TECHMIZE by TONGHUI

OM

OPERATION MANUAL

TH2516 Series

DC Low-Resistance Meter — TH2516 / TH2516A / TH2516B. Covers front-panel operation, measurement setup and system configuration; see Chapter 7 for the remote-control interfaces and Chapter 8 for the HANDLER interface.

Techmize Electronic GmbH · Ismaning, Germany

Rev. 2026-10

TH2516 Series Operation Manual

DC Low-Resistance Meter — TH2516 / TH2516A / TH2516B

This manual covers the TH2516 series of DC low-resistance meters. **TH2516** is the flagship model with resistance-and-temperature measurement (R-T, LPR-T) and temperature-correction (TC) / temperature-conversion (Δt) functions; **TH2516A** and **TH2516B** are resistance models without temperature measurement or TC/Δt. The low-current (LPR) mode is available on TH2516 and TH2516A only. **TH2516A** has offset-voltage compensation (OVC); **TH2516B** does not.

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The full SCPI/MODBUS command reference is issued as a separate companion document, TH2516 Series SCPI/MODBUS Command Reference, in line with Techmize's standard practice for command sets of this size. Chapter 7 of this manual covers the remote interfaces and command structure only.

CHAPTER 1

Safety & Compliance

1.1 About this manual

This is the original-language (English) edition of the operation manual for the Techmize TH2516 series of DC low-resistance meters, covering models **TH2516**, **TH2516A** and **TH2516B**. Where this manual and the instrument itself appear to disagree, or where a described function is not present on your particular model, contact Techmize or your authorized distributor using the details in §1.10 before relying on the instrument for measurement decisions.

Techmize continually improves the performance, features and construction of its instruments; content, specifications and accessories described here are subject to change without notice. This manual does not necessarily describe every optional accessory or every firmware revision.

1.2 Safety symbols used in this manual

The following symbols and signal words appear in this manual and on the instrument itself:

WARNING — a hazard that, if not avoided, could result in personal injury or death.

CAUTION — a hazard that, if not avoided, could damage the instrument or the device under test, or invalidate a measurement.

NOTE — supplementary information that helps with correct or efficient use, but is not itself a hazard.

Protective ground — this terminal must be connected to protective earth. Also printed next to the instrument's rear-panel ground terminal.

1.3 General safety requirements

The TH2516 series is a **Protection Class I** instrument: protective earthing of the chassis, via the three-wire AC power cord, is essential to safety and must not be defeated.

> **WARNING — ELECTRIC SHOCK**
>
> Always use a supply outlet with a protective earth contact. Never connect the AC supply, or operate the instrument, with the protective ground disconnected or with a two-wire (ungrounded) adapter. Disconnect the power cord before replacing the fuse or opening the case.

The instrument's AC inlet accepts a nominal **90–125 V** or **190–250 V** supply, at **50 Hz or 60 Hz**; power consumption ≤ 30 VA. A voltage-range selector switch next to the rear-panel power inlet must be set to match the actual supply voltage before connecting power. For the EU market, set the switch to the **190–250 V** position.

> **WARNING — VOLTAGE SELECTOR**
>
> Confirm the rear-panel voltage-range selector switch is set correctly for the local supply *before* connecting the power cord. Connecting the instrument to a 230 V supply while the switch is set to the 90–125 V position can damage the instrument.

> **CAUTION — FUSE RATING**
>
> The instrument fuse is a factory-fitted standard part. Replace it only with a fuse of the same rating and type supplied by Techmize/Tonghui.

Environment. Normal operation: 0–40 °C, ≤80% RH, no condensation (reference condition for rated accuracy: 23 °C ±5 °C, ≤80% RH — see §6.3.5 for the temperature-correction factor K outside this range). Storage: −10–50 °C, ≤90% RH, no condensation. Avoid dusty, vibrating, direct-sunlight or corrosive-gas environments. Keep the side ventilation opening clear for accurate, stable operation, and keep test leads away from strong electromagnetic fields.

> **WARNING — TEST TERMINALS**
>
> The instrument's 4-terminal INPUT connector (DRIVE HI/LO, SENSE HI/LO) sources test current into the device under test. Always use the test cable or fixture supplied or specified by Techmize/Tonghui, matching the plug colour and arrow marking to the panel socket — a mismatched connection can cause abnormal measurement results. Disconnect the device under test before changing wiring.

