CMD

SCPI / MODBUS COMMAND REFERENCE

TH2516 Series

DC Low-Resistance Meter — TH2516 / TH2516A / TH2516B. Companion document to the TH2516 Series Operation Manual. Covers the full SCPI command set, the MODBUS register map, protocol framing, CRC16 calculation, and communication debug procedures.

Techmize Electronic GmbH · Ismaning, Germany
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TH2516 Series Command Reference

SCPI & MODBUS command sets — TH2516 / TH2516A / TH2516B

This document is the companion command reference to the *TH2516 Series Operation Manual*. It lists the complete SCPI command set and the complete MODBUS holding-register map for the TH2516 series. For instrument setup, the physical remote interfaces (RS232C, USBTMC, USBVCOM) and general operation, see the Operation Manual, Chapter 7.

Commands marked *(TH2516 only)* are not available on TH2516A or TH2516B, which do not have the temperature-measurement or TC/Δt functions.

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SECTION 1

SCPI Command Set

All SCPI commands are case-insensitive ASCII strings terminated with LF (0x0A). Maximum command length 2 KB. See the Operation Manual §7.1 for the RS232C/USBTMC/USBVCOM physical setup.

1.1 DISP — display page & status

Command	Parameters	Description
`DISP:PAGE <page>`	MEAS, COMP, BIN, MSET, BSET, TSET[1], STAT, SYST, FLIS	Set the active display page (Measurement/Compare/BIN display, Measurement/BIN/TCΔt/System setup, Statistics display, internal file list).
`DISP:PAGE?`	—	Query the active page. Returns one of the strings above.
`DISP:STAT ON|OFF`	ON / OFF	Show/hide the measurement result on the Measurement/Compare/BIN Display page.
`DISP:STAT?`	—	Query display state. Returns 0 (OFF) or 1 (ON).

1. TSET (TC/Δt Setup) is not available on TH2516A/TH2516B.

1.2 FUNC — measurement parameter & function

Command	Parameters	Description
`FUNC:IMP <mode>`	R, RT[1], T[1], LPR[2], LPRT[1]	Set the Measurement Setup parameter mode.
`FUNC:IMP?`	—	Query parameter mode. Returns R / RT / T / LPR / LPRT.
`FUNC:IMP:RES:RANG <value>`	0–2E+6 Ω	Set a fixed R/R-T range. Available ranges depend on the model (Operation Manual §6.2). *Example: FUNC:IMP:RES:RANG 123 sets the range to 200 Ω.*
`FUNC:IMP:RES:RANG?`	—	Query R/R-T range. Returns a scientific-notation value from the model's fixed range list (Operation Manual §6.2).
`FUNC:IMP:RES:RANG:AUTO ON|OFF`	ON = AUTO, OFF = HOLD	Set R/R-T range mode.
`FUNC:IMP:RES:RANG:AUTO?`	—	Returns 1 (AUTO) or 0 (HOLD).
`FUNC:IMP:LPR:RANG <value>`	0–2000 Ω	Set a fixed LPR/LPR-T range. *Example: FUNC:IMP:LPR:RANG 15 sets 20 Ω.*
`FUNC:IMP:LPR:RANG?`	—	Query LPR/LPR-T range: 2000.00E−3 / 20.0000E+0 / 200.000E+0 / 2000.00E+0.
`FUNC:IMP:LPR:RANG:AUTO ON|OFF`	ON = AUTO, OFF = HOLD	Set LPR/LPR-T range mode.
`FUNC:IMP:LPR:RANG:AUTO?`	—	Returns 1 (AUTO) or 0 (HOLD).
`FUNC:ADJ:EXE`	—	Turn ADJ (0 ADJ) ON and execute short-circuit zero correction.
`FUNC:ADJ:STAT?`	—	Query ADJ state. Returns 0 (OFF) or 1 (ON).
`FUNC:ADJ:SUCC?`	—	Query whether the last 0 ADJ succeeded. Returns 0 (failed) or 1 (succeeded).
`FUNC:ADJ:CLEAR`	—	Turn ADJ OFF and clear the stored 0 ADJ baseline.
`FUNC:OVC ON|OFF`	ON / OFF *(TH2516B: not fitted)*	Set offset-voltage compensation.
`FUNC:OVC?`	—	Returns 0 (OFF) or 1 (ON).
`FUNC:NGBEEP <0|1|2>`	0=OFF, 1=LONG, 2=TWO SHORT	Set the NG beep mode.
`FUNC:NGBEEP?`	—	Returns 0/1/2 as above.
`FUNC:GDBEEP <0|1|2>`	0=OFF, 1=LONG, 2=TWO SHORT	Set the GD beep mode.
`FUNC:GDBEEP?`	—	Returns 0/1/2 as above.

