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SCPI & MODBUS COMMAND REFERENCE

# TH7100 Series

Covers the TH7105, TH7110 and TH7120 single-phase, linear-amplifier programmable AC power sources: remote interfaces, SCPI command syntax and subsystem commands, and the full MODBUS register map. Companion volume to the TH7100 Series Operation Manual.

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> **NOTE**
>
> SCPI and MODBUS are standard capabilities supported across all three TH7100 series models (Operation Manual, Ch. 6), not model-exclusive features. All command/address tables in this volume apply equally to TH7105, TH7110 and TH7120 unless a row states otherwise. Where a parameter's numeric range depends on the model's current or power rating (e.g. current limits, peak-current limits, power limits), the applicable range is noted directly in the table rather than restated per model — see the Operation Manual, Chapter 7, for the exact per-model figures.

SECTION 1

# Remote Interfaces

## 1.1 RS232

Full-duplex asynchronous serial communication via the rear-panel 9-pin D-sub connector. The instrument implements a minimal subset of the standard RS-232 signal set — only TXD, RXD and GND are used. A self-made 3-wire cable (<1.5 m, two-core shielded wire) can be used; when self-made, short pins 4 and 6, and pins 7 and 8, at the computer-side connector.

| PIN | SIGNAL |
|---|---|
| 3 | TXD — Transmit Data |
| 2 | RXD — Receive Data |
| 5 | GND — Ground |

| PARAMETER | VALUE |
|---|---|
| Transmission mode | Full-duplex, asynchronous, with start and stop bits |
| Data bits | 8 bit |
| Stop bits | 1 bit |
| Parity | None |
| Baud rate | 4800 / 9600 / 14400 / 19200 / 38400 / 57600 / 96000 / 115200 bps (default 9600; set via System Setup > Communication, or `:SYST:BUS:RATE`) |
| End character | LF (line feed, ASCII 10) |
| Connector | 9-pin D-sub |

**WARNING**

To avoid electrical shock, switch the instrument off before connecting or disconnecting the RS232 cable. Never short the output terminals or the output to chassis ground.

## 1.2 USB Virtual COM Port

The rear-panel USB device port presents itself to a host PC as a virtual serial (COM) port once the matching USB-to-UART bridge driver is installed. All RS232 command syntax and settings described in this document apply unchanged to the USB virtual COM port. Install the driver supplied by Techmize before connecting the instrument via USB; once installed, the port appears in the host's device manager as a standard USB-to-UART bridge COM port.

SECTION 2

# SCPI Command Syntax Rules

SCPI (Standard Commands for Programmable Instruments) commands are organized in a hierarchical, tree-like structure. The top level of each branch is a subsystem keyword; the levels beneath it are reached by descending through colon-separated keywords.

## 2.1 Basic rules

1. Commands are case-insensitive.
2. At least one space must separate a command keyword from its parameter.
3. No space may be placed immediately before or after a colon ( `:` ).
4. A semicolon ( `;` ) separates two commands belonging to the same subsystem sent on one line.
5. A comma ( `,` ) separates multiple parameters within one command.
6. Appending a question mark ( `?` ) to a command executes a query of its current value.
7. A command keyword may be sent in full or abbreviated form; the abbreviation is the capitalized portion shown in this document (e.g. `:FUNCtion` may be sent as `:FUNC` ).
8. A keyword in square brackets is optional and may be omitted when sending the command.
9. Every command sent to the instrument must be terminated with a <NL> (newline) character; a terminator always resets the active command path back to the root.

## 2.2 Common (IEEE-488.2) commands

| COMMAND | DESCRIPTION |
|---|---|
| `*CLS` | Clears the Standard Event, Query Event and Status Byte registers. |
| `*ESE?` | Queries the Standard Event Status Enable register (returns 0–255). |
| `*ESR?` | Reads and clears the Standard Event Status register. |
| `*IDN?` | Queries instrument model, serial number and firmware version. Example return: `Tonghui,TH7110,SHF-888-8888,V1.0.0` `Copyright(c) 2017-09-01` |
| `*OPC?` | Sets the OPC bit of the Standard Event register once all preceding commands have completed, and returns "1" to the output buffer. |
| `*RST` | Resets the instrument to its factory default state. |
| `*SRE?` | Queries the Status Byte Enable register; returns the weighted decimal sum of the enabled bits. |
| `*STB?` | Reads the Status Byte register. |

> **NOTE**
> Each command in Section 3 is given with its full syntax, its recognized abbreviation, and the function it performs.

