refer to operation procedures of POWER-ON OPTION.

❖ 3801-50, 3802-50 instruction manual "Power-On Options"

Commands Summary Chapter 3

Overview of Command Type and Format

- All commands must be entered in the upper case.
- There are two types of the 3801-50, 3802-50 programming commands: IEEE 488 common commands and Standard Commands for Programmable Instruments (SCPI).
- Some commands are device-specific to the 3801-50, 3802-50. They are not included in the version 1999.0 of the SCPI standard. However, these commands are designed with the SCPI format in mind and they follow the syntax rules of the standard.

Common Command Format

- The IEEE 488 standard defines the common commands as commands that perform functions like reset and system query.
- Common commands usually come with the asterisk "*" character, and may include parameters. Some examples of Common command like: *IDN?, *RST, *CLS, GTL, LLO.

SCPI Command Format and Query Format

- The SCPI commands control instrument functions.
- A subsystem command has a hierarchical structure that usually consists of a top-level (or root) keyword, one or more lower level keywords, and parameters.
- The following example shows a command and its associated query:

A. **CONFigure:VOLTage:DC 0.5** : Set the main display to the DC voltage measurement , and select the 510.00mV range.

B. **CONFigure?** : Return the function of the main display measurement.

- CONFigure is a root level keyword with the second level keyword, VOLTage, and 0.5 is the command parameter.
- The query command ends with a question mark "?".

NOTE

SCPI stems from IEEE488.1 and IEEE 488.2. Although the IEEE 488.2 standard addressed some instrument measurements, it principally dealt with common commands and syntax or data formats. Please refer to the IEEE488.2 and SCPI reference manual for more information.

Terminator

A terminator is a character sent by a host, which identifies the end of a command string. A valid terminator consists of two-byte data:

<CR> (Carriage Return, ASC(&H0D))
<LF> (Line Feed, ASC(&H0A))

Responding Message

Chapter 4

Return result

- After the meter executes a query command the return of the result will be in the following format:

<Result> + <CR> <LF>

- If communication of the meter is under data output mode, the meter will print out the measured data when the measurement cycle is completed. The printed data are only for primary display.
  The format of printed data will be shown as following:

<Measurement Data> + <CR> <LF>

- On the meter warning the return of the prompt will be in the following format except Xon and Xoff:

<Prompt> + <CR> <LF>

Data Types

- Returned message is the ASC II string from the meter responding to a query.
- A query is a command followed by a question mark.

The following table is explanation for data types.

Data Types of Responding Message and Parameter

Data Type	Explanation	Example
<NR1>	An integer	+10000, -10000, 123, -100
<NR2>	This numeric representation has an explicit radix point.	+13.234, -.00002, 3.4567
<NR3>	This representation has an explicit radix point and an exponent.	-1.20000000E+02, +9.90000000E+37*
<Boolean>	Single ASCII-encoded byte, is return for the setting query.	0 or 1,OFF or ON

Data Types of Responding Message and Parameter

Data Type	Explanation	Example
<Literal>	ASCII-encoded bytes corresponding to the short form of the literal used as the command parameter.	AVER, PEAK
***: +9.90000000E+37 means positive overload, -9.90000000E+37 means negative overload.**		

Prompts

When the meter comes up any system warnings, the meter sends a prompt string to the host through remote interface.

The meter returns one of the prompts as shown on the following table.

Return Prompts

Prompts	Description
***L**	Into local mode
***E**	Remote command's error warning
***B**	Battery low warning
***I**	Input warning • When a test lead is connected to the "A" terminal while the function switch is set to a function other than mA.A • When the input voltage exceeds 1010 V during voltage measurement
***0**	Function switch position: ⏦V
***1**	Function switch position: V
***2**	Function switch position: mV
***3**	Function switch position: **Ω**
***4**	Function switch position: ⭲
***5**	Function switch position: ⊣⊢
***6**	Function switch position: **µ**A
***7**	Function switch position: mA.A
***8**	Function switch position: ⎍ (Only 3801-50)
ASC(&H11)	Xon: The meter is available.
ASC(&H13)	Xoff: The meter is busy.

NOTE

- On Model 3802-50, undetermined characters such as 「∗」or 「∗8」 may be returned when the function switch is turned from mA.A to OFF. This occurs when the meter is sending the function switch status at the moment it is switched off. This response should be ignored.
- You can confirm the input warning status from the N and O items returned in response to the STAT? command.