`FUNC:BIAS <value>`	−2.2E+6–2.2E+6 Ω	Set the bias (offset) compensation value. *Example: FUNC:BIAS 5e-3 sets 5 mΩ.*
`FUNC:BIAS?`	—	Query the bias compensation value, Ω.

1. RT, T and LPRT are not available on TH2516A/TH2516B. 2. LPR and the FUNC:IMP:LPR commands are not available on TH2516B.

1.3 APER — measurement speed & averaging

Command	Parameters	Description
`APER <speed>`	FAST, MED, SLOW1, SLOW2	Set the measurement speed.
`APER?`	—	Query speed. Returns FAST/MED/SLOW1/SLOW2.
`APER:AVER <value>`	1–255	Set the averaging count. *Example: APER:AVER 10.*
`APER:AVER?`	—	Query averaging count, 1–255.

1.4 TRIG — trigger

Command	Parameters	Description
`TRIG`	—	Trigger one measurement.
`TRIG:SOUR <source>`	INT, MAN, EXT, BUS	Set the trigger source (internal continuous / TRIGGER key / HANDLER external / remote-command bus).
`TRIG:SOUR?`	—	Query trigger source. Returns INT/MAN/EXT/BUS.
`TRIG:DELAY <value>`	0–9.999 s	Set the measurement delay. *Example: TRIG:DELAY 0.01 sets 10 ms.*
`TRIG:DELAY?`	—	Query measurement delay, 0–9.999 s.
`TRIG:DELAY:AUTO ON|OFF`	ON = automatic, OFF = fixed value	Set whether measurement delay is automatic.
`TRIG:DELAY:AUTO?`	—	Returns 1 (automatic) or 0 (fixed value).

1.5 FETC — fetch measurement result

Command	Parameters	Description
`FETC?`	—	Fetch the last measurement result and system status. Returns data only while the instrument is on the Measurement/Compare/BIN/Statistics Display page — see §7 for the full return format.
`FETC:AUTO ON|OFF`	ON / OFF	Enable/disable automatic return of each measurement result. Takes effect at power-on only if <System Setup> FetcAuto is also ON.
`FETC:AUTO?`	—	Returns 1 (automatic) or 0 (not automatic).

1.6 TEMP — TC/Δt Setup *(TH2516 only)*

Command	Parameters	Description
`TEMP:CORR:STAT ON|OFF`	ON = TC, OFF = OFF	Set the TC/Δt parameter to TC.
`TEMP:CORR:STAT?`	—	Returns 0 (OFF) or 1 (TC).
`TEMP:CORR:PAR <t0>,<αt0>`	t0: −10.0–99.9 °C · αt0: −99999–99999 ppm	Set TC reference temperature t0 and coefficient αt0. *Example: TEMP:CORR:PAR 10,3930.*
`TEMP:CORR:PAR?`	—	Query t0, αt0 (floating point).
`TEMP:CON:DELT:STAT ON|OFF`	ON = Δt, OFF = OFF	Set the TC/Δt parameter to Δt.
`TEMP:CON:DELT:STAT?`	—	Returns 0 (OFF) or 1 (Δt).
`TEMP:CON:DELT:PAR <R1>,<t1>,<k>`	R1: 0–110.000E+6 Ω · t1: −10.0–99.9 °C · k: −999.9–999.9 °C	Set Δt reference resistance R1, reference temperature t1, constant k. *Example: TEMP:CON:DELT:PAR 100,20,235.*
`TEMP:CON:DELT:PAR?`	—	Query R1, t1, k (floating point).
`TEMP:SENS <sensor>`	PT, ANAL	Set the temperature sensor type (PT500 or 0–2 V analog input).
`TEMP:SENS?`	—	Returns PT or ANAL.
`TEMP:PAR <V1>,<T1>,<V2>,<T2>`	V1,V2: 0–2 V · T1,T2: −99.9–999.9 °C	Set the analog-input linearization points. *Example: TEMP:PAR 0,0,1,500.*
`TEMP:PAR?`	—	Query V1, T1, V2, T2 (floating point).

