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SCPI COMMAND REFERENCE

TH9010 Series

Parallel Multi-Channel AC/DC Withstand Voltage & Insulation Resistance Tester

Companion document to the TH9010 Series Operation Manual. Full remote-control SCPI command set over RS232C, USB (USBTMC/USBVCOM) and the optional GPIB interface, covering display, file, per-test-mode (AC/DC/IR/OS/S.CK/D.CK) and system subsystems.

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TH9010 Series SCPI Command Reference

TH9010 (8-channel) / TH9010A (4-channel)

This document lists the full remote-control command set for the TH9010 series parallel multi-channel AC/DC withstand-voltage and insulation-resistance tester. It is the companion reference to the *TH9010 Series Operation Manual*. SCPI is available over RS232C, USB (USBTMC/USBVCOM) and the optional GPIB interface. **The instrument does not support MODBUS.**

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Commands only describe the actual characters received or sent; all characters are ASCII. Unlabelled numeric data defaults to integer or floating-point format, with no unit shown in the command itself. Every command string must end with the termination tag NL (newline, decimal 10); without it the instrument will not parse the command. Over GPIB, ^END (the IEEE 488 bus EOI signal) may additionally terminate a command.

SECTION 1

Conventions

1.1 Command subsystems

Subsystem	Covers
`DISPlay`	Active display page (§2)
`MMEM`	Internal test-file store/load (§3)
`FUNCtion`	Test start/stop, file editing, and the per-mode test-parameter trees for AC/DC/IR/OS/S.CK/D.CK (§4–6)
`SYSTem`	Pass-hold, step-hold, GFI, fail mode, delay, offset, control mode (§7)
Other	`*IDN?`, `FETCh` (§8)

1.2 Syntax rules

- Command characters are all ASCII; the data placeholder `<???>` used in this document is an ASCII string, in the system's default integer or floating-point format, with the data unit not shown in the command itself.
- Every command string must end with a command-end tag: `NL` (newline, decimal 10) is the default and mandatory terminator — without it the instrument does not parse the command. `^END` (IEEE 488 bus EOI) can additionally terminate a command sent over GPIB.
- Multiple commands can be sent in one line to reduce overhead; this document uses an underscore `_` in examples only to denote a space, which is not itself part of the command syntax.

1.3 Sending multiple commands together

To simplify sending, several related settings can be issued in one command line for the same test step, for example:

```
FUNC:SOUR:STEP_1:AC:VOLT_1000;UPPC_1;TTIM_9.9;CH1_HIGH;CH2_LOW
                    FUNC:SOUR:STEP:INS
FUNC:SOUR:STEP_2:DC:VOLT_1000;UPPC_1;TTIM_9.9;CH1_HIGH;CH2_LOW
```

The underscore in the example above represents a space character (NL/^END terminators omitted for clarity). The first line configures STEP 1 as an AC test at 1000 V with a 1 mA upper current limit and 9.9 s test time; the second inserts a new step; the third configures the new STEP 2 as a DC test with equivalent parameters.

> **NOTE**
> Command keywords use mixed-case notation: the capitalized portion of a keyword is mandatory, the lower-case portion optional. The instrument does not distinguish upper and lower case on received commands.

SECTION 2

DISPlay Subsystem

Sets or queries the instrument's active display page.

Command	Details
`DISPlay:PAGE?` `DISPlay:PAGE <page name>`	Query/switch the active display page. `page name`: `MEASurement` (<TEST>), `MSETup` (<SETUP>), `SYSTem` (<SYSTEM>), `FLISt` (<FILE>). Query return format: `<page name><NL^END>`. Example: `DISPlay:PAGE MEASurement`.

`<page name>`	Switches display to
`MEASurement`	<TEST> — measurement display page
`MSETup`	<SETUP> — measurement setting page
`SYSTem`	<SYSTEM> — system setting page
`FLISt`	<FILE> — file list page

SECTION 3

MMEM Subsystem

Stores the current instrument settings to an internal file, or loads a previously stored internal file as the current settings (equivalent to the <FILE> → Int.File operations, Operation Manual §4.2.4).

Command	Details
`MMEM:STOR:STAT <file #> [, <file name>]`	Store the current settings to internal file number `<file #>`. `<file #>`: integer, 1–20, accuracy 1. `<file name>` (optional): characters, 1–15 length; name stored with the internal file. No query form. Example: `MMEM:STOR:STAT 1,TESTFILE01`.
`MMEM:LOAD:STAT <file #>`	Load internal file number `<file #>` as the current settings. `<file #>`: integer, 1–20, accuracy 1. No query form. Example: `MMEM:LOAD:STAT 1`.

> **NOTE**
>
> A file saved under a different firmware version may not load correctly. If the loaded file's test conditions display incompletely on the instrument, restore factory settings and re-edit the file (Operation Manual §4.2.4).