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Instructions of Command Sets Chapter 5

5.1 IEEE 488 Common Commands

***CLS**

Description	Clear the System Error Queue.

***IDN?**

Description	Query the Meter identification.
Response	Returns instrument maker name, model number, serial number and firmware version.

***RST**

Description	Put the meter to power-on-reset state, but no affect the Output Queue and interface parameter.

NOTE

The reset operation is executed for 3 seconds at least. Be sure to execute other commands then.

LLO

Description	Put the meter into the local lockout state when in remote control. This means no local key operation at the front panel is allowed during remote control.

GTL

Description	Put the meter into the local state, clearing the remote state and front panel lockout.

5.2 SCPI Commands

This subsection describes the SCPI subsystem commands for the meter. The meter only accepts the UPPER CASE part of command. It is unnecessary to send complete command characters.

Some SCPI Symbol Conventions

Text Symbol	Meaning
[ ]	Option: can be omitted
|	Exclusive OR
< >	Defined element
( )	Comment
?	Question mark
:	Separated two command keywords
;	Compound commands

CONFigure Subsystem:

CONFigure
:CURRent
:DC [<range>]
:AC [<range>]
:ACDC [<range>]
:PERCent

Description	• Set to DC, AC or AC+DC current measurement. (Only 3801-50: AC+DC) The function switch is at current measuring. When measuring DCmA, select the % conversion. Use the SYST:CPER command to select the 4-20 mA or 0-20 mA scale.
Parameter	• If parameter is omitted, the meter is set to auto range. • Enter the current measurement range to <range>. The function switch is at μA measuring: 500u, 5000u 500u(510.00 μA), 5000u(5100.0 μA) The function switch is at mA.A measuring: 0.05, 0.5, 5 or 10 0.05(51.000 mA), 0.5(510.00 mA), 5(5.1000 A), 10(10.000 A)
Example	**CONF:CURR:DC** : Set to DC current. **CONF:CURR:AC 0.5** : Set to AC current and 510.00 mA range. **CONF:CURR:PERC** : For DCmA measurements, select the % conversion..

CONFigure
:VOLTage
:DC [<range>]
:AC [<range>]
:ACDC [<range>]]

Description	Set to DC, AC or AC+DC voltage measurement. (Only 3801-50: AC+DC) The function switch is at mV measuring or V measuring.
Parameter	• If parameter is omitted, the meter is set to auto range. • Enter the voltage measurement range to <range>: The function switch is at mV measuring : 0.05 0.5 or 1 0.05(51.000 mV), 0.5(510.00 mV), 1(1000.0 mV) The function switch is at V measuring: 5, 50, 500 or 1000 5(5.1000 V), 50(51.000 V), 500(510.00 V), 1000(1000.0 V)
Example	**CONF:VOLT:DC** : Set to DC voltage measuring. **CONF:VOLT:AC 0.5** : Set to AC voltage and 510 mV range.

CONFigure
:FCOUnter
:PREScale<1 / 100>

Description	Select frequency counter prescaling. (Only 3801-50) The function switch is at diode measuring. Range is auto range.
Parameter	1 :Disables frequency counter prescaling (divisor = 1). 100 :Disables frequency counter prescaling (divisor = 100).
Example	**CONF:FCOU:PRES 1**: Disables frequency counter prescaling (divisor = 1).

CONFigure:FREQuency [<range>]

Description	Frequency measurement can be selected for voltage or current measurement. The function switch is at voltage or current measuring. The display shows both main and sub displays simultaneously. The frequency range changes when measuring frequency. (Only 3801-50) The function switch is at D(Hz).
Parameter	• If parameter is omitted, the meter is set to auto range. • Enter the resistance measurement range to <range>. (Unit: Hz) : 100, 1000, 10K, 100K, 1000K, 10M*, or 100M*(Only frequency measurement) * Only 3801-50 frequency counter measurement.
Example	**CONF:FREQ 10k** : Set to frequency measuring and 9.9999 kHz range.