1.7 COMP — comparator (Compare Display)

Command	Parameters	Description
`COMP:STAT ON|OFF`	ON / OFF	Enable/disable the comparator.
`COMP:STAT?`	—	Returns 0 (OFF) or 1 (ON).
`COMP:MODE ATOL|PTOL`	ATOL = ABS, PTOL = %	Set the comparator limit mode.
`COMP:MODE?`	—	Returns ATOL or PTOL.
`COMP:UPP <value>`	0–2.2E+6 Ω	Set the upper limit (ABS mode).
`COMP:UPP?`	—	Query upper limit, 0–2.2E+6 Ω.
`COMP:LOW <value>`	0–2.2E+6 Ω	Set the lower limit (ABS mode).
`COMP:LOW?`	—	Query lower limit, 0–2.2E+6 Ω.
`COMP:REF <value>`	0–2.2E+6 Ω	Set the nominal value (% mode).
`COMP:REF?`	—	Query nominal value, 0–2.2E+6 Ω.
`COMP:PERC <value>`	0–100 %	Set %(upper) — Default/POSI mode upper tolerance.
`COMP:PERC?`	—	Query %(upper), 0–100.
`COMP:PERCLO <value>`	0–100 %	Set %(lower) tolerance.
`COMP:PERCLO?`	—	Query %(lower), 0–100.
`COMP:RES?`	—	Query the comparator result: HL (above upper), IN (pass), LO (below lower), OFF (comparator off), ERR (measurement error).
`COMP:COUN:STAT ON|OFF`	ON / OFF	Enable/disable the pass/fail counters.
`COMP:COUN:STAT?`	—	Returns 0 (OFF) or 1 (ON).
`COMP:COUN:CLEAR`	—	Clear the comparator counters.

1.8 BIN — multi-bin sorting

Command	Parameters	Description
`BIN:STAT ON|OFF`	ON / OFF	Enable/disable BIN sorting.
`BIN:STAT?`	—	Returns 0 (OFF) or 1 (ON).
`BIN:MODE ATOL|PTOL`	ATOL = ABS, PTOL = %	Set the BIN limit mode.
`BIN:MODE?`	—	Returns ATOL or PTOL.
`BIN:COLOR:NG <color>`	OFF, GRAY, RED, GREEN	Set the NG-result indicator colour.
`BIN:COLOR:NG?`	—	Returns OFF/GRAY/RED/GREEN.
`BIN:COLOR:GD <color>`	OFF, GRAY, RED, GREEN	Set the GD-result indicator colour.
`BIN:COLOR:GD?`	—	Returns OFF/GRAY/RED/GREEN.
`BIN:UPP <bin>,<value>`	bin: 1–3 · value: Ω	Set BIN <bin>'s upper limit. *Example: BIN:UPP 1,1000.*
`BIN:UPP? <bin>`	bin: 1–3	Query BIN <bin>'s upper limit, 0–2.2E+6 Ω (+9.90000E+37 if not set).
`BIN:LOW <bin>,<value>`	bin: 1–3 · value: Ω	Set BIN <bin>'s lower limit. *Example: BIN:LOW 1,500.*
`BIN:LOW? <bin>`	bin: 1–3	Query BIN <bin>'s lower limit, 0–2.2E+6 Ω (+9.90000E+37 if not set).
`BIN:REF <bin>,<value>`	bin: 1–3 · value: Ω	Set BIN <bin>'s nominal value. *Example: BIN:REF 1,1000.*
`BIN:REF? <bin>`	bin: 1–3	Query BIN <bin>'s nominal value, 0–2.2E+6 Ω.
`BIN:PERC <bin>,<value>`	bin: 1–3 · value: 0–99.999 %	Set BIN <bin>'s %(upper). *Example: BIN:PERC 1,10.*
`BIN:PERC? <bin>`	bin: 1–3	Query BIN <bin>'s %(upper), 0–99.999.
`BIN:PERCLO <bin>,<value>`	bin: 1–3 · value: 0–99.999 %	Set BIN <bin>'s %(lower). *Example: BIN:PERCLO 1,10.*
`BIN:PERCLO? <bin>`	bin: 1–3	Query BIN <bin>'s %(lower), 0–99.999.
`BIN:ENAB <mask>`	0–7 (bitmask: bit0=BIN1, bit1=BIN2, bit2=BIN3)	Enable/disable individual bins. *Example: BIN:ENAB 6 enables BIN2 and BIN3 (binary 110).*
`BIN:ENAB?`	—	Query bin-enable mask, 0–7.
`BIN:RES?`	—	Query the BIN sort result, 0–7 (bitmask: bit set = that bin's result is GD; clear = NG or that bin is OFF).