SECTION 3

# SCPI Subsystem Commands

## 3.1 DISPlay — Display page command set

Selects or queries the active display page. The root keyword is `:DISPlay:PAGE` (abbreviated `:DISP:PAGE`).

| COMMAND | ABBREVIATION | DESCRIPTION |
|---|---|---|
| `:DISPlay:PAGE:MEASurement` | `:DISP:PAGE:MEAS` | Switch to the Measurement Display page. |
| `:DISPlay:PAGE:MANUal:MEMory` | `:DISP:PAGE:MANU:MEM` | Switch to the Manual Mode Sequence Setting page. |
| `:DISPlay:PAGE:MANUal:COMMon` | `:DISP:PAGE:MANU:COMM` | Switch to the Manual Mode Common Setting page. |
| `:DISPlay:PAGE:PROGram:MEMory1` | `:DISP:PAGE:PROG:MEM1` | Switch to Program Mode Sequence Setting page 1. |
| `:DISPlay:PAGE:PROGram:MEMory2` | `:DISP:PAGE:PROG:MEM2` | Switch to Program Mode Sequence Setting page 2. |
| `:DISPlay:PAGE:PROGram:MEMory3` | `:DISP:PAGE:PROG:MEM3` | Switch to Program Mode Sequence Setting page 3. |
| `:DISPlay:PAGE:PROGram:COMMon` | `:DISP:PAGE:PROG:COMM` | Switch to the Program Mode Common Setting page. |
| `:DISPlay:PAGE:SYSTem:ENV` | `:DISP:PAGE:SYST:ENV` | Switch to the System Setup > Environment page. |
| `:DISPlay:PAGE:SYSTem:COM` | `:DISP:PAGE:SYST:COM` | Switch to the System Setup > Communication page. |
| `:DISPlay:PAGE:SYSTem:TOOL` | `:DISP:PAGE:SYST:TOOL` | Switch to the System Setup > Tools page. |
| `:DISPlay:PAGE:INTerFile` | `:DISP:PAGE:INTF` | Switch to the Internal File page. |
| `:DISPlay:PAGE:EXTerFile` | `:DISP:PAGE:EXTF` | Switch to the External File page. |
| `:DISPlay:PAGE?` | `:DISP:PAGE?` | Query the currently active display page. Returns one of: `MEAS`, `MANUMEM`, `MANUCOMM`, `PROGMEM1`, `PROGMEM2`, `PROGMEM3`, `PROGCOMM`, `SYSTENV`, `SYSTCOM`, `SYSTTOOL`, `INTF`, `EXTF`. |

## 3.2 FUNCtion — Function command set

The `:FUNCtion` (abbreviated `:FUNC`) subsystem carries all output control and measurement-setting commands, for both Manual and Program test modes. Unless noted, a command is rejected while the AC output is on.

### 3.2.1 Output, mode and general control

| COMMAND | DESCRIPTION |
|---|---|
| `:FUNC:OUTPut ON` / `OFF` · `:FUNC:OUTPut?` | Turn the AC output on/off (valid only on the Measurement Display page), or query the output state (0=off, 1=on). |
| `:FUNC:RunMode:MANUal` / `:PROGram` · `:FUNC:RunMode?` | Select Manual or Program test mode (rejected while output is on), or query the active mode (returns `manual` or `program`). |
| `:FUNC:EXIT` | Exit the result-display state. |
| `:FUNC:SaveResult` ( `:FUNC:SR` ) | Save the test result (effective only when Result Display Mode = ALL). |
| `:FUNC:TRIG` | Manually trigger the surge/drop (SD) waveform. |
| `:FUNC:CLR` | Clear the current alarm state. |
| `:FUNC:ALM:STAT` | Retrieve the active alarm type. |