SECTION 4

FUNCtion Subsystem — Test Control & File Editing

4.1 Test control

Command	Details
`FUNC:STARt`	Start the current test file. Equivalent to the front-panel START button (requires the HANDLER INT LOCK signal closed). No query form.
`FUNC:STOP`	Stop the test in progress. Equivalent to the front-panel STOP button. No query form.

4.2 File editing — step navigation

Edits the current test file's step list. Issued under the `FUNC:SOUR:STEP` path.

Command	Details
`FUNC:SOUR:STEP:INS`	Insert a new test step after the currently selected step. No query form.
`FUNC:SOUR:STEP:NEW`	Create a new, empty test file (replacing the current one with a single default step). No query form.
`FUNC:SOUR:STEP:DEL`	Delete the currently selected test step/project. No query form.
`FUNC:SOUR:STEP:UP`	Move to the previous test step/project. No query form.
`FUNC:SOUR:STEP:DOWN`	Move to the next test step/project. No query form.

4.3 Per-step parameter command tree

Test-mode and parameter commands for a given step follow the form `FUNC:SOUR:STEP<sn>:<mode>:<field>`, where `<sn>` is the step number (integer, **1–16**) and `<mode>` is one of `AC`, `DC`, `IR`, `OS`, `CK` (S.CK) or `DK` (D.CK). The field commands for each mode are given in §5 (AC/DC) and §6 (IR/OS/CK/DK).

`<sn>` (step number, 1–16) addresses a step within the currently selected test file, and is a separate value from the file number used by the `MMEM` subsystem (§3), `<file #>` (1–20), which addresses one of the instrument's 20 internally stored test files. Each file can hold up to 16 steps.

```
Command message:  FUNC:SOUR:STEP<sn>:AC:VOLT<voltage>
   Query message:     FUNC:SOUR:STEP<sn>:AC:VOLT?
```

Example: setting STEP 1's AC test voltage to 1000 V: `FUNC:SOUR:STEP 1:AC:VOLT 1000`; querying it back: `FUNC:SOUR:STEP 1:AC:VOLT?` → returns `1000`.

SECTION 5

FUNCtion Subsystem — AC / DC Parameters

All commands below are issued as `FUNC:SOUR:STEP<sn>:AC:<field>` or `...:DC:<field>` (§4.3). Field ranges, units and the worked example below match the AC/DC test-parameter tables in Operation Manual §4.3.1–4.3.2.

5.1 AC fields

Field	Data format / range / unit	Description
VOLT	integer, 50–5000, V	AC test voltage
UPPC	float, 0.001–10.000, mA, accuracy 0.001 mA	Upper current limit
LOWC	0, 0.001–10.000, mA (0 = OFF)	Lower current limit (syntax as UPPC; must be less than the upper limit)
TTIM	float, 0–999.9, s (0 = OFF), accuracy 0.1 s	Test time
RTIM	float, 0–999.9, s (syntax as TTIM)	Voltage rise time
FTIM	float, 0–999.9, s (syntax as TTIM)	Voltage fall time
ARC	float, 0–20.0, mA (0 = OFF), accuracy 0.1 mA	Arc current upper limit
FREQ	character, 50 / 60	Test frequency, Hz
UNITx	character, ON/OFF (1/0)	Unit x (1–8) participation switch
CHx	character, HIGH/LOW/OPEN	Scan-box channel x role (with scanning module fitted)

Worked examples

```
FUNC:SOUR:STEP_1:AC:VOLT_1000  →  sets STEP 1 ACW voltage to 1000 V
FUNC:SOUR:STEP_1:AC:UPPC_1  →  sets STEP 1 ACW upper current limit to 1 mA
FUNC:SOUR:STEP_1:AC:UNIT1_ON/1  →  switches UNIT 1 ON for STEP 1
FUNC:SOUR:STEP_1:AC:CH1_HIGH  →  sets scan channel 1 to HIGH for STEP 1
```

5.2 DC fields

Field	Data format / range / unit	Description
VOLT	integer, 50–6000, V	DC test voltage
UPPC	float, 0.0001–5.0000, mA (i.e. 0.1 µA–5.00 mA)	Upper current limit
LOWC	0, 0.0001–5.0000, mA (0 = OFF)	Lower current limit (syntax as UPPC)
TTIM / RTIM / FTIM	float, 0–999.9, s	Test / rise / fall time (syntax as AC)
WTIM	float, 0–999.9, s (syntax as AC TTIM)	DC charging wait time
ARC	float, 0–20.0, mA	Arc current upper limit (syntax as AC)
RAMP	character, ON/OFF (1/0)	Judge the current upper limit during voltage rise
UNITx / CHx	as AC	Unit participation / scan-channel role

Worked example — configuring a 2-step file

```
FUNC:SOUR:STEP_1:AC:VOLT_1000;UPPC_1;TTIM_9.9;CH1_HIGH;CH2_LOW
FUNC:SOUR:STEP:INS
FUNC:SOUR:STEP_2:DC:VOLT_1000;UPPC_1;TTIM_9.9;CH1_HIGH;CH2_LOW
```

Configures STEP 1 as a 1000 V AC test (1 mA upper limit, 9.9 s test time, scan channels 1/2 as HIGH/LOW), inserts a new step, then configures the new STEP 2 as the DC equivalent.