1.9 STAT — statistics (Statistics Display)

Command	Parameters	Description
`STAT ON|OFF`	ON / OFF	Enable/disable statistics accumulation.
`STAT?`	—	Returns 0 (OFF) or 1 (ON).
`STAT:MODE ATOL|PTOL`	ATOL = ABS, PTOL = %	Set the in/out-of-tolerance limit mode. *Ignored while statistics is ON.*
`STAT:MODE?`	—	Returns ATOL or PTOL.
`STAT:UPP <value>`	0–2.2E+6 Ω	Set the upper limit. Must be ≥ lower limit; ignored while statistics is ON.
`STAT:UPP?`	—	Query upper limit (+9.90000E+37 if not set).
`STAT:LOW <value>`	0–2.2E+6 Ω	Set the lower limit. Must be ≤ upper limit; ignored while statistics is ON.
`STAT:LOW?`	—	Query lower limit (+9.90000E+37 if not set).
`STAT:REF <value>`	0–2.2E+6 Ω	Set the nominal value. Ignored while statistics is ON.
`STAT:REF?`	—	Query nominal value (+9.90000E+37 if not set).
`STAT:PERC <value>`	0–99.999 %	Set the % tolerance band around nominal. Ignored while statistics is ON.
`STAT:PERC?`	—	Query % tolerance (+9.90000E+37 if not set).
`STAT:CLEAR`	—	Clear accumulated statistics. Ignored while statistics is ON.
`STAT:NUMB?`	—	Query num (total count) and valn (valid count), integers.
`STAT:MEAN?`	—	Query $\bar{X}$ (mean), floating point. Returns +9.90000E+37 if valn < 1.
`STAT:MAX?`	—	Query Max and its sample index.
`STAT:MIN?`	—	Query Min and its sample index.
`STAT:COUN?`	—	Query Hi, Lo, In and error counts, integers.
`STAT:DEV?`	—	Query σ (standard deviation), floating point.
`STAT:VAR?`	—	Query s (sample variance), floating point.
`STAT:CP?`	—	Query Cp and Cpk, floating point.

1.10 SYST — system setup

Command	Parameters	Description
`SYST:BEEP:STAT ON|OFF`	ON / OFF	Set the touch-tone (key beep).
`SYST:BEEP:STAT?`	—	Returns 0 (OFF) or 1 (ON).
`SYST:LFR <50|60>`	50, 60	Set the AC line frequency (Hz).
`SYST:LFR?`	—	Returns 0 (50 Hz) or 1 (60 Hz).
`SYST:SAVE <slot>,<name>`	slot: 1–30 · name: ≤8 chars, no extension	Save the current settings to internal file <slot>. *Example: SYST:SAVE 2,abc.*
`SYST:LOAD <slot>`	slot: 1–30	Load internal file <slot> (must already contain a saved file; ignored otherwise).
`SYST:EXTVCC INT|EXT`	INT / EXT	Set the HANDLER power source (internal/external).
`SYST:EXTVCC?`	—	Returns INT or EXT.
`SYST:RESET`	—	Trigger the System Setup page's system reset.

1.11 Common commands

Command	Description
*RST	Reset the instrument to factory default settings.
*TRG	Trigger one measurement and return the result; effective when <Measurement Setup> trigger source = BUS.
*IDN?	Query the instrument model.

SECTION 2

SCPI Communication Debug Procedure

2.1 Instrument setup

On the instrument: set Bus Mode to RS232C, Baud Rate to 9600, and (under <System Setup> Tools) CommMode to SCPI.

2.2 Terminal software

Any standard serial terminal can be used. Configure: the COM port matching the instrument's connection, the baud rate matching the instrument's setting, no parity, 8 data bits, 1 stop bit, and line-ending/"send new line" mode enabled (a command sent without a line ending will not get a response).