### 3.2.2 Manual mode — Sequence and Common setting

| COMMAND | PARAMETERS | DESCRIPTION |
|---|---|---|
| `:FUNC:MEMory:MANUal <value>` / `?` | 1–50 | Set/query the Manual mode memory (sequence) number. |
| `:FUNC:VOLTage:MANUal <value>` / `?` | 0.0–300.0 V | Set/query the Manual mode set voltage. |
| `:FUNC:VOLTage:MODE:MANUal:AUTO` / `:HIGH` · `?` | AUTO, HIGH | Set the Manual mode voltage-output mode, or query it (0=auto, 1=high). |
| `:FUNC:FREQuncy:MANUal <value>` / `?` | 45.0–500 Hz (0.1 Hz step <100 Hz, 1 Hz step ≥100 Hz) | Set/query the Manual mode output frequency. |
| `:FUNC:CURRent:HIghLiMiT:MANUal <value>` / `?` | 0.000–8.400 A (set voltage ≤150 V) or 0.000–4.200 A (>150 V) — model-dependent, see Ch. 7 of the Operation Manual | Set/query the Manual mode current upper limit. |
| `:FUNC:CURRent:LOwLiMiT:MANUal <value>` / `?` | as above | Set/query the Manual mode current lower limit. |
| `:FUNC:VOLTage:HIghLiMiT:MANUal <value>` / `?` | 0.0–300.0 V | Set/query the Manual mode voltage upper limit. |
| `:FUNC:VOLTage:LOwLiMiT:MANUal <value>` / `?` | 0.0–300.0 V | Set/query the Manual mode voltage lower limit. |
| `:FUNC:FREQuncy:HIghLiMiT:MANUal <value>` / `?` | 45.0–500 Hz | Set/query the Manual mode frequency upper limit. |
| `:FUNC:FREQuncy:LOwLiMiT:MANUal <value>` / `?` | 45.0–500 Hz | Set/query the Manual mode frequency lower limit. |
| `:FUNC:StartANGle:MANUal <value>` / `?` | 0–359° | Set/query the Manual mode start phase angle. |
| `:FUNC:EndANGle:MANUal <value>` / `?` | 0–359° | Set/query the Manual mode end phase angle. |
| `:FUNC:RESULT:MANUal NONE/LAST/ALL/P-F` (0/1/2/3) · `?` | NONE, LAST, ALL, P/F | Set/query the Manual mode result-display mode. |

### 3.2.3 Manual mode — Surge/Drop, overcurrent fold, timer, voltage limit

| COMMAND | PARAMETERS | DESCRIPTION |
|---|---|---|
| `:FUNC:SurgeDrop:MANUal ON / OFF · ?` | ON, OFF | Enable/disable, or query, the Manual mode Surge/Drop (SD) function. |
| `:FUNC:SurgeDrop:VOLT:MANUal <value> / ?` | 0.0–300.0 V | Set/query the Manual mode SD voltage. |
| `:FUNC:SurgeDrop:SITE:MANUal <value> / ?` | 0–20 ms | Set/query the position (time) at which the SD event occurs. |
| `:FUNC:SurgeDrop:TIME:MANUal <value> / ?` | 0–20 ms | Set/query the SD pulse width. |
| `:FUNC:SurgeDrop:ConnecT:MANUal ON / OFF · ?` | ON, OFF | Enable/disable, or query, SD connect for the current memory sequence. |
| `:FUNC:OverCurrentFold:MANUal ON / OFF · ?` | ON, OFF | Enable/disable, or query, the Manual mode overcurrent-fold-back function. |
| `:FUNC:OverCurrentTime <value>` ( `:FUNC:OCT` )`/ ?` | 0–5 | Set/query the overcurrent fold-back time. |
| `:FUNC:VOLTage:LiIMT <value>` ( `:FUNC:VOLT:LMT` )`/ ?` | 5.0–50.0 V | Set/query the output voltage limit protection (the maximum allowed deviation between set and output voltage). |
| `:FUNC:TIME:SECond <value> / ?` | 0–59 | Set/query the Manual mode timer — seconds. |
| `:FUNC:TIME:MINute <value> / ?` | 0–59 | Set/query the Manual mode timer — minutes. |
| `:FUNC:TIME:HOUR <value> / ?` | 0–99 | Set/query the Manual mode timer — hours. |