CONFigure
:PULSe
:PWIDth [<range>]
:NWIDth [<range>]
:PDUTycycle
:NDUTycycle

Description	Set to pulse width measurement, pulse duty measurement. This can be selected when voltage, current or frequency counter∗ (divisor = 1) measurement is selected. ∗ Only 3801-50
Parameter	• If parameter is omitted, the meter is set to auto range. • Enter the pulse measurement range to <range>: • Set the parameter to 5 to select the 1999.9 ms range for pulse width measurement. :0.5, 5 0.5(510.00 ms), 5(1999.9 ms)
Example	**CONF:PULS:NWID 0.5** :Sets negative pulse width measurement in the 510.00 ms range. **CONF:PULS:NDUT** :Measures negative pulse duty.

CONFigure:RESistance [<range>]

Description	Set to 2-wire resistance measuring. The function switch is at resistance measuring.
Parameter	• If parameter is omitted, the meter is set to auto range. • Enter the resistance measurement range to <range>. (Unit: Ω): 500, 5K, 50K, 500K, 5M, 50M or 500M∗ ∗Only 3801-50
Example	**CONF:RES 50k** : Set to resistance measuring and 51.000 kΩ range.

CONFigure:CONTinuity [<range>]

Description	Set to 2-wire resistance measuring with the continuity test. The function switch is at resistance measuring.
Parameter	• If parameter is omitted, the meter is set to auto range. • Enter the resistance measurement range to <range>.(Unit: Ω): 500, 5K, 50K, 500K, 5M, 50M or 500M∗. ∗Only 3801-50
Example	**CONF:CONT 500** : Set to resistance measuring with the continuity test and 510.00 Ω range.

CONFigure:CONDuctance

Description	• Set to conductance measuring . The function switch is at resistance measuring.
Example	• **CONF:COND** : Set to conductance measuring.

CONFigure:CAPacitance [<range>]

Description	Set to capacitance measurement . The function switch is at C measuring.
Parameter	If parameter is omitted, the meter is set to auto range. Capacitance measurement range to <range>.(Unit: F) : 10n, 100n, 1000n, 10u, 100u, 1000u, 10m or 100m
Example	**CONF:CAP 100u**: Set to capacitance measurement and 99.99 μF range.

CONFigure:DIODe

Description	Set to diode measuring with continuity test. The function switch is at diode measuring.

CONFigure:TEMPerature <K | J>

Description	Set to temperature measuring with continuity test. (Only 3801-50 : J Termocouple) The function switch is at C measuring.
Paramete	K, J: Termocouple sensor (Type K or J) .
Example	**CONF:TEMP K**: Set to temperature of the K termocouple.

CONFigure? [@2]

Description	Query the function of the primary or secondary display.
Parameter	If parameter is omitted, query the function of the main display.
Response	Return <"function range,resolution"> format string, the examples are as following:

Example	Function	Range	Resolution
VOLT +5.000000E-01,+1.000000E-05	DCV	510.00 mV	0.01 mV
CURR:AC +5.000000E-02,+1.000000E-06	ACA	51.000 mA	0.001 mA
VOLT:DBM	dBm		
CPER:0-20mA +5.000000E-02,+1.000000E-06	DCmA percentage disply: 0-20mA	51.000 mA	0.001 mA
FREQ +1.000000E+03,+1.000000E-02	Frequency	999.99 Hz	0.01 Hz
PULS:PWID +5.000000E+00,+1.000000E-04	Pulse width(Positive)	1999.9 ms	0.1 ms
PULS:NDUT	Pulse duty ratio(Negative)		
CAP +1.000000E-08,+1.000000E-12	C (Capacitance)	9.999 nF	0.001 nF
RES+5.000000E+07,+1.000000E+03	R (Resistance)	51.000 MΩ	0.01 MΩ
COND+5.000000E-07,+1.000000E-11	R (Conductance)	510.00 nS	0.01 nS
CONT +5.000000E+02,+1.000000E-02	R (Continuous)	510.00 Ω	0.01 Ω
DIOD	Diode		
TEMP:TC K CEL	Temperature K-thermocouple		

Example	Function	Range	Resolution
TEMP:ENV CEL	Temperature ambient temperature		
TIME:PRES+1.000000E+05,+1.000000E+00	Elapsed time of recording function	100000 s	1 s

NOTE

- If query the sub function and the sub is not set, the meter returns an error prompt to the host.
- The sub display is enabled by sending **CONF:FREQ** or **CONF:PULS** command. Original main function changes to sub display, and the main function is replaced by frequency or pulse function.