2.3 Connection test

1. Connect the instrument to the PC with a null-modem (crossover) RS232 cable.
2. Open the terminal, select the correct COM port, and set the baud rate to match the instrument.
3. Send `*IDN?` with the line ending enabled.
4. A response such as `Tonghui,TH2516,Version:2.4.7` confirms the link is working.

> **NOTE**
> If there is no response, check: that pins 2 and 3 of the serial cable are crossed (TXD ↔ RXD) — this applies to a USB-to-serial adapter cable too; and that the baud rate, COM port and CommMode (SCPI) settings match the instrument.

2.4 Fetching a measurement result

Mode	Procedure
Manual	Set <Measurement Setup> trigger to BUS. Send `TRIG`, then `FETC?` (allow time between the two for the measurement to complete). Repeat for each new reading. Keep the instrument on the Measurement Display page while following this procedure.
Semi-automatic (recommended)	Set trigger to BUS. Set <System Setup> Tools → FetcAuto to ON. Send `TRIG` for each reading — the result returns automatically. Keep the instrument on the Measurement Display page while following this procedure.
Fully automatic	Set trigger to INT. Set FetcAuto to ON. The instrument sends the result automatically after every measurement, with no command needed (including immediately after power-on, since FetcAuto is a persistent setting). Keep the instrument on the Measurement Display page while following this procedure.

See §7 for the exact data-return format.

SECTION 3

MODBUS Protocol Framing

The TH2516 series MODBUS implementation uses a fixed-length holding-register frame with function code `0x10` (write, preset multiple registers) and `0x03` (read, read holding registers). It is carried over RS232C or USBVCOM (not RS485 — see Operation Manual §7.4) when <System Setup> Tools → CommMode is set to MODBUS.

3.1 Write frame (function 0x10)

Request: `[addr][0x10][reg-hi][reg-lo][reg-count-hi][reg-count-lo][byte-count][data 1..n][CRC-lo][CRC-hi]`

Response: `[addr][func][reg-hi][reg-lo][reg-count-hi][reg-count-lo][CRC-lo][CRC-hi]`

Field	Meaning
Send address	The instrument's bus address, set under <System Setup> → Bus Address. Range 1–31 (0x01–0x1F).
Function code	`0x10` for a write.
Register address (hi/lo)	The register's address in the instrument's internal map (§4).
Register count (hi/lo)	Number of 16-bit registers used by this value: 1 for a 2-byte (16-bit integer) value, 2 for a 4-byte (single float) value, 4 for an 8-byte (two floats) value.
Byte count	Total data bytes written — always register count × 2.
Data bytes 1..n	The value(s) to write, most-significant byte first. A 2-byte value is a 16-bit integer; a 4-byte value is an IEEE-754 single-precision float; an 8-byte value is two consecutive floats. *Example: decimal 25.16 = hex 41 C9 47 AE (byte 1 = 0x41 … byte 4 = 0xAE).*
CRC (lo/hi)	CRC16 checksum of the preceding bytes — see §5.

3.2 Read frame (function 0x03)

Request: `[addr][0x03][reg-hi][reg-lo][reg-count-hi][reg-count-lo][CRC-lo][CRC-hi]`

Response: `[addr][func][byte-count][data 1..n][CRC-lo][CRC-hi]`

Fields follow the same meanings as the write frame; the byte-count and data fields describe the returned value rather than a value to write. A returned 4-byte field is a single-precision float with byte 1 most significant; a returned 8-byte field is two consecutive floats.

SECTION 4

MODBUS Register Map

Each register corresponds one-to-one to an SCPI command in §1; the parameter ranges, units and enumerations there apply equally here. Data width: "2B" = one 16-bit register (integer), "4B" = two registers (one float), "8B/16B" = four/eight registers (two or four floats).