SECTION 6

FUNCtion Subsystem — IR / OS / CK / DK Parameters

Issued as `FUNC:SOUR:STEP<sn>:IR:<field>`, `...:OS:<field>`, `...:CK:<field>` or `...:DK:<field>` (§4.3). Ranges match Operation Manual §4.3.3–4.3.6.

6.1 IR (insulation resistance) fields

Field	Data format / range / unit	Description
`UPPC`	float, 0, 0.1–10000, MΩ (0 = OFF), accuracy 0.1 MΩ	Upper resistance limit
`LOWC`	float, 0, 0.01–10000, MΩ (0 = OFF), accuracy 0.01 MΩ	Lower resistance limit (the resulting lower-limit test current must not exceed 5 mA)
`RANG`	integer, 0–6 (0 = AUTO, 1 = 5 mA, 2 = 1 mA, 3 = 100 µA, 4 = 10 µA, 5 = 1 µA, 6 = 0.1 µA)	Fixed/auto current range
`VOLT`	integer, 50–1000, V, accuracy 1 V	IR test voltage. Sent in volts, as for AC (e.g. `500` = 500 V). Note the narrower range than AC (50–5000 V).
`TTIM` / `RTIM` / `FTIM`	as AC (§5.1), s	Test / rise / fall time
`UNITx` / `CHx`	as AC	Unit participation / scan-channel role

Example: `FUNC:SOUR:STEP_1:IR:UPPC_1` *sets STEP 1's IR upper resistance limit to 1 MΩ;* `FUNC:SOUR:STEP_1:IR:VOLT_500` *sets STEP 1's IR test voltage to 500 V;* `FUNC:SOUR:STEP_1:IR:RANG_1` *sets STEP 1's IR range to the fixed 5 mA range.*

6.2 OS (open/short-circuit detection) fields

Field	Data format / range / unit	Description
`OPEN`	integer, 10–100, %, accuracy 1	Open-circuit threshold (as a fraction of STAND)
`SHOT`	integer, 0–500, % (0 = OFF), accuracy 10	Short-circuit threshold
`STAND`	float, 0.001–40.0, nF, accuracy 0.001 nF	Standard capacitance value
`GET`	— (command, no data)	Samples the current channel's distribution and uses it as the new standard value. Initiates an OS test — confirm the port and test loop are correctly configured before sending.

Example: `FUNC:SOUR:STEP_1:OS:STAND_1` *sets STEP 1's OS standard capacitance to 1 nF;* `FUNC:SOUR:STEP_1:OS:OPEN_50` *sets the open-circuit threshold to 50%.*

6.3 CK (S.CK single-ended contact check) fields

Field	Data format / range / unit	Description
CHx	character, ON/OFF (1/0)	Scan channel x contact-check participation. Only two states apply for CHx in CK mode.

Example: `FUNC:SOUR:STEP_1:CK:CH1_1` *switches channel 1's contact check ON for STEP 1. The CK function checks whether the two leads are connected at the same test end; with multiple test ends, the instrument detects step by step automatically.*

6.4 DK (D.CK double-ended contact check) fields

Field	Data format / range / unit	Description
CHx	character, HIGH/LOW/OPEN	Scan channel x role for the double-ended check

Example: `FUNC:SOUR:STEP_1:DK:CH1_HIGH` *sets channel 1 to HIGH for STEP 1's D.CK test. DK checks whether two separate test ends are reliably connected; each loop requires one HIGH and one LOW channel, and multiple loops must be checked one at a time.*

> **NOTE**
>
> The `CK` and `DK` field commands above require the TH90101/TH90101A scanning module to be fitted (Operation Manual §4.3.5–4.3.6, §4.5).

SECTION 7

SYSTem Subsystem

Sets or queries the test-safety and multi-step control settings normally reached on <SYSTEM> → Test (Operation Manual §4.2.1).