### 3.2.4 Program mode — Sequence setting

| COMMAND | PARAMETERS | DESCRIPTION |
|---|---|---|
| `:FUNC:MEMory:PROGram <value> / ?` | 1–50 | Set/query the Program mode memory (sequence) number. |
| `:FUNC:MEMory:CYCLE <value> / ?` | 0–999 | Set/query the current memory sequence's cycle count. |
| `:FUNC:STEP <value> / ?` | 1–9 | Set/query the active step number. |
| `:FUNC:STEP:CYCLE <value> / ?` | 0–999 | Set/query the active step's cycle count. |
| `:FUNC:VOLTage:PROGram <value> / ?` | 0–300 V | Set/query the step's set voltage. |
| `:FUNC:VOLTage:MODE:PROGram:AUTO / :HIGH · ?` | AUTO, HIGH | Set/query the step's voltage-output mode. |
| `:FUNC:FREQuncy:PROGram <value> / ?` | 45.0–500 Hz | Set/query the step's output frequency. |
| `:FUNC:CURRent:HIghLiMiT:PROGram <value> / ?` | model-dependent, see Ch. 7 | Set/query the step's current upper limit. |
| `:FUNC:CURRent:LOwLiMiT:PROGram <value> / ?` | model-dependent, see Ch. 7 | Set/query the step's current lower limit. |
| `:FUNC:CONNECT ON / OFF · ?` | ON, OFF | Enable/disable, or query, step-connect (chaining) for the active step. |
| `:FUNC:AmperePeak:HIghLiMiT <value>` ( `:FUNC:AP:HILMT` )`/ ?` | 0.0–33.6 A (voltage mode AUTO, <150 V) or 0.0–16.8 A (AUTO >150 V, or HIGH); 0.0 disables the function | Set/query the step's peak-current upper limit. |
| `:FUNC:AmperePeak:LOwLiMiT <value>` ( `:FUNC:AP:LOLMT` )`/ ?` | as above | Set/query the step's peak-current lower limit. |
| `:FUNC:POWer:HIghLiMiT <value> / ?` | 0–1000 W | Set/query the step's power upper limit. |
| `:FUNC:POWer:LOwLiMiT <value> / ?` | 0–1000 W | Set/query the step's power lower limit. |