CALCulate Subsystem:

CALCulate:FUNCtion NULL
AVERage
PEAKhold [,< DC | AC | PERCent >]
DBM [,< DC | AC | ACDC >]
DBV [,< DC | AC | ACDC >]
NONE

Description	Set or off the function of the calculation.
Parameter	**NULL** - Enables the relative value (REL) display function. **AVER** - Recording function **PEAK** - Peak-hold function **DBM** -Set to decibel measuring.(dBm) (Only 3801-50: AC+DC) **DBV** -Set to decibel measuring.(dBV) (Only 3801-50: AC+DC) **NONE**- Disables calculation function settings.
Example	**CALC:FUNC AVER**

NOTE

When AVERage or PEAKhold is selected, the trigger signal source changes to IMMediate.

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The following calculation functions can be combined: AVER/NULL, PEAK/NULL, NULL/AVER,DBx/AVER (/NULL), DBx/NULL (/AVER)

CALCulate:FUNCtion?

Description	Query the function of the calculation.
Response	Return <Literal> format string: **AVER**, **PEAK**, **NULL**, **DBM**, **DBV** or **NONE**.
Example	Return of **AVER** or **NULL** indicates that the recording and relative value (REL) display functions are enabled.

CALCulate:NULL:OFFSet?

Description	Query the offset value of the relative value (REL) function.
Response	Return <NR3> format string.

CALCulate:DBM:REFerence <numeric>

Description	Set the reference impedance for the decibel (dBm) conversion screen.
Parameter	Value to be entered to <numeric> : 1-9999

NOTE

Stored in non-volatile memory.

CALCulate:DBM:REFerence?

Description	Query the decibel (dBm) conversion of the reference impedance.
Response	Return <NR3> format string.

CALCulate
:AVERage
:MAXimum?
:MINimum?
:AVERage?
:PRESent?
:COUNt?

Description	Query the value of the dynamic recording function.
Response	Return <NR3> format string.
Example	**CALC:AVER:MAX?** : Query the maximum measuring value. **CALC:AVER:MIN?** : Query the minimum measuring value. **CALC:AVER:AVER?** : Query the average measuring value. **CALC:AVER:PRES?** : Query the present measuring value. **CALC:AVER:COUN?**: Query the sampling frequency of the average mode.

CALCulate
:PEAKhold
:MAXimum?
:MINimum?

Description	Query the value of the peak-hold function.
Response	Return <NR3> format string.
Example	**CALC:PEAK:MAX?**: Query the maximum peak-hold value. **CALC:PEAK:MIN?** : Query the minimum peak-hold value.

TRIGger Subsystem:

TRIGger:SOURce < BUS | REFreshhold | IMMediate >

Description	Select the source of the start trigger signal.
Parameter	**BUS** - select a bus command and enter the trigger (hold) mode. **REF** - select a refresh-hold trigger source and enter the trigger mode **IMM** - select the internal trigger source and escape the trigger mode.
Example	**TRIG:SOUR BUS**

NOTE

- If BUS or REF is selected when the recording and peak hold functions are enabled, they are disabled.
- The threshold for the refresh-hold function must be set before selecting BUS or REF.
- When the threshold of the refresh-hold mode is zero(OFF), the parameter REF is invalid. Contrary, the parameter BUS is invalid when the threshold of the refresh-hold mode is not zero(OFF).

TRIGger:SOURce?

Description	Query the type of the trigger source.
Response	Return <Literal> format string: **BUS**, **REF**, **IMM**

TRIGger:REFreshhold:COUNt <numeric>

Description	Set the threshold for the refresh hold mode.
Parameter	<numeric>: 0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000.

NOTE

Stored in non-volatile memory.

TRIGger:REFreshhold:COUNt?

Description	Query the threshold of the refresh hold mode.
Response	Return <NR1> format string: 0 to 1000.

ABORt

Description	When the trigger hold function is enabled (TRIG HOLD displayed), the displayed value is reset and measurement is stopped. Measurement does not resume until a subsequent INIT or READ? command is sent, or when the HOLD key is pressed.

INITiate

Description	Acquires one sample when the trigger hold function is enabled (TRIG HOLD displayed). Valid when TRIGger:SOURce is set to BUS.