4.1 Common & display registers

Addr	Function	Width	Equivalent SCPI
0x0001	Reset instrument (write-only)	2B	*RST
0x0002	Trigger & auto-return result (read, semi-auto workflow)	8B	TRIG + FETC?
0x0003	Instrument model	—	*IDN?
0x0004	Display page	2B	DISP:PAGE
0x0005	Measurement-result display ON/OFF	2B	DISP:STAT

4.2 Measurement parameter & range registers

Addr	Function	Width	Equivalent SCPI
0x0006	Parameter (R/R-T/T/LPR/LPR-T)	2B	FUNC:IMP
0x0007	R range	4B	FUNC:IMP:RES:RANG
0x0008	R range AUTO/HOLD	2B	FUNC:IMP:RES:RANG:AUTO
0x0009	LPR range *(not on TH2516B)*	4B	FUNC:IMP:LPR:RANG
0x000A	LPR range AUTO/HOLD *(not on TH2516B)*	2B	FUNC:IMP:LPR:RANG:AUTO
0x000B	0 ADJ execute/state	2B	FUNC:ADJ:EXE / :STAT? / :SUCC? / :CLEAR
0x000C	OVC ON/OFF *(TH2516B: not fitted)*	2B	FUNC:OVC
0x001D	GD beep mode	2B	FUNC:GDBEEP
0x0027	NG beep mode	2B	FUNC:NGBEEP
0x0052	Bias compensation	4B	FUNC:BIAS
0x000D	Measurement speed	2B	APER
0x000E	Average count (1–255)	2B	APER:AVER

4.3 Trigger & fetch registers

Addr	Function	Width	Equivalent SCPI
0x000F	Trigger (non-automatic workflow)	2B	TRIG
0x0010	Trigger source	2B	TRIG:SOUR
0x0011	Measurement delay	4B	TRIG:DELAY
0x0012	Measurement delay AUTO/fixed	2B	TRIG:DELAY:AUTO
0x0013	Read single-parameter measurement value	8B	FETC? (single-param)
0x0014	Read dual-parameter measurement value	16B	FETC? (dual-param)
0x0015	Automatic-return result (fully automatic workflow)	—	FETC:AUTO

4.4 TC/Δt registers *(TH2516 only)*

Addr	Function	Width	Equivalent SCPI
0x0016	TC ON/OFF	2B	TEMP:CORR:STAT
0x0017	t0, αt0	8B	TEMP:CORR:PAR
0x0018	Δt ON/OFF	2B	TEMP:CON:DELT:STAT
0x0019	R1, t1, k	12B	TEMP:CON:DELT:PAR
0x001A	T.SENS (0=Pt, 1=AnLG_In)	2B	TEMP:SENS
0x001B	V1, T1, V2, T2	16B	TEMP:PAR

4.5 Comparator registers

Addr	Function	Width	Equivalent SCPI
0x001C	Comparator ON/OFF	2B	COMP:STAT
0x001E	Comparator mode (ABS/%)	2B	COMP:MODE
0x001F	Upper limit	4B	COMP:UPP
0x0020	Lower limit	4B	COMP:LOW
0x0021	Nominal value	4B	COMP:REF
0x0022	%(upper)	4B	COMP:PERC
0x004F	%(lower)	4B	COMP:PERCLO
0x0023	Comparator result	2B	COMP:RES?
0x0024	Pass/fail counters	—	COMP:COUN:STAT
0x0025	Clear counters (write-only)	2B	COMP:COUN:CLEAR

4.6 BIN registers

Addr	Function	Width	Equivalent SCPI
0x0026	BIN overall ON/OFF	2B	BIN:STAT
0x0028	BIN mode (ABS/%)	2B	BIN:MODE
0x0029	NG colour	2B	BIN:COLOR:NG
0x002A	GD colour	2B	BIN:COLOR:GD
0x002B / 0x002C / 0x002D	BIN1 / BIN2 / BIN3 upper limit	4B each	BIN:UPP
0x002E / 0x002F / 0x0030	BIN1 / BIN2 / BIN3 lower limit	4B each	BIN:LOW
0x0031 / 0x0032 / 0x0033	BIN1 / BIN2 / BIN3 nominal value	4B each	BIN:REF
0x0034 / 0x0035 / 0x0036	BIN1 / BIN2 / BIN3 %(upper)	4B each	BIN:PERC
0x004C / 0x004D / 0x004E	BIN1 / BIN2 / BIN3 %(lower)	4B each	BIN:PERCLO
0x0037	Per-bin enable mask	2B	BIN:ENAB
0x0038	BIN sort result	2B	BIN:RES?