Test fixtures and cables. Use only the test fixture or cable supplied by Techmize/Tonghui, or an equivalent specified by Techmize; a user-made or third-party fixture or cable can produce incorrect measurement results. Keep the fixture, cable and the leads of the device under test clean to ensure good contact.

Warm-up. Allow at least **30 minutes** of warm-up after switch-on before relying on the rated accuracy given in Chapter 6. Do not power-cycle the instrument frequently, as this may cause internal data confusion.

1.4 Electrical safety test data

Dielectric-withstand, insulation-resistance and leakage-current test figures are not published for this series. Contact Techmize/Tonghui engineering if a formal electrical safety test report is required.

1.5 CE marking

The TH2516 series carries the CE mark.

1.6 WEEE — disposal of electrical and electronic equipment



This symbol indicates that the instrument must not be disposed of as unsorted municipal waste at the end of its service life. Within the European Union, return the instrument to Techmize, your distributor, or a designated collection point for electrical and electronic equipment, in accordance with the WEEE Directive (2012/19/EU) and its national transposition in your country. Correct disposal helps prevent potential harm to the environment and human health from uncontrolled waste handling.

1.7 RoHS compliance

The TH2516 series is covered by Techmize's own RoHS (Directive 2011/65/EU, as amended) self-declaration. No independent third-party RoHS certificate is currently available for this series.

1.8 Warranty

Techmize warrants this instrument to be free from defects in material and workmanship for a period of **two (2) years** from the date of delivery to the original purchaser. During the warranty period, Techmize will repair or replace, at its discretion, a product that proves defective, provided it has been used within the specified operating conditions. A warranty card is required to claim warranty service.

This warranty does not cover: damage from misuse, accident, unauthorized modification or repair; consumable/wear items such as the fuse or PT500 temperature sensor; or damage from operation outside the environmental limits given in §1.3. Repair must be carried out by qualified technical personnel; do not replace internal components without authorization. After any repair, the instrument must be recalibrated before further use.

1.9 Limitation of liability

Except as expressly stated in §1.8, Techmize makes no other warranty, express or implied, regarding this instrument or its documentation. Techmize is not liable for indirect, incidental or consequential damages arising from the use of this instrument, to the extent permitted by applicable law. Techmize is not responsible for data loss on a USB storage device used with the instrument — back up USB data before connecting it.

1.10 Manufacturer & EU contact

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Registration

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

CHAPTER 2

Out of the Box

2.1 Unpacking

Inspect the shipping container for damage after unpacking. It is not recommended to power on the instrument if the container shows signs of damage — contact your carrier and your Techmize distributor before proceeding. Check the contents against the packing list below; if anything does not conform, notify Techmize or your distributor promptly.

Item	Qty
TH2516-series DC low-resistance meter (model as ordered)	1
TH26050S 4-terminal test cable	1 set
EU power cable (Schuko, CEE 7/7)	1
PT500 temperature sensor *(TH2516 only — not applicable to TH2516A/TH2516B, which have no temperature-measurement function)*	1
Spare fuse, 2 A	2
This operation manual	1
Certificate of conformity	1
Test report	1
Warranty card	1

Keep the original packaging — it is the recommended way to store or return the instrument. Store the instrument in a dry, well-ventilated room at 5–40 °C and ≤85% RH when not in use for an extended period, away from corrosive gases.

2.2 Connecting the power supply

Item	TH2516 / TH2516A / TH2516B
Supply	90–125 V or 190–250 V (set the rear-panel voltage selector switch to match), 50/60 Hz
Power consumption	≤ 30 VA
Power switch	Front-panel POWER switch, bottom-left of the front panel

Match the L (line), N (neutral) and E (earth) conductors of the supply cable to the instrument's rear-panel power inlet, and confirm reliable grounding before switching on. If mains conditions are noisy, fitting a power-line filter ahead of the instrument is recommended.

> **WARNING**
> Make sure the protective-earth conductor is reliably grounded before connecting the power cable, to prevent electric shock from leakage current. Confirm the voltage-range selector switch next to the power inlet is set correctly before connecting power (§1.3). Disconnect the power cable before replacing the fuse.

2.3 Connecting the device under test

Connect the TH26050S 4-terminal test cable (or an equivalent Techmize/Tonghui-specified fixture) to the front-panel INPUT connector, matching the plug colour and arrow marking to the panel socket. The instrument uses true 4-terminal (Kelvin) connection: **DRIVE HI/LO** source the test current and **SENSE HI/LO** sense the voltage drop across the device under test, eliminating lead and contact-resistance error from the reading.

