HIOKI

REMOTE OPERATION MANUAL

# 3804-50
# 3805-50

# DIGITAL HiTESTER

HIOKI E. E. CORPORATION

# Contents

# 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. |

# Remote Interface Overview Chapter 1

Fig. 1 shows a connection between the 3804-50/ 3805-50 and a computer via an optical cable.
Either a USB or an RS-232C interface optical cable can be used for communication.

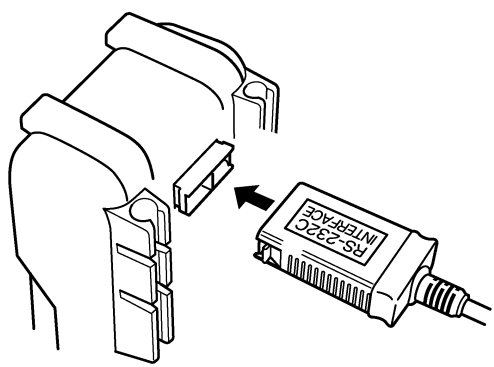
**Procedure**

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 4800 to 19200 baud rate.
- The communication port of the 3804-50, 3805-50 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 3804-50, 3805-50 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 3804-50, 3805-50 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 | 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 RS232 of the 3804-50, 3805-50 is flashing when the meter is set to data output ON.
- If the remote interface of the 3804-50, 3805-50 is under data output mode, the 3804-50, 3805-50 will print out the measured data when the measurement cycle is completed.
- The 3804-50, 3805-50 auto-sends the newest data to a host continuously.
- The 3804-50, 3805-50 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.

❖ 3804-50, 3805-50 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 3804-50, 3805-50 programming commands: IEEE 488 common commands and Standard Commands for Programmable Instruments (SCPI).
- Some commands are device-specific to the 3804-50, 3805-50. 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 10** : Set the main display to the DC voltage measurement , and select the 10 V range.
B. **CONFigure?** : Return the function of the main display measurement.

- CONFigure is a root level keyword with the second level keyword, VOLTage, and 10 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. | DCV, ACA |
| ***: +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<br>• When the input voltage exceeds 610 V during voltage measurement |
| ***0** | Function switch position: V |
| ***1** | Function switch position: ⊣◀ |
| ***2** | Function switch position: Ω |
| ***3** | Function switch position: ⊣⊢ |
| ***4** | Function switch position: µA |
| ***5** | Function switch position: mA |
| ***6** | Function switch position: A |
| ***7** | Function switch position: T1, T2 (3805-50 only) |
| **ASC(&H11)** | Xon: The meter is available. |
| **ASC(&H13)** | Xoff: The meter is busy. |

NOTE

- 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>]**
**:PERCent**

| | |
|---|---|
| Description | • Set to DC or AC current measurement.<br>The function switch is at current measuring.<br>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.<br>• Enter the current measurement range to <range>.<br>The function switch is at µA measuring: 1m, 10m<br>1m (999.9 µA), 10m (9999 µA)<br>The function switch is at mA measuring: 0.1, 1<br>0.1(99.99 mA), 1(999.9 mA)<br>The function switch is at A measuring: 10<br>10 (9.99 A) |
| Example | **CONF:CURR:DC** : Set to DC current.<br>**CONF:CURR:AC 0.1** : Set to AC current and 99.99 mA range.<br>**CONF:CURR:PERC** : For DCmA measurements, select the % conversion. |

**CONFigure**
**:VOLTage**
**:DC [<range>]**
**:AC [<range>]**
**:HRATio**

| | |
|---|---|
| Description | Set to DC, AC voltage measurement or Harmonics Percentage Display. (3805-50 only:Harmonics Percentage Display)<br>The function switch is at V measuring. |
| Parameter | • If parameter is omitted, the meter is set to auto range.<br>• Enter the voltage measurement range to <range>:<br>The function switch is at V measuring: 1, 10, 100 or 1000<br>1 (999.9 mV), 10 (9.999 V), 100 (99.99 V), 1000 (999.9 V) |
| Example | **CONF:VOLT:DC** : Set to DC voltage measuring.<br>**CONF:VOLT:AC 10** : Set to AC voltage and 9.999 V range.<br>**CONF:VOLT:HRAT** : For voltage measurements, select the Harmonics Percentage Display. |

**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.<br>Capacitance measurement range to <range>. (Unit: F)<br>: 10u, 100u, 1000u or 10m |
| Example | **CONF:CAP 100u**: Set to capacitance measurement and 99.99 μF range. |

**CONFigure:RESistance [<range>]**

| | |
|---|---|
| Description | Set to 2-wire resistance measuring.<br>The function switch is at resistance measuring. |
| Parameter | • If parameter is omitted, the meter is set to auto range.<br>• Enter the resistance measurement range to <range>.<br>(Unit: Ω): 1000, 10K, 100K, 1000K, 10M or 100M |
| Example | **CONF:RES 100k** : Set to resistance measuring and 99.99 kΩ range. |