4.7 Statistics registers

Addr	Function	Width	Equivalent SCPI
0x0039	Statistics ON/OFF	2B	STAT
0x003A	Limit mode (ABS/%)	2B	STAT:MODE
0x003B	Upper limit	4B	STAT:UPP
0x003C	Lower limit	4B	STAT:LOW
0x003D	Nominal value	4B	STAT:REF
0x003E	% tolerance	4B	STAT:PERC
0x003F	Clear statistics (write-only)	2B	STAT:CLEAR
0x0040	num, valn (count)	4B	STAT:NUMB?
0x0041	$\bar{X}$ (mean)	4B	STAT:MEAN?
0x0042	Max, MaxIndex	8B	STAT:MAX?
0x0043	Min, MinIndex	8B	STAT:MIN?
0x0044	Hi, Lo, In, Err counts	—	STAT:COUN?
0x0045	σ (standard deviation)	4B	STAT:DEV?
0x0046	s (sample variance)	4B	STAT:VAR?
0x0047	Cp, Cpk	8B	STAT:CP?

4.8 System registers

Addr	Function	Width	Equivalent SCPI
0x0048	Touch tone ON/OFF	2B	SYST:BEEP:STAT
0x0049	AC line frequency	2B	SYST:LFR
0x004A	HANDLER power (internal/external)	2B	SYST:EXTVCC
0x004B	System reset (write-only)	2B	SYST:RESET
0x0051	Load internal file (slot 1–30)	2B	SYST:LOAD

Register 0x0051 (load internal file) is not available on all firmware versions. Contact Techmize to confirm availability on a specific unit.

SECTION 5

CRC16 Calculation

Every MODBUS frame ends with a 2-byte CRC16 checksum (low byte first, then high byte) covering every preceding byte of the frame, calculated with the standard Modbus CRC16 lookup-table method shown below.

```
U16 CalcCrc16Code(char *pbuf, U16 size)
{
  U8 crc_high = 0xFF;
  U8 crc_low  = 0xFF;
  U8 crc_index;
  U16 crc_code;

  while (size--) {
    crc_index = crc_low ^ *pbuf++;
    crc_low  = crc_high ^ Crc16HighTable[crc_index];
    crc_high = Crc16LowTable[crc_index];
  }
  crc_code = ((crc_high << 8) | crc_low);
  return (crc_code);
}
```

Lookup tables (each 256 bytes, indexed by `crc_index`):

```
Crc16HighTable[] = {
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40 };

Crc16LowTable[] = {
0x00,0xC0,0xC1,0x01,0xC3,0x03,0x02,0xC2,0xC6,0x06,0x07,0xC7,0x05,0xC5,0xC4,0x04,
0xCC,0x0C,0x0D,0xCD,0x0F,0xCF,0xCE,0x0E,0x0A,0xCA,0xCB,0x0B,0xC9,0x09,0x08,0xC8,
0xD8,0x18,0x19,0xD9,0x1B,0xDB,0xDA,0x1A,0x1E,0xDE,0xDF,0x1F,0xDD,0x1D,0x1C,0xDC,
0x14,0xD4,0xD5,0x15,0xD7,0x17,0x16,0xD6,0xD2,0x12,0x13,0xD3,0x11,0xD1,0xD0,0x10,
0xF0,0x30,0x31,0xF1,0x33,0xF3,0xF2,0x32,0x36,0xF6,0xF7,0x37,0xF5,0x35,0x34,0xF4,
0x3C,0xFC,0xFD,0x3D,0xFF,0x3F,0x3E,0xFE,0xFA,0x3A,0x3B,0xFB,0x39,0xF9,0xF8,0x38,
0x28,0xE8,0xE9,0x29,0xEB,0x2B,0x2A,0xEA,0xEE,0x2E,0x2F,0xEF,0x2D,0xED,0xEC,0x2C,
0xE4,0x24,0x25,0xE5,0x27,0xE7,0xE6,0x26,0x22,0xE2,0xE3,0x23,0xE1,0x21,0x20,0xE0,
0xA0,0x60,0x61,0xA1,0x63,0xA3,0xA2,0x62,0x66,0xA6,0xA7,0x67,0xA5,0x65,0x64,0xA4,
0x6C,0xAC,0xAD,0x6D,0xAF,0x6F,0x6E,0xAE,0xAA,0x6A,0x6B,0xAB,0x69,0xA9,0xA8,0x68,
0x78,0xB8,0xB9,0x79,0xBB,0x7B,0x7A,0xBA,0xBE,0x7E,0x7F,0xBF,0x7D,0xBD,0xBC,0x7C,
0xB4,0x74,0x75,0xB5,0x77,0xB7,0xB6,0x76,0x72,0xB2,0xB3,0x73,0xB1,0x71,0x70,0xB0,
0x50,0x90,0x91,0x51,0x93,0x53,0x52,0x92,0x96,0x56,0x57,0x97,0x55,0x95,0x94,0x54,
0x9C,0x5C,0x5D,0x9D,0x5F,0x9F,0x9E,0x5E,0x5A,0x9A,0x9B,0x5B,0x99,0x59,0x58,0x98,
0x88,0x48,0x49,0x89,0x4B,0x8B,0x8A,0x4A,0x4E,0x8E,0x8F,0x4F,0x8D,0x4D,0x4C,0x8C,
0x44,0x84,0x85,0x45,0x87,0x47,0x46,0x86,0x82,0x42,0x43,0x83,0x41,0x81,0x80,0x40 };
```