Measuring Subsystem:

FETCh? [@2]

Description	• Return the primary or secondary function value of output buffer. • Retrieves the measurements taken by the INITiate command and places them into the device's output buffer. • The query will return data any time that the last reading is valid. • The meter produces an Error 230 in the following case, and no result is returned: When invalid data is present while awaiting a trigger event (such as when the range is changed while the Hold function is enabled).
Parameter	If parameter is omitted, the meter returns the primary function value.
Response	Return <NR3> format string.
Example	**FETC? @2**: Return the value, e.g. **+1.23450000E+00**

NOTE

- If query the sub function value and the sub is not set, the meter returns an error prompt to the host.
- The sub display is enabled by sending **CONF:FREQ** or **CONF:PULS** command. Original main function changes to sub function, and the main function is replaced by frequency or pulse function.

READ?

Description	• Return the primary function value of output buffer after the next triggered measurement is complete. • The command provides a method of performing a **FETC?** operation on fresh data. • The query command is identical to: **ABOR**; **INIT**; **FETC?**. The command is like FETCh? on the immediate trigger mode.
Response	Return <NR3> format string.

SOURce Subsystem:

SOURce?

Description	Query the set the pulse output. (Only 3801-50) The function switch is at pulse output.
Response	<"function amplitude,frequency, duty ratio"> format string, the examples are as following:

Example	Function	Amplitude	Frequency duty
SQU+2.800000E+00, +1.200000E+03,+5.000000E+01	pulse output	2.8 V	1200 Hz、50%

SOURce:DCYCle:DECimal <numeric>

Description	Set the duty ratio of the pulse output (Only 3801-50) The function switch is at pulse output. Duty ratio = numeric / 256 (Unit :%)
Parameter	Value to be entered to <numeric>: 1 to 255
Example	**SQU:DCYC:DEC 64**: The duty ratio is 25%.

SQUare:PWIDth:DECimal <numeric>

Description	Set the pulse width of the pulse output.(Only 3801-50) The function switch is at pulse output. Pulse width = numeric / (frequency x 0.256)
Parameter	Value to be entered to <numeric>: 1 to 255.
Example	**SQU:PWID:DEC 64**: The pulse width is approx 0.42 ms on 600 Hz.

SQUare:FREQuency <numeric>

Description	Set the frequency of the pulse output.(Only 3801-50) The function switch is at pulse output.
Parameter	<numeric>: 0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 100, 120, 150, 200, 240, 300, 400, 480, 600, 800, 1200, 1600, 2400, 4800. The other numeric is invalid value.
Example	**SQU:FREQ 600**: Set the frequency at 600 Hz.

SYSTem Subsystem:

SYSTem:ERRor?

Description	Query the error message.
Response	Return <Number,"Error String"> format string. The following table is a list of SCPI error message that might occur during operation.

NOTE The buffer size of the system error queue is one.

SCPI Error Message

Number	Error String	Number	Error String
+0	No error	-213	Init ignoredInit
-100	Command error	-220	Parameter error
-200	Execution error	-230	Data stale

SYSTem:VERSion?

Description	Query the version of the SCPI.
Response	Return 1999.0 string.

SYSTem:BEEPer [< CONTinous | STOP | TONE >]

Description	• Set the action of the beeper. • Ignore the original state of the beeper.
Parameter	If parameter is omitted, the meter is set to tone. **CONT**- beep continuously. **STOP**- stop to beep. **TONE**- beep one tone.
Example	**SYST:BEEP:**beep one tone.

SYSTem:TCOMpensated <Boolean>

Description	Enable or disable the "0°C" temperature compensation. The function switch is at C measurement. Set this after enabling temperature measurement with the TEMP command . ❖ 17p
Parameter	Value to be entered to <Boolean>: ON, 1: OFF, 0

SYSTem:TENVironment <Boolean>

Description	Select whether to display the environment (ambient) temperature on the sub display (measured by an internal thermal sensor). This selection is available when not measuring on the sub display.
Parameter	Value to be entered to <Boolean>: ON, 1: OFF, 0

SYSTem:BLIT <Boolean>

Description	Enable or disable the back lit.
Parameter	Value to be entered to <Boolean>: ON, 1: OFF, 0

NOTE The backlit will be auto turned off depending on below time setting. To turn off backlit by this command once the time is set to "0".