### 3.2.5 Program mode — timing, limits, SD and result commands

| COMMAND | PARAMETERS | DESCRIPTION |
|---|---|---|
| `:FUNC:PowerFactor:HIghLiMiT <value> ( :FUNC:PF:HILMT )/ ?` | 0.000–1.000 | Set/query the step's power-factor upper limit. |
| `:FUNC:PowerFactor:LOwLiMiT <value> ( :FUNC:PF:LOLMT )/ ?` | 0.000–1.000 | Set/query the step's power-factor lower limit. |
| `:FUNC:TIME:UNIT:SEC / :MIN / :HOUR · :FUNC:TIME:UNIT?` | SEC, MIN, HOUR | Set the time unit for the step's Delay and Dwell times, or query it (0=sec, 1=min, 2=hour). |
| `:FUNC:DELAY <value> / ?` | 0.1–999.9 (unit per 3.2.5 above) | Set/query the step's delay (judgement-hold-off) time. |
| `:FUNC:DWELL <value> / ?` | 0.1–999.9 | Set/query the step's dwell (test) time. |
| `:FUNC:RAMP:UP <value> / ?` | 0.0–999.9 s | Set/query the step's voltage rise time. |
| `:FUNC:RAMP:DOWN <value> / ?` | 0.0–999.9 s | Set/query the step's voltage fall time. |
| `:FUNC:SurgeDrop:VOLT:PROGram <value> / ?` | 0.0–300.0 V | Set/query the step's SD voltage. |
| `:FUNC:SurgeDrop:SITE:PROGram <value> / ?` | 0–20 ms | Set/query the step's SD occurrence position. |
| `:FUNC:SurgeDrop:TIME:PROGram <value> / ?` | 0–20 ms | Set/query the step's SD pulse width. |
| `:FUNC:SurgeDrop:ConnecT:PROGram ON / OFF · ?` | ON, OFF | Enable/disable, or query, SD connect for the step. |
| `:FUNC:VOLTage:HIghLiMiT:PROGram <value> / ?` | 0.0–300.0 V | Set/query the step's voltage upper limit. |
| `:FUNC:VOLTage:LOwLiMiT:PROGram <value> / ?` | 0.0–300.0 V | Set/query the step's voltage lower limit. |
| `:FUNC:FREQuncy:HIghLiMiT:PROGram <value> / ?` | 45.0–500 Hz | Set/query the step's frequency upper limit. |
| `:FUNC:FREQuncy:LOwLiMiT:PROGram <value> / ?` | 45.0–500 Hz | Set/query the step's frequency lower limit. |
| `:FUNC:StartANGle:PROGram <value> / ?` | 0–359° | Set/query the step's start phase angle. |
| `:FUNC:EndANGle:PROGram <value> / ?` | 0–359° | Set/query the step's end phase angle. |
| `:FUNC:RESULT:PROGram LAST/ALL/P-F (0/1/2) · ?` | LAST, ALL, P/F | Set/query the Program mode result-display mode. |
| `:FUNC:SurgeDrop:PROGram ON / OFF · ?` | ON, OFF | Enable/disable, or query, SD for the active step. |
| `:FUNC:OverCurrentFold:PROGram ON / OFF · ?` | ON, OFF | Enable/disable, or query, overcurrent fold-back for the active step. |
| `:FUNC:LoopCycle <value> ( :FUNC:LC )/ ?` | 0–999 | Set/query the memory sequence's total loop count. |
| `:FUNC:SingleStep ON / OFF ( :FUNC:SS )· ?` | ON, OFF | Enable/disable, or query, single-step test mode. |

## 3.3 FETCH — Measurement query command set

Queries the Manual-mode output measurement values. All commands in this group are queries only.

| COMMAND | DESCRIPTION |
|---|---|
| `:FETCH:VOLTage?` ( `:FETCH:VOLT?` ) | Query the output voltage. |
| `:FETCH:CURRent?` ( `:FETCH:CURR?` ) | Query the output current. |
| `:FETCH:CURRent:SURGe?` | Query the inrush (surge) current, returned in the range 0.000–100.000 A. Clear the stored value with `:FETCH:CURR:SURG CLR` before the next measurement. |
| `:FETCH:POWer?` ( `:FETCH:POW?` ) | Query the output power. |
| `:FETCH:AmperePeak?` ( `:FETCH:AP?` ) | Query the peak output current. |
| `:FETCH:PowerFactor?` ( `:FETCH:PF?` ) | Query the power factor. |
| `:FETCH:CrestFactor?` ( `:FETCH:CF?` ) | Query the crest factor. |
| `:FETCH?` | Query voltage, current, power, peak current, power factor and crest factor in one call. Example return: `100.0,1.000,100.0,1.42,1.000,1.413` |