> **CAUTION**
> A user-made or third-party test fixture or cable can produce incorrect measurement results. Keep the fixture/cable and the device-under-test leads clean for good contact, and keep test leads away from strong electromagnetic fields.

2.4 Starting the instrument for the first time

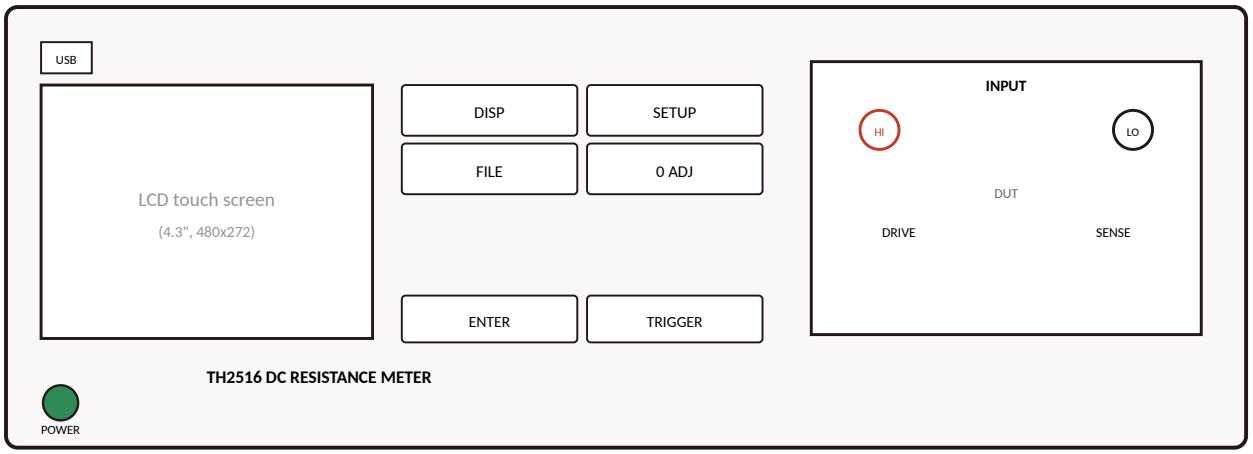
1. Connect the EU power cable to the rear-panel inlet, confirming reliable earth-ground connection and that the voltage selector switch is set correctly (§1.3, §2.2).
2. Press the front-panel **POWER** switch (bottom-left of the front panel).
3. The instrument displays a startup screen showing the Tonghui trademark, model and firmware version.
4. If password protection is enabled, the instrument prompts for the startup password before continuing (factory default: `2516`).
5. The display opens on the default <Measurement Display> page.

Allow at least 30 minutes of warm-up before relying on the rated accuracy (§1.3). For an overview of the front panel, rear panel and screen layout, continue to Chapter 3.

CHAPTER 3

Getting to Know the Instrument

3.1 Front panel



Simplified front-panel layout (schematic, not to scale) — see the legend below for the full item list

1 **USB HOST port** — for USB flash-drive storage and firmware upgrade.

2 **LCD display** — 4.3" 24-bit colour TFT touch screen, 480×272 resolution.

3 **DISP** — opens the <Measurement Display> page (§4.1).

4 **FILE** — opens internal/external file management (§5.2).

5 **SETUP** — opens the <Measurement Setup> page (§4.5).

6 **0 ADJ** — executes the short-circuit zero-correction function (§4.1).

7 **INPUT (4-terminal test port)** — DRIVE HI/LO, SENSE HI/LO; connect the test cable or fixture, matching plug colour and arrow marking to the panel socket.

8 **TRIGGER** — manual trigger; active when trigger source = MAN (§4.5.3).

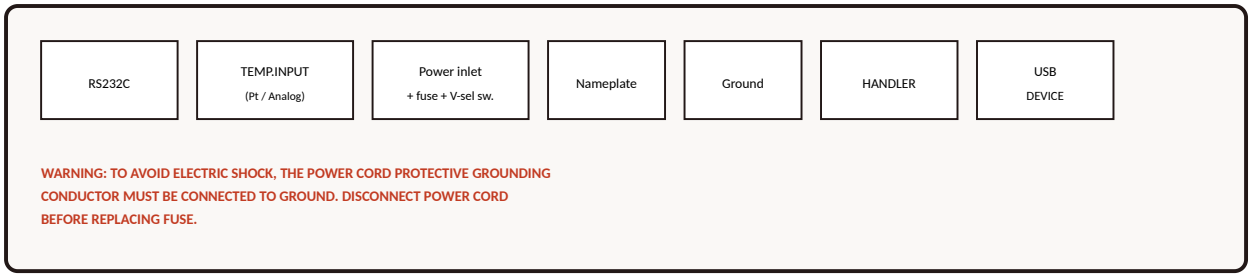
9 **ENTER** — confirms and saves an entry.