SYSTem:BLIT:TIME <second>

Description	Set the time of the back lit.
Parameter	Value to be entered to <second>: 0 to 99 (Set "0" to disable auto turning off backlit.)

NOTE Stored in non-volatile memory.

SYSTem:AOFF:TIME <minute>

Description	Set the time of the auto power save function.
Parameter	Value to be entered to <minute>:0 to 99 (Set "0" to disable auto power save function.)

NOTE Stored in non-volatile memory.

SYSTem:CPERcent < 0-20 | 4-20 >

Description	Selects the % conversion display (4-20mA or 0-20mA) for DCmA measurements. It is available when % conversion display is enabled by the CONF:CURR:PERC command.
Parameter	0-20: 0 mA (0 %) ~ 20 mA (100 %) 4-20: 4 mA (0 %) ~ 20 mA (100 %)
Example	SYST:CPER 4 to 20

NOTE Stored in non-volatile memory.

SYSTem:BATTery?

Description	Query the battery level.
Parameter	<NR3>Outputs a formatted text string. Response from 0 to 100% corresponds to battery voltage of 6.0 to 10.0 V.
Example	0% (6.0 V) to 100% (10 V)

NOTE Stored in non-volatile memory.

SYSTem:DEFAult

Description	Returns meter settings to their factory defaults. Internal adjustments are unaffected. The meter resets after executing this command.

STATus Subsystem:

STATus?

Description	Query the status of the meter.
Response	Return <"ABCDEFGHIJKLMNOPQRSTU"> format string. Each character means as following:

	Item	Description
A	Recordong	0: off, 1: on
B	Relative value (REL)	0: off, 1: on
C	Decibel	0: off, M: dBm, V: dBV
D	Unused	always 0
E	Peak hold	0 :off, 1: on
F	Percentage	0: 0-20 mA, 1: 4-20 mA
G	Trigger hold	I: IMM, B: BUS, R: REF
H	Refresh hold	0: off, 1: on
I	0°C temperature compensation	0: off, 1: on
J	Beep	0: off, 1: 1 kHz, 2: 2 kHz, 4: 4 kHz, F: 600 Hz
K	Auto power savef	0: off, 1:on
L	Back lit	0: off, 1:on
M	Meter mode	always L
N	Input warning	0:normal, 1:warming
O	Terminal A connection	0:Unconnected state, 1:Connected state (The test lead connects it with terminal A.)
P	Function switch position	0: ACV input ∼ 1: V input 2: voltage input & voltage output 3: input 4: capacitance input ⊣⊢ 5: diode input ⊣⊢ 6: μA input 7: mA.A input 8: pulse output ⎍⎍ OUT (Only 3801-50)
Q	Output status	0:stand-by, 1:operation
R	Rate	4:50000 counts
S	Battery	0:normal, 1:low
T	Frequency counter divisor	0:1 1:100 (3802-50 is always 0)
U	Auto range	0:off, 1:on

Summary of SCPI Commands

Chapter 6

Command	Parameter	Description
CONFigure?	[@2]	Query the function of the display.
CONFigure		Configure the meter to perform specified measurement.
:VOLTage		Set the voltage measurement.
:AC	[<range>]	
:DC	[<range>]	
:ACDC	[<range>]	(Only 3801-50)
:CURRent		Set the current measurement.
:AC	[<range>]	
:DC	[<range>]	
:ACDC	[<range>]	
PERC		(Only 3801-50)
:FCOUnter:PREScale	[<0|100>]	Set the frequency counter prescaling. (Only 3801-50)
:FREQuency	[<range>]	Set the meter to frequency measurement.
:PULSe		Set the pulse measurement.
:PWIDth	[<range>]	Positive pulse width
:NWIDth	[<range>]	Negative pulse width
:PDUTycycle		Positive pulse duty ratio
:NDUTycycle		Negative pulse duty ratio
:CAPacitance	[<range>]	Set the capacitance measurement .
:RESistance	[<range>]	Set the resistance measurement.
:CONTinuity	[<range>]	Set the resistance measurement with the continuity test.
:CONDuctance		Set the conductance measurement.
:DIODe		Set the diode measurement.
:TEMPerature	[<K|J>]	Set the temperature measurement.