## 3.4 SYSTem — System command set

| COMMAND | PARAMETERS | DESCRIPTION |
|---|---|---|
| `:SYSTem:BEEP:PASS ON / OFF · ?` | ON, OFF | Enable/disable, or query, the pass beeper. |
| `:SYSTem:BEEP:FAIL ON / OFF · ?` | ON, OFF | Enable/disable, or query, the fail beeper. |
| `:SYSTem:BEEP:KEY ON / OFF · ?` | ON, OFF | Enable/disable, or query, the key-press beeper. |
| `:SYSTem:BEEP:ALARM ON / OFF · ?` | ON, OFF | Enable/disable, or query, the alarm beeper. |
| `:SYSTem:DATE <date> / ?` | e.g. `2017-8-30` | Set/query the system date. |
| `:SYSTem:DATE:YEAR/MONTH/DAY <value> / ?` | year 2000–2099; month 1–12; day 1–31 | Set/query the system date by field. |
| `:SYSTem:TIME <time> / ?` | e.g. `08:00:00` | Set/query the system time. |
| `:SYSTem:TIME:HOUR/MINute/SECond <value> / ?` | hour 0–23; minute/second 0–59 | Set/query the system time by field. |
| `:SYSTem:PLC ON / OFF · ?` | ON, OFF | Enable/disable, or query, remote control. |
| `:SYSTem:LastState ON / OFF ( :SYST:LS ) · ?` | ON, OFF | Enable/disable, or query, hold of the last power-off state at the next power-on. |
| `:SYSTem:RESET:FACTory` | — | Restore the instrument to factory defaults. |
| `:SYSTem:RESET:SETUP` | — | Restore all measurement settings to their defaults. |
| `:SYSTem:INTerFile:SAVE <name>` | file name | Save the current settings to internal storage under the given file name (rejected if the name already exists). |
| `:SYSTem:INTerFile:LOAD <name>` | file name | Load a settings file from internal storage. |
| `:SYSTem:INTerFile?` | — | Query the files held in internal storage. |
| `:SYSTem:BUS:RATE <value> / ? ·` `:SYSTem:BUS:MODE RS232/USB / ?` | see §1.1 for baud rate list | Set/query the interface baud rate and bus mode. |

SECTION 4

# MODBUS Protocol — Frame Format

MODBUS is a serial communication protocol, originally published by Modicon for PLC communication, and now a de facto industry standard for connecting industrial electronic equipment. The TH7100 series supports MODBUS over the same RS232 / USB virtual COM port used for SCPI (§1).

## 4.1 Write command (function code 0x10)

**Send:** Address · Function Code (0x10) · Address High · Address Low · Register Count High · Register Count Low · Byte Count · Data Byte 1...n · CRC Low · CRC High

**Return:** Address · Function Code · Address High · Address Low · Register Count High · Register Count Low · CRC Low · CRC High

## 4.2 Read command (function code 0x03)

**Send:** Address · Function Code (0x03) · Address High · Address Low · Register Count High · Register Count Low · CRC Low · CRC High

**Return:** Address · Function Code · Byte Count · Data Byte 1...n · CRC Low · CRC High

## 4.3 Field definitions

| FIELD | DEFINITION |
|---|---|
| Address | Instrument bus address, configurable under System Setup > Communication; range 1–31 (SCPI `:SYST:BUS` page). |
| Function Code | Write-multiple-registers: `0x10` . Read-holding-registers: `0x03` . |
| Address High / Low | The parameter's register address (see the Register Map, §5) — 8-bit high byte and 8-bit low byte. |
| Register Count High / Low | Number of 16-bit registers involved in the operation (1 register = 2 bytes). A 4-byte floating-point value occupies 2 registers; a 2-byte integer occupies 1 register. |
| Byte Count | Total number of data bytes written or returned. Always twice the register count. |
| Data Byte 1...n | The value written to, or read from, the instrument. A 2-byte value occupies the high 8 bits in byte 1 and the low 8 bits in byte 2. A 4-byte IEEE-754 floating-point value occupies bytes 1–4; e.g. the decimal value 25.16 converts to the 4 hex bytes `0x41 0xC9 0x47 0xAE` (byte 1=0x41 ... byte 4=0xAE), stored in memory as `a[0]=0xAE, a[1]=0x47, a[2]=0xC9, a[3]=0x41` . |
| CRC High / Low | 16-bit CRC checksum, computed by table lookup over the preceding bytes of the frame. |

> **NOTE**
> In the Register Map (§5), the "Registers" column states 1 for a single 16-bit integer value and 2 for a 4-byte floating-point value. The "R/W" column states whether the address is read/write, read-only, or (for one address) write-only.

SECTION 5

# MODBUS Register Map

All register addresses below are decimal and common to TH7105, TH7110 and TH7120 (the current/power-related ranges differ per the model's rating — see Operation Manual Ch. 7). The bus address range for all frames is 1–31.