10 **Arrow keys** — up/down/left/right, for field navigation and selection.

11 **Trademark & model** — instrument brand and model.

12 **POWER switch.**

3.2 Rear panel



Simplified rear-panel layout (schematic, not to scale) — see the legend below for the full item list

1 **RS232C port** — serial communication with a host PC (Chapter 7).

2 **TEMP.INPUT** — temperature-sensor input, accepting either a Pt (PT500) sensor or an analog voltage input (§4.6.2). *TH2516 only — not fitted/applicable on TH2516A/TH2516B.*

3 **Power inlet, fuse & voltage selector** — AC power inlet, fuse holder and the 90–125 V / 190–250 V voltage-range selector switch (§1.3, §2.2).

4 **Nameplate** — shows the specific instrument model.

5 **Ground terminal** — connected to the instrument's metal chassis, for protective/shielding ground.

6 **HANDLER port** — outputs the comparator/BIN-sorting result and a measurement-complete signal, and accepts an external trigger input, for integration into an automatic test system (Chapter 8).

7 **USB DEVICE port** — PC control of the instrument over USBTMC or USBVCOM (§7.3, §7.4).

3.3 Screen display

The TH2516 series uses a 24-bit colour, 4.3" touch screen at 480×272 resolution. The screen is divided into seven zones:

Zone	Contents
Main menu area	Name of the current page.
File area	File-management shortcuts (file manager, full-screen copy).
Tools area	Quick-access instrument functions for the current page.
Soft-key area	Shows the function menu for the field currently selected by the cursor.
Measurement result area	Displays the measured value(s) — e.g. resistance and/or temperature.
Message area	Status/prompt messages during testing.
Function area	For changing the test mode and test parameters.

3.4 Main keys and basic operation

Key	Opens
DISP	<Measurement Display> · <Compare Display> · <BIN Display> · <Statistics Display> pages, plus (via *More*) <Measurement Setup>, <TC/Δt Setup>, <BIN Setup> and <System Setup> (Chapters 4–5)
SETUP	<Measurement Setup> · <TC/Δt Setup> · <BIN Setup> · <System Setup>, plus (via *More*) the four display pages above
FILE	<File> management: internal file · external file · exit (§5.2)

1. Use DISP / SETUP / FILE and the on-screen soft keys to reach the page you want, or touch the screen directly — the 4.3" display is fully touch-operated.
2. Use the arrow keys to move the cursor to a field (the selected field is highlighted); the corresponding function menu appears in the soft-key area. Press ENTER to select the first soft key, then navigate with the arrow keys and press ENTER again to confirm.
3. For a field requiring a numeric or text entry, press ENTER to open the on-screen keyboard.

> **CAUTION**
> Never use a sharp object or a fingernail on the touch screen — this can damage it. Techmize/Tonghui is not responsible for damage caused this way.

3.5 Starting the instrument

Confirm reliable earth-ground connection and the correct voltage-selector setting, then press POWER (§2.4). The instrument shows a startup screen (trademark, model, firmware version), then opens on the default <Measurement Display> page. If password protection is enabled, enter the startup password when prompted (factory default: `2516`; see §5.1.5). Allow at least 30 minutes of warm-up before relying on rated accuracy (§1.3, Chapter 6).

CHAPTER 4

Basic Operation

This chapter describes the four display pages reached with DISP, and the three setup pages reached with SETUP. TH2516A and TH2516B do not have temperature measurement or the TC/Δt function. Offset-voltage compensation (OVC) is available on TH2516 and TH2516A only.

4.1 <Measurement Display> page

Opened with DISP (default page on start-up). Shows the live measured value(s) in large digits, plus the current test parameters.