SECTION 6

MODBUS Communication Debug Procedure

> **NOTE**
> Verify RS232C wiring and settings with the SCPI procedure (§2) first, then switch CommMode to MODBUS.

6.1 Instrument setup

Set <System Setup> Bus Address (example used below: 8) and set Tools → CommMode to MODBUS.

6.2 Connection test

Send (hex): `08 03 00 03 00 01 74 93` — a read of register 0x0003 (instrument model) from bus address 8.

Expected response: `08 03 02 00 00 64 45`. A response confirms the link; no response means the bus address or CommMode setting does not match.

6.3 Fetching a measurement result

Mode	Procedure
Manual	Set trigger to BUS. Write register 0x000F to trigger: `08 10 00 0F 00 01 02 00 00 CC FF` → `08 10 00 0F 00 01 31 53`. Then read register 0x0013 (4 registers) for the result: `08 03 00 13 00 04 B5 55` → `08 03 08 41 C2 C9 3D 00 00 00 00 E1 27`. Repeat both steps for each new reading.
Semi-automatic (recommended)	Set trigger to BUS and FetcAuto ON. Read register 0x0002 (4 registers) — this triggers a measurement and returns the result in one transaction: `08 03 00 02 00 04 E5 50` → `08 03 08 41 20 23 A3 00 00 00 00 9C 3F`. Repeat for each new reading.
Fully automatic	Set trigger to INT and FetcAuto ON. The instrument sends the result automatically after every measurement: `08 03 08 41 20 18 E7 00 00 00 00 68 BB`, with no request needed.

Keep the instrument on the Measurement Display page while following these procedures.

SECTION 7

Measurement Data Return Format

This format applies to both the SCPI `FETC?` command and the MODBUS measurement-result registers (0x0002, 0x0013, 0x0014), whenever the instrument is on the Measurement, Compare, BIN, or Statistics Display page.

7.1 Single-parameter mode (R, T, or LPR)

Format: `<main value>,<status>`

Field	Description
Main value	Floating point. Resistance in Ω (parameter R or LPR) or temperature in ℃ (parameter T). On overflow or measurement error: `+9.900000E+37`.
Status	`−1` = no data in buffer · `0` = normal measurement · `+1` = measurement error.

Example: `+2.434457E+01,+0` *— resistance 24.34457 Ω, measurement normal.*

7.2 Dual-parameter mode (R-T or LPR-T, TH2516 only)

Format: `<main value>,<secondary value>,<status>`

Field	Description
Main value	Resistance, Ω. `+9.900000E+37` on overflow/error.
Secondary value	Temperature, ℃. `+9.900000E+37` on overflow/error.
Status	Same codes as §7.1.

Example: `+2.434709E+01,+9.205499E+01,+0` *— resistance 24.34457 Ω, temperature 92.05499 ℃, measurement normal.*

Related documents

- TH2516 Series Operation Manual (Techmize) — instrument setup, front-panel operation, remote-interface physical setup, HANDLER interface
- TH2516 Series Datasheet (Techmize)

Techmize Electronic GmbH
Office 125–126, Regus
Carl-Zeiss-Ring 15a, 85737 Ismaning, Germany
An international subsidiary of Changzhou Tonghui Electronic Co., Ltd. (China)

Contact
Mobile: +49 171 4981898
Email: dx.han@tonghui.com.cn
Web: en.tonghui.com.cn

Registration
Managing Director: Haohua Zhao
Register Court: Amtsgericht München
HRB 312530 · VAT ID DE463170824