## 5.1 Common & Output Control (addresses 1–3)

| ADDR. | REGS. | R/W | VALUES | DESCRIPTION |
|---|---|---|---|---|
| 1 | 1 | Read | 7105 / 7110 / 7120 | Read the instrument model. |
| 2 | 1 | R/W | 0=off, 1=on | Set/query the AC output state. |
| 3 | 1 | R/W | 0=Manual, 1=Program | Set/query the active test mode. |

## 5.2 Manual Mode Parameters (addresses 4–26)

| ADDR. | REGS. | R/W | VALUES | DESCRIPTION |
|---|---|---|---|---|
| 4 | 1 | R/W | 1–50 | Manual mode memory (sequence) number. |
| 5 | 2 | R/W | 0.0–300.0 V | Manual mode set voltage. |
| 6 | 1 | R/W | 0=AUTO, 1=HIGH | Manual mode voltage output mode. |
| 7 | 2 | R/W | 45.0–500 Hz | Manual mode output frequency. |
| 8 | 2 | R/W | 0.000–8.400 A (≤150 V) / 0.000–4.200 A (>150 V)* | Manual mode current upper limit. |
| 9 | 2 | R/W | as address 8* | Manual mode current lower limit. |
| 10 | 2 | R/W | 0.0–300.0 V | Surge/Drop (SD) voltage. |
| 11 | 1 | R/W | 0–20 (ms) | SD occurrence position. |
| 12 | 1 | R/W | 0–20 (ms) | SD pulse width. |
| 13 | 1 | R/W | 0=off, 1=on | SD connect state for the current memory sequence. |
| 14 | 2 | R/W | 0.0–300.0 V | Voltage upper limit. |
| 15 | 2 | R/W | 0.0–300.0 V | Voltage lower limit. |
| 16 | 2 | R/W | 45.0–500 Hz | Frequency upper limit. |
| 17 | 2 | R/W | 45.0–500 Hz | Frequency lower limit. |
| 18 | 1 | R/W | 0–359° | Start phase angle. |
| 19 | 1 | R/W | 0–359° | End phase angle. |
| 20 | 1 | R/W | 0=NONE, 1=LAST, 2=ALL, 3=P/F | Result-display mode. |
| 21 | 1 | R/W | 0=off, 1=on | Surge/Drop function enable. |
| 22 | 1 | R/W | 0=off, 1=on | Overcurrent fold-back enable. |
| 23 | 2 | R/W | 5.0–50.0 V | Output voltage limit protection (allowed set/output deviation). |
| 24 | 1 | R/W | 0–59 | Timer — seconds. |
| 25 | 1 | R/W | 0–59 | Timer — minutes. |
| 26 | 1 | R/W | 0–99 | Timer — hours. |

* Current-range figures shown are for TH7110; the applicable range is model-dependent — see Operation Manual Ch. 7 for TH7105 and TH7120 figures.