Field	Options / range
Parameter	R · R-T · T · LPR · LPR-T (R-T, T and LPR-T available on TH2516 only; LPR on TH2516 and TH2516A only)
Range	Resistance and LPR ranges per model, Chapter 6; AUTO / HOLD / ↑ / ↓
Temperature range (TH2516 only)	PT500 sensor: −99.9–250.0 °C · Analog input: 0–2 V
Speed	FAST · MED · SLOW1 · SLOW2
TC/Δt (TH2516 only)	OFF · TC · Δt (configured on the <TC/Δt Setup> page, §4.6)
Resolution	Resistance: 5-digit floating decimal · Temperature: 4-digit, 1 decimal place

The **File** area gives access to file management and a **Save Data** toggle: when set to ON, measurement results are written continuously to a *.CSV file on a connected USB drive; set to OFF to stop logging (§5.2.4).

The **Tools** area provides: Display ON/OFF; **0 ADJ** short-circuit zero correction (short the test leads using the correct wiring — red S+ to black S−, white D+ to blue D− — then press 0 ADJ or the touch key); **ADJ** ON/OFF (applies/bypasses the stored zero-correction value); and **OVC** ON/OFF, offset-voltage compensation, which eliminates thermal-EMF error (*not available on TH2516B*).

> NOTE
>
> 0 ADJ removes residual offset from the test leads/fixture at the present range. Re-zero whenever the test cable, fixture or range is changed, for best accuracy.

4.2 <Compare Display> page

Shows the measured value together with the comparator result (**HI** / **IN** / **LO**) against the limits configured on the <Measurement Setup> page (§4.5). When the **Count** tool is set to ON, the page also displays running totals: **TOT** (total tested), **IN**, **HI**, **LO**. The File and Tools areas behave as on the <Measurement Display> page.

4.3 <BIN Display> page

Shows the sorting result against the BIN limits configured on the <BIN Setup> page (§4.7): a colour-coded **GD** (good) or **NG** (no good) indication together with the BIN number. The File and Tools areas behave as above.

4.4 <Statistics Display> page

Accumulates basic statistical-process-control figures over a run of measurements: mean, standard deviation, sample variance and process-capability indices.

Symbol	Meaning
$\bar{X}$	Mean of the measured values in the current run
σ	Standard deviation (population)
s	Sample variance
Cp	Process capability index
Cpk	Process capability index, adjusted for off-centre mean

Cp / Cpk result	Interpretation
Cp > 1.33 and Cpk > 1.33	Ideal process capability
1.00 ≤ Cp ≤ 1.33 and Cpk > 1.00	Qualified process capability
Cp < 1.00 or Cpk < 1.00	Insufficient process capability

The page also shows the current edge mode and run status. Use the Tools area to clear accumulated statistics and start a new run.

4.5 <Measurement Setup> page

Opened with [SETUP]. Configures how a measurement is taken and judged.

Field	Options / range
Parameter	Same options as §4.1
Range	AUTO · HOLD · ↑ · ↓
Trigger	INT (continuous) · MAN ([TRIGGER] key) · EXT (HANDLER input) · BUS (remote command)
Measurement delay	AUTO (fixed internal default) · MANUAL, 0–9999 ms user-set
Average	1–255, programmable
Speed	FAST · MED · SLOW1 · SLOW2 (timing, §6.1.6)
0 ADJ	ON · OFF
Base-value save	ON · OFF — when ON, the 0 ADJ baseline is retained across a power cycle
Base-value threshold ratio	1–100 — the measured base value must fall within (current range × ratio) for the zero-correction to succeed; otherwise the instrument reports a zero-clear failure
GD beep / NG beep	OFF · LONG · TWO SHORT
OVC	ON · OFF *(not available on TH2516B)*
HDL interval time	0–2000 ms (0 = off) — HANDLER timing, §8.3
HDL hold time	0–2000 ms (0 = off) — HANDLER timing, §8.3
Over-range judgment	ON · OFF — controls whether an over-range reading is logged to USB / returned to the host
Lock mode	AUTO (a remote command locks the panel; any physical key unlocks it) · MANU (press the arrow keys in sequence to lock; press [ENTER] three times to unlock)
HDL polarity	LOW · HIGH

4.5.1 Upper/lower-limit mode

Two ways to express the comparator's percentage limits around a nominal value:

Mode	Description
Default (POSI)	Both %(upper) and %(lower) must be positive. In-tolerance range = nominal ± (nominal × %). *Example: nominal 100 Ω, upper 10%, lower 10% → 90–110 Ω.*
POSI/NEGA	%(lower) may be entered as a negative value. In-tolerance range = (nominal + nominal×upper%) to (nominal + nominal×lower%). *The same example above (upper 10%, lower −10%) again gives 90–110 Ω — the two modes differ only in how the lower limit is expressed, not in the resulting range.*

4.6 <TC/Δt Setup> page *(TH2516 only)*

> **NOTE**
> This page, and the TC/Δt function itself, is available on TH2516 only. TH2516A and TH2516B do not measure temperature and do not offer this page.