**CONFigure:CONTinuity [<range>]**

| | |
|---|---|
| Description | Set to 2-wire resistance measuring with the continuity test.<br>The function switch is at resistance measuring. |
| Parameter | • If parameter is omitted, the meter is set to auto range.<br>• Enter the resistance measurement range to <range>.<br>(Unit: Ω): 1000, 10K, 100K, 1000K, 10M or 100M |
| Example | **CONF:CONT 1000** : Set to resistance measuring with the continuity test and 999.9 Ω range. |

**CONFigure:DIODe**

| | |
|---|---|
| Description | Set to diode measuring with continuity test.<br>The function switch is at diode measuring. |

**CONFigure:FREQuency**

| | |
|---|---|
| Description | Frequency measurement can be selected for voltage or current measurement. The function switch is at voltage or current measurement. (3805-50 only)<br>The function swich is at voltage or current measuring. |
| Example | **CONF:FREQ** : Set to frequency measuring. |

### CONFigure:TEMPerature <T1|T2|DT> [,<K|J>]

| | |
|---|---|
| Description | Set to temperature measuring.<br>The function switch is at temperature measuring.<br>(3805-50 only) |
| Parameter | • T1, T2, DT: Setting the measurement channel.<br>• K, J:Termocouple sensor（Type K or J). |
| Example | **CONF:TEMP T1** :For measurements channel, select the T1. |

### CONFigure?

| | |
|---|---|
| Description | Query the function. |
| Response | Return <"function, range, resolution"> format string, the examples are as following: |

| Example | Function | Range | Resolution |
|---|---|---|---|
| **VOLT +1.000000E-01,+1.000000E-05** | DCV | 100 mV | 0.01 mV |
| **CURR:AC +1.000000E-02,+1.000000E-06** | ACA | 10 mA | 0.001 mA |
| **CPER:0-20mA +1.000000E+03,+1.000000E-01** | DCmA percentage disply: 0-20mA | 1000% | 0.1% |
| **FREQ +1.000000E+03,+1.000000E-01** | Frequency | 1 kHz | 0.1 Hz |
| **HRAT** | Harmonics Percentage Display | | |
| **CAP +1.000000E-07,+1.000000E-11** | C（Capacitance） | 10 nF | 0.01 nF |
| **RES+1.000000E+07,+1.000000E+03** | R（Resistance） | 10 MΩ | 0.001 MΩ |
| **CONT +1.000000E+02,+1.000000E-02** | R（Continuous） | 100 Ω | 0.01 Ω |
| **DIOD** | Diode | | |
| **T1: K CEL** | Temperature T1 K-thermocouple | | |

## CALCulate Subsystem:

**CALCulate:FUNCtion NULL**
**AVERage**
**NONE**

| | |
|---|---|
| Description | Set or off the function of the calculation. |
| Parameter | **NULL** - Enables the relative value (REL) display function.<br>**AVER** - Recording function<br>**NONE**- Disables calculation function settings. |
| Example | **CALC:FUNC AVER** |

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

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The following calculation functions can be combined: AVER/NULL, NULL/AVER

**CALCulate:FUNCtion?**

| | |
|---|---|
| Description | Query the function of the calculation. |
| Response | Return <Literal> format string: **AVER**, **NULL** 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**
**:AVERage**
**:MAXimum?**
**:MINimum?**
**:DIFFerential?**
**: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.<br>**CALC:AVER:MIN?** : Query the minimum measuring value.<br>**CALC:AVER:DIFF?** : Query the maximum measuring value - minimum measuring value<br>**CALC:AVER:AVER?** : Query the average measuring value.<br>**CALC:AVER:PRES?** : Query the present measuring value.<br>**CALC:AVER:COUN?**: Query the sampling frequency of the average mode. |

## 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.<br>**REF** - select a refresh-hold trigger source and enter the trigger mode<br>**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 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?

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

### READ?

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

## 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.<br>• Ignore the original state of the beeper. |
| Parameter | If parameter is omitted, the meter is set to tone.<br>**CONT**- beep continuously.<br>**STOP** - stop to beep.<br>**TONE**- beep one tone. |
| Example | **SYST:BEEP:**beep one tone. |

### SYSTem:TCOMpensated <Boolean>

| | |
|---|---|
| Description | Enable or disable the "0°C" temperature compensation.<br>The function switch is at temperature measurement.<br>Set this after enabling temperature measurement with the TEMP command. (3805-50 only)<br>❖ 16p |
| Parameter | Value to be entered to <Boolean>: ON, 1: OFF, 0 |

### SYSTem:BLIT <Boolean>

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

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

**SYSTem:BLIT:TIME <second>**

| | |
|---|---|
| Description | Set the time of the backlitgh. |
| Parameter | Value to be entered to <second>: 0 to 99<br>(Set "0" to disable auto turning off back light.) |

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<br>(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 %) to 20 mA (100 %)<br>4-20: 4 mA (0 %) to 20 mA (100 %) |
| Example | SYST:CPER 4 to 20 |

NOTE Stored in non-volatile memory.