Command	Details
`SYST:PASS?` `SYST:PASS <time>`	PASS-hold time. `<time>`: float, 0, 0.1–99.9, s (0 = OFF), accuracy 0.1 s. Example: `SYST:PASS_1` sets a 1.0 s PASS hold.
`SYST:STEP?` `SYST:STEP <time>` or `SYST:STEP KEY`	Inter-step hold. `<time>`: as for `SYST:PASS` (0 = OFF), the wait between steps in a multi-step test. `KEY`: key-controlled — the instrument pauses after each step until START is pressed (the `KEY` option of STEP HOLD, Operation Manual §4.2.1).
`SYST:GFI?` `SYST:GFI <ON/OFF> or <1/0>`	Ground-current detection (GFI) on/off. Example: `SYST:GFI_ON` or `SYST:GFI:1`.
`SYST:FAIL?` `SYST:FAIL <STOP/CONT/PAUS>` or `<0/1/2>`	Behaviour on a failed step. `<data>`: character, `STOP` (0), `CONT` (1) or `PAUS` (2). Example: `SYST:FAIL_STOP` (or `SYST:FAIL_0`) sets FAIL mode to STOP; the query returns the current mode, e.g. `STOP`.
`SYST:DELAy?` `SYST:DELAy <time>`	Start delay (time between pressing START and the first test item). Syntax as `SYST:PASS`.
`SYST:OFFSet?` `SYST:OFFSet <ON/OFF/GET> or <1/0/G>`	Base-current clearing. `<data>`: character, 0 (OFF), 1 (ON), GET (sample and store the current zero base). Example (direct sampling): `SYST:OFFSet_GET`.
`SYST:CTRL?` `SYST:CTRL <STEP/FILE>`	Multi-step control/result-output mode. `FILE`: result output only at end of file; `STEP`: result output at the end of each step.

7.1 Worked examples

Goal	Command
Set PASS-hold to 1.0 s	`SYST:PASS_1` · query: `SYST:PASS?` → `1.000`
Enable ground-current detection	`SYST:GFI_ON` · query: `SYST:GFI?` → `1`
Set failure mode to STOP	`SYST:FAIL_STOP` · query: `SYST:FAIL?` → `STOP`
Enable base clearing / sample now	`SYST:OFFSet_ON` then `SYST:OFFSet_GET` · query: `SYST:OFFSet?` → `1`

WARNING

`SYST:OFFSet GET` initiates a brief high-voltage test on the currently configured test conditions to sample and store the zero base. Do not connect the device under test, and confirm the test loop is safely configured, before sending this command.

SECTION 8

Other Commands & FETCh Data Format

8.1 *IDN? — instrument identification

Command	Details
`*IDN?`	Query the instrument model and version. Returns `<manufacturer>,<model>,<firmware><NL^END>`. `<manufacturer>`: `Tonghui`; `<model>`: e.g. `TH9010`; `<firmware>`: e.g. `Version1.0.0`. Example: `*IDN?` → `Tonghui,TH9010,Version1.0.0`.

8.2 FETCh — retrieving measurement results

Command	Details
`FETCh:AUTO <ON/OFF> or <1/0>`	Automatic test-data return on/off. When ON, the instrument automatically sends the test results once the test ends, with no separate query needed. Example: `FETCh:AUTO_ON`.
`FETCh?`	Query the current measurement result of the instrument.

Return data format

After the instrument receives `FETCh?` (or with FETCh:AUTO ON, automatically once the test ends), it sends the test results in the following structured format, where (1), (2) and (3) mark the separator types used:

```
Step:test mode:unit,test voltage (V),measured value,sorting result
```

Separator	Meaning
(1) `:`	Between the step/project fields, and between the project and the unit test data
(2) `,`	Between the individual unit test data fields
(3a) `;` (semicolon)	Between the result blocks of different units within one step.
(3b) `;` (semicolon + space)	Between steps.
Terminator	NL (0x0A), sent once at the very end of the whole message. The message is a single line: no line break is inserted between steps.

Measured value field (third field of each unit block), by test mode:

Test mode	Measured value	Unit
AC, DC	Test current	mA
IR	Insulation resistance	MΩ

All data values are integers or floating-point numbers; the unit is not transmitted. All characters are ASCII.

Worked example

With UNIT 1 and UNIT 3 switched on, and a file of STEP 1 = AC 1000 V (both units PASS, 1.000 mA) and STEP 2 = IR 500 V (both units PASS, 100.000 MΩ), the returned data is one message, shown here wrapped onto two lines for readability (`_` = space character):

```
STEP1:AC:1,1000,1.000,PASS;3,1000,1.000,PASS;_
STEP2:IR:1,500,100.000,PASS;3,500,100.000,PASS(NL)
```

Contact, support & related documents

This command reference is the companion to the *TH9010 Series Operation Manual* (front-panel operation, test-parameter setup, scanning-module and HANDLER/SIGNAL interface) and the *TH9010 Series Datasheet* (specifications). For questions about any command's exact behaviour, or to report a discrepancy against your instrument's firmware, contact Techmize using the details below.

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