Reached from <Measurement Setup> → *More*, or directly via [SETUP] → *More*. Configures the temperature sensor and, optionally, a resistance-to-temperature correction or conversion calculation.

4.6.1 Temperature sensor (T.SENS)

Setting	Description
Pt	PT500 resistance-temperature sensor, connected to the rear-panel TEMP.INPUT port
AnLG_In	0–2 V analog voltage input, linearized against two user-defined calibration points (V1, T1) and (V2, T2), V1/V2 in 0–2 V, T1/T2 in −99.9–999.9 °C

$$T = [(T2-T1) / (V2-V1)] \times V_{in} + [(T1 \cdot V2 - T2 \cdot V1) / (V2-V1)]$$

4.6.2 TC — Temperature Correction

Converts a resistance measured at the present ambient temperature to the equivalent resistance at a chosen reference temperature t0, using the standard temperature coefficient of resistance.

$$R_{t0} = R_t / [1 + \alpha_{t0} \times (t - t0)]$$

t0: reference temperature, −10.0–99.9 °C. α_{t0}: temperature coefficient of resistance at t0, −99999–99999 ppm.

4.6.3 Δt — Temperature Conversion

Converts a change in resistance into an equivalent temperature difference, for example to estimate winding temperature rise from a resistance measurement.

$$\Delta t = (R2/R1) \times (k + t1) - (k + t_a)$$

R1: reference resistance, 0–110.000E+6 Ω. t1: temperature at which R1 was measured, −10.0–99.9 °C. k: a constant derived from the material's temperature coefficient ($k = 1/\alpha_{t0} - t0$, with α_{t0} in units of 10^{-6}/°C, i.e. ppm × 10^{-6}); range −999.9–999.9 °C. *Worked example: for α_{t0} = 3930 ppm at t0 = 20 °C, k ≈ 234.5.*

> **NOTE**
> This manual also lists standard conductivity and temperature-coefficient reference data for common conductor materials (annealed/hard-drawn copper, cadmium copper, silver copper, chrome copper, corrosion-resistant alloy, soft/hard-drawn aluminum, aluminum alloy) and a copper-wire conductivity-by-diameter table, for use when deriving k or α_{t0} for a specific winding material. Contact Techmize if you need this reference data for a material not already in your own engineering records.

4.7 <BIN Setup> page

Configures multi-bin sorting (up to 3 bins) against a nominal value and tolerance.

Field	Options / range
BIN mode	ABS (absolute limits) · % (percentage limits around nominal)
BIN clear	Resets accumulated BIN counts
Sorting mode	DEFAULT · MODE 1
HANDLER3 pin function	FAIL mode · PASS mode — determines how HANDLER pin 3 (and the related comparator/BIN pins) reports a 3-bin result, see §8.1
BIN 1 / 2 / 3 state	ON · OFF, each independently
Upper limit / Lower limit	Per-bin absolute limits (ABS mode)
%(upper) / %(lower)	Per-bin percentage limits (% mode); same Default/POSI-NEGA interpretation as §4.5.1

The Tools area on this page provides the BIN Mode, BIN Clear, Sorting Mode and HANDLER3 function controls listed above.

4.8 Correct measurement technique

4.8.1 4-terminal (Kelvin) connection

Always connect the device under test using all four terminals — DRIVE HI, DRIVE LO, SENSE HI, SENSE LO. The DRIVE pair sources the test current; the SENSE pair measures the resulting voltage drop directly at the device under test, so that lead resistance and contact resistance are excluded from the measurement. A 2-terminal connection will include lead/contact resistance in the result and should not be used for low-resistance measurement.

4.8.2 Zero correction (0 ADJ)

Before measuring, short-circuit the test leads correctly — red S+ to black S−, white D+ to blue D− — and perform 0 ADJ (§4.1) with 0 ADJ set to ON. Re-zero after changing the test cable, fixture, or measurement range, and whenever ambient temperature changes significantly.