**SYSTem:COMmunication <band>, <parity>, <data>**

| | |
|---|---|
| Description | Set the communication port. |
| Parameter | <baud>:4800, 9600, 19200<br><parity>:N (none), E (even), O (odd)<br><add>:7, 8 |
| Example | SYST:COM 9600, N, 8 |

NOTE Stored in non-volatile memory. The setting cannot be changed from the meter (by communication only). Communication may not be possible with 7-bit data length and no parity check. In this case, select two stop bits from the PC side.

**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.<br>Each character means as following: |

| | Item | Description |
|---|---|---|
| **A** | Recordong | 0: off, 1: on |
| **B** | Relative value (REL) | 0: off, 1: on |
| **C** | Unused | always 0 |
| **D** | Unused | always 0 |
| **E** | Unused | always 0 |
| **F** | Percentage | 0: 0-20 mA, 1: 4-20 mA |
| **G** | Trigger mode | 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: 1200Hz, 2: 2400Hz, C: 300Hz, F: 600 Hz |
| **K** | Auto power save | 0: off, 1:on |
| **L** | Back light | 0: off, 1:on |
| **M** | Meter mode | always L |
| **N** | Input warning | 0:normal, 1:warming |
| **O** | Unused | always 0 |
| **P** | Function switch position | 0: V input<br>1: diode input<br>2: resistance input<br>3: capacitance input<br>4: µA input<br>5: mA input<br>6: A input<br>7: temperature input (3805-50 only) |
| **Q** | Unused | always 0 |
| **R** | Rate | 1:10000 counts |
| **S** | Battery | 0:normal, 1:low |
| **T** | Unused | always 0 |
| **U** | Auto range | 0:off, 1:on |

# Summary of SCPI Commands Chapter 6

| Command | Parameter | Description |
|---|---|---|
| **CONFigure?** | | Query the function of the display. |
| **CONFigure** | | Configure the meter to perform specified measurement. |
| **:VOLTage** | | Set the voltage measurement. |
| **:AC** | [<range>] | |
| **:DC** | [<range>] | |
| **:HRATio** | | Harmonics Percentage Display (3805-50 only) |
| **:CURRent** | | Set the current measurement. |
| **:AC** | [<range>] | |
| **:DC** | [<range>] | |
| **PERCent** | | |
| **:FREQuency** | | Set the meter to frequency measurement. |
| **:CAPacitance** | [<range>] | Set the capacitance measurement . |
| **:RESistance** | [<range>] | Set the resistance measurement. |
| **:CONTinuity** | [<range>] | Set the resistance measurement with the continuity test. |
| **:DIODe** | | Set the diode measurement. |
| **:TEMPerature** | <T1\|T2\|DT>[,<K\|J>] | Set the temperature measurement. |
| **TRIGger** | | Trigger function |
| **:SOURce?** | | Query the trigger source type. |
| **:SOURce** | <BUS\|REF\|IMM> | Select a trigger source. |
| **:REF:COUNt?** | | Query the threshold of the refresh-hold mode. |
| **:REF:COUNt** | <numeric>: 0 to 1000 | Set the threshold of the refresh-hold mode. |

| Command | Parameter | Description |
|---|---|---|
| **ABORt** | | Reset the trigger system of the meter. |
| **INITiate** | | Initiate the trigger system of the meter. |
| **FETCh?** | | Query the latest measurement value. |
| **READ?** | | Return the data any time that the last reading is valid. |
| **CALCulate** | | |
| **:FUNCtion?** | | Query the calculation function. |
| **:FUNCtion** | <function> | Set the calculation function. |
| **:NULL:OFFSet?** | | Query the offset value of the relative (REL) function. |
| **:AVERage**<br>**:MAXimum?**<br>**:MINimum?**<br>**:DIFFerential?**<br>**:AVERage?**<br>**:PRESent?**<br>**:COUNt?** | | Query the value of the dynamic recording function. |
| **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 light. |
| **:TIME** | <second>: 0 to 99 | Set the time of the back light. |
| **:CPERcent** | < 0-20 \| 4-20 > | For DCmA measurements, select the % conversion. |
| **:TCOMpensated** | <Boolean> | Sets 0 **℃** temperature compensation. (3805-50 only) |
| **:COMmunication** | <baud>, <parity>, <data> | Configure the COM port. |
| **: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
' 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
  Text1.Text = ""                                         ' clear text box contents
  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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Technical Support Section

All inquiries to International Sales and Marketing Department
81 Koizumi, Ueda, Nagano, 386-1192, Japan
TEL: +81-268-28-0562 / FAX: +81-268-28-0568
E-mail: os-com@hioki.co.jp
URL http://www.hioki.com/

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HIOKI

HIOKI E. E. CORPORATION

**HEAD OFFICE**
81 Koizumi, Ueda, Nagano 386-1192, Japan
TEL +81-268-28-0562 / FAX +81-268-28-0568
E-mail: os-com@hioki.co.jp / URL http://www.hioki.com/

**HIOKI USA CORPORATION**
6 Corporate Drive, Cranbury, NJ 08512, USA
TEL +1-609-409-9109 / FAX +1-609-409-9108

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