Command	Parameter	Description
TRIGger		Trigger function
:SOURce?	<BUS|REF|IMM>	Query the trigger source type.
:SOURce		Select a trigger source.
:REF:COUNt?	<numeric>: 0 to 1000	Query the threshold of the refresh-hold mode.
:REF:COUNt		Set the threshold of the refresh-hold mode.
ABORt		Reset the trigger system of the meter.
INITiate[:IMMediate]		Initiate the trigger system of the meter.
FETCh?	[@2]	
READ?		Return the data any time that the last reading is valid.
CALCulate	<function>	
:FUNCtion?		Query the calculation function.
:FUNCtion		Set the calculation function.
:NULL:OFFSet?		Query the offset value of the relative (REL) function.
:DBM	<numeric>:1 to 9999	Query the decibel (dBm) conversion of the reference impedance.
:REFerence?		
:REFerence		Set the reference impedance for the decibel (dBm) conversion screen.
:AVERage		Query the value of the dynamic recording function.
:MAXimum?		
:MINimum?		
:AVERage?		
:PRESent?		
:COUNt?		
:PEAKhold		Query the value of the peak-hold function.
:MAXimum?		
:MINimum?		

Command	Parameter	Description
SOURce?		Query the plus output function. (Only 3801-50)
SQUare		Set the puls output. (Only 3801-50)
:DCYCle:DECimal	<numeric>: 1 to 255	Set the duty ratio of the pulse output.
:PWIDth:DECimal	<numeric>: 1 to 255	Set the pulse width of the pulse output.
:FREQuency	<numeric>	Set the frequency of the pulse output.
SYSTem		
:AOFF:TIME	<minute>: 0 to 99	Set the time of the auto power save function.
:BEEPer	[<CONT|STOP|TONE>]	Set the action of the beeper
:BLIT	<Boolean>	Enable or disable the back lit.
:TIME	<second>: 0 to 99	Set the time of the back lit.
:CPERcent	< 0-20 | 4-20 >	For DCmA measurements, select the % conversion.
:TCOMpensated	<Boolean>	Sets 0 ℃ temperature compensation.
:TENVironment	<Boolean>	Selects display of environment (ambient) temperature.
:DEFAult		Returns meter settings to their factory defaults.
:BATTery?		Queries the remaining charge state of the battery.
:ERRor?		Query the error message.
:VERSion?		Query the version of the SCPI.
STATus?		Query the status of the meter.

Remote Program Example Using Visual Basic 6 Chapter 7

Acquires ten measurement values and displays the average value.

```
Private Sub Command1_Click()
' Create a form containing the following three objects:
' 1.TextBox                    - Text1
' 2.CommandButton              - Command1
' 3. Microsoft Comm Control 6.0 - MSComm1     added from Menu Bar / Project / Components
' Add from the menu bar [Project] - [Component].

  MSComm1.CommPort = 1                                    ' set COM1 port
  MSComm1.PortOpen = True                                 ' open COM
  MSComm1.Settings = "9600,n,8,1"                         ' communications settings

  MSComm1.Output = "LLO" & vbCrLf                         ' send Local lock command
  MSComm1.Output = "CONF:VOLT:DC 5" & vbCrLf              ' set DCV 5V function

  For i = 1 To 50000                                      ' wait for function ready
    DoEvents
  Next i

  buffer = MSComm1.Input                                  ' clear COM input buffer
  Text1.Text = ""                                         ' clear display
  reading = 0                                             ' clear average value

  For i = 1 To 10
    MSComm1.Output = "FETC?" & vbCrLf                     ' send FETCH? command
    buffer = ""
    Do
      buffer = buffer & MSComm1.Input
    Loop While InStr(buffer, vbCrLf) = 0                  ' receive reading
    reading = reading + Val(buffer)                       ' sum reading
    Text1.Text = Text1.Text & "Reading" & i & " = " & buffer & vbCrLf
                                                          ' show reading
  Next i

  Text1.Text = Text1.Text & vbCrLf & "Average = " & (reading / 10) & vbCrLf
                                                          ' show average

    MSComm1.Output = "GTL" & vbCrLf                       ' send Goto Local command
    MSComm1.Port Open = False                             ' close COM
End Sub
```

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Remote Operation Manual

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