4.8.3 Offset-voltage compensation (OVC)

Thermal EMF generated at dissimilar-metal junctions in the test circuit can add a small error to a low-resistance reading. Enabling OVC (§4.1, §4.5) applies a compensation measurement that removes this error, at the cost of a longer measurement time (§6.1.6). *Not available on TH2516B.*

4.8.4 Warm-up and environment

Allow at least 30 minutes of warm-up before relying on rated accuracy. Keep the test environment within 23 °C ±5 °C and ≤80% RH for the basic accuracy figures in Chapter 6; outside this range, apply the temperature-correction factor K given in §6.3.5.

4.8.5 Test leads and connections

Use only the TH26050S test cable or a Techmize/Tonghui-specified equivalent fixture. Keep contacts clean, keep leads short and away from strong electromagnetic fields, and avoid flexing or straining the cable near the connectors during measurement.

CHAPTER 5

System Setup & File Management

5.1 <System Setup> page

Field	Options / range
Touch tone	ON · OFF
Password	OFF · Lock system · Lock file · Modify (factory default password: `2516`)
Bus mode	RS232C · USBTMC · USBVCOM
Baud rate	9600 · 19200 · 28800 · 38400 · 96000 · 115200
AC frequency	50 Hz · 60 Hz — matched to the local mains frequency, to reject supply-frequency interference
Handler power	External · Internal
LCD style	Default · Classic
Bus address	Send address for MODBUS, range 1–31; adjustable with ++ / + / − / −− step keys (steps of 5 / 1 / 1 / 5)
Date / time	Format YY-MM-DD HH:MM:SS; adjustable with ++ / + / − / −− and « / » cursor keys

The Tools area on this page also provides **System Reset** (restores factory default settings) and sets the **communication mode** (SCPI or MODBUS, over RS232C or USBVCOM) and **FetcAuto** (ON/OFF — automatic return of test results to the host without a dedicated fetch command), described further in Chapter 7.

> **NOTE**
> The startup password and the system/file lock password are factory-set to `2516`. Record any password you change it to — a lost password requires Techmize/Tonghui support to clear.

5.2 File management

Reached with FILE, or from the File area of any display page. Configuration settings can be saved to and recalled from a file, so a complete instrument setup does not need to be re-entered manually.

5.2.1 Storage types

Type	Format	Recallable	Purpose
Config save (internal)	*.STA	Yes	Saves the instrument's configuration state to internal flash memory
Config save (USB)	*.STA	Yes	Saves the instrument's configuration state to a USB drive
Data save (USB)	*.CSV	No	Saves measurement results to a USB drive
Screen save (USB)	*.gif	No	Saves a screen snapshot to a USB drive

5.2.2 USB folder structure

Folder	Max files	Contents
CSV	999	Measurement-result *.CSV files
STA	999	Instrument configuration *.STA files
IMAGE	20	Screen-snapshot *.gif files

The CSV and STA folders are created automatically when a USB drive is connected. Use a USB2.0 drive formatted as FAT32, and avoid storing an excessive number of files or folders on it for best save/load performance. Back up data on the USB drive before connecting it to the instrument — Techmize/Tonghui is not responsible for USB-drive data loss.

5.2.3 File operations

Operation	Effect
Load	Recalls the selected file's saved settings into the active configuration (confirm with Yes/No)
Save	Saves the current configuration under a new file name entered on the on-screen keyboard; saving to an already-used file number overwrites the existing file
Delete	Deletes the selected file (confirm with Yes/No)
Copy to USB	Copies the selected internal file(s) to a connected USB drive
Select	Marks a file for a multi-file operation; the TH2516 supports copying multiple selected files to USB in one operation

To save measurement results continuously: on the <Measurement Display> page, open the File area and toggle **Save Data** to ON; toggle it back to OFF to stop. To save a screen snapshot: open the File area and touch **full-screen copy**.