## 5.3 Program Mode Parameters (addresses 27–63)

| ADDR. | REGS. | R/W | VALUES | DESCRIPTION |
|---|---|---|---|---|
| 27 | 1 | R/W | 1–50 | Program mode memory (sequence) number. |
| 28 | 1 | R/W | 0–999 | Memory sequence cycle count. |
| 29 | 1 | R/W | 1–9 | Active step number. |
| 30 | 1 | R/W | 0–999 | Active step cycle count. |
| 31 | 2 | R/W | 0.0–300.0 V | Step set voltage. |
| 32 | 1 | R/W | 0=AUTO, 1=HIGH | Step voltage output mode. |
| 33 | 2 | R/W | 0.000–8.400 A / 0.000–4.200 A* | Step current upper limit. |
| 34 | 2 | R/W | as address 33* | Step current lower limit. |
| 35 | 2 | R/W | 45.0–500 Hz | Step output frequency. |
| 36 | 1 | R/W | 0=off, 1=on | Step-connect (chaining) state. |
| 37 | 2 | R/W | 0.0–33.6 A or 0.0–16.8 A*; 0.0=disabled | Step peak-current upper limit. |
| 38 | 2 | R/W | as address 37* | Step peak-current lower limit. |
| 39 | 2 | R/W | 0.0–1000 W; 0.0=disabled | Step power upper limit. |
| 40 | 2 | R/W | 0.0–1000 W; 0.0=disabled | Step power lower limit. |
| 41 | 2 | R/W | 0.000–1.000; 0.000=disabled | Step power-factor upper limit. |
| 42 | 2 | R/W | 0.000–1.000; 0.000=disabled | Step power-factor lower limit. |
| 43 | 1 | R/W | 0=sec, 1=min, 2=hour | Time unit for the step's delay and test time. |
| 44 | 2 | R/W | 0.1–999.9 | Step delay (judgement-hold-off) time. |
| 45 | 2 | R/W | 0.1–999.9 | Step test (dwell) time. |
| 46 | 2 | R/W | 0.0–999.9 s | Step voltage rise time. |
| 47 | 2 | R/W | 0.0–999.9 s | Step voltage fall time. |
| 48 | 2 | R/W | 0.0–300.0 V | Step Surge/Drop voltage. |
| 49 | 1 | R/W | 0–20 | Step SD occurrence position. |
| 50 | 1 | R/W | 0–20 | Step SD pulse width. |
| 51 | 1 | R/W | 0=off, 1=on | Step SD connect state. |

* Current and peak-current range figures are model-dependent — see Operation Manual Ch. 7.

## 5.3 Program Mode Parameters (continued — addresses 52–63)

| ADDR. | REGS. | R/W | VALUES | DESCRIPTION |
|---|---|---|---|---|
| 52 | 2 | R/W | 0.0–300.0 V | Step voltage upper limit. |
| 53 | 2 | R/W | 0.0–300.0 V | Step voltage lower limit. |
| 54 | 2 | R/W | 45.0–500 Hz | Step frequency upper limit. |
| 55 | 2 | R/W | 45.0–500 Hz | Step frequency lower limit. |
| 56 | 1 | R/W | 0–359° | Step start phase angle. |
| 57 | 1 | R/W | 0–359° | Step end phase angle. |
| 58 | 1 | R/W | 0=LAST, 1=ALL, 2=P/F | Program mode result-display mode. |
| 59 | 1 | R/W | 0=off, 1=on | Step Surge/Drop enable. |
| 60 | 1 | R/W | 0=off, 1=on | Step overcurrent fold-back enable. |
| 61 | 1 | R/W | 0–999 | Memory sequence total loop count. |
| 62 | 1 | R/W | 0=off, 1=on | Single-step test mode enable. |
| 63 | 1 | Write | — | Exit the result-display state (write-only; no data byte required beyond the frame header). |

## 5.4 Measurement Readback (addresses 64–71)

| ADDR. | REGS. | R/W | VALUES | DESCRIPTION |
|---|---|---|---|---|
| 64 | 2 | Read | 0.0–300.0 V | Output voltage. |
| 65 | 2 | Read | 0.000–8.400 A / 0.000–4.200 A* | Output current. |
| 66 | 2 | Read | 0.0–1000 W | Output power. |
| 67 | 2 | Read | 0.0–16.8 A or 0.0–33.6 A* | Peak output current. |
| 68 | 2 | Read | 0.000–1.000 | Power factor. |
| 69 | 2 | Read | 0.000–1.000 | Crest factor. |
| 70 | 2 | Read | 0.000–102.000 A | Inrush (surge) current. |
| 71 | 1 | R/W | 0–5 | Overcurrent fold-back time (Manual mode). |

* Range figures are model-dependent — see Operation Manual Ch. 7 for TH7105/TH7110/TH7120 figures.

**NOTE**

Addresses 64–70 correspond to the SCPI `:FETCH` subsystem (§3.3) and are read-only. Address 71 (overcurrent fold-back time) is read/write and is listed at the end of the register map rather than adjacent to address 22 (overcurrent fold-back enable); both addresses apply to the Manual mode function described in §3.2.3.

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