CHAPTER 6

Performance & Specifications

6.1 Measurement function

Item	Specification
Measurement parameters	R (resistance) · T (temperature) · LPR (low-current resistance)
Parameter combinations	TH2516: R, R-T, T, LPR, LPR-T · TH2516A: R, LPR · TH2516B: R
Range mode	Auto · Manual (Hold / Up / Down)
Trigger	Internal (continuous) · Manual (TRIGGER key) · External (HANDLER input) · Bus (remote command)
Test-terminal configuration	4-terminal: DRIVE HI, DRIVE LO, SENSE HI, SENSE LO
Average	1–255, programmable

6.1.1 Resistance measurement time

OVC off:

Speed	50 Hz	60 Hz
FAST	5 ms + t1	5 ms + t1
MED	20 ms + t1	16.6 ms + t1
SLOW1	110 ms + t1	110 ms + t1
SLOW2	450 ms + t1	450 ms + t1

OVC on *(TH2516 / TH2516A only)*:

Speed	50 Hz	60 Hz
FAST	10 ms + t + t1	10 ms + t + t1
MED	40 ms + t + t1	33 ms + t + t1
SLOW1	220 ms + 9t + t1	220 ms + 11t + t1
SLOW2	900 ms + 39t + t1	900 ms + 47t + t1

t = measurement wait time; t1 = data-processing time, ≈ 5 ms. See §8.3 for the full HANDLER timing diagram and sampling-time tables.

6.2 Test signal

6.2.1 Range current — resistance test mode

Range	TH2516	TH2516A	TH2516B
20 mΩ	1 A	Not fitted	1 A
200 mΩ	1 A	100 mA	1 A
2 Ω	100 mA	100 mA	100 mA
20 Ω	10 mA	10 mA	10 mA
200 Ω	1 mA	1 mA	1 mA
2 kΩ	100 µA	100 µA	100 µA
20 kΩ	100 µA	100 µA	100 µA
200 kΩ	10 µA	10 µA	Not fitted
2 MΩ	1 µA	Not fitted	Not fitted

TH2516A does not have the 20 mΩ or 2 MΩ ranges; TH2516B does not have the 200 kΩ or 2 MΩ ranges.

6.2.2 Range current — low-current (LPR) resistance test mode *(TH2516 and TH2516A only)*

Range	TH2516 / TH2516A
2 Ω	10 mA
20 Ω	1 mA
200 Ω	100 µA
2 kΩ	10 µA

6.2.3 Open-circuit output voltage — resistance test mode

Range	TH2516	TH2516A	TH2516B
20 mΩ – 2 Ω	0.7 V	0.7 V *(200 mΩ–2 Ω; 20 mΩ not fitted)*	0.7 V
20 Ω – 20 kΩ	2.7 V	2.7 V	2.7 V
200 kΩ – 2 MΩ	2.7 V	2.7 V *(200 kΩ; 2 MΩ not fitted)*	Not fitted

6.2.4 Open-circuit output voltage — low-current (LPR) resistance test mode *(TH2516 and TH2516A only)*

Range	TH2516 / TH2516A
2 Ω – 2 kΩ	40 mV

6.3 Measurement accuracy

Basic accuracy applies at 23 °C ±5 °C, ≤80% RH, after ≥30 minutes warm-up, with the test cable correctly short-circuited and 0 ADJ performed (0 ADJ = ON). Outside this temperature range, multiply the basic accuracy by the temperature-correction factor K (§6.3.5).

6.3.1 Normal-mode resistance accuracy — 1 year

TH2516

Range	Resolution	Accuracy	Temp. coefficient
20 mΩ	1 µΩ	0.1% + 3	300 ppm
200 mΩ	10 µΩ	0.05% + 2	300 ppm
2 Ω – 200 kΩ	100 µΩ – 10 Ω	0.05% + 2	100 ppm
2 MΩ	100 Ω	0.2% + 2	100 ppm

TH2516A

Range	Resolution	Accuracy	Temp. coefficient
200 mΩ	10 µΩ	0.05% + 2	300 ppm
2 Ω – 200 kΩ	100 µΩ – 10 Ω	0.05% + 2	100 ppm

TH2516B

Range	Resolution	Accuracy	Temp. coefficient
20 mΩ – 200 mΩ	1 µΩ – 10 µΩ	0.1% + 3	300 ppm
2 Ω – 20 kΩ	100 µΩ – 1 Ω	0.1% + 2	100 ppm

6.3.2 Low-current (LPR) mode accuracy — 1 year, TH2516 and TH2516A

Range	Current	Resolution	Accuracy	Temp. coefficient
2 Ω	10 mA	100 µΩ	0.2% + 5	200 ppm
20 Ω	1 mA	1 mΩ	0.2% + 5	200 ppm
200 Ω	100 µA	10 mΩ	0.2% + 5	200 ppm
2 kΩ	10 µA	100 mΩ	0.2% + 5	200 ppm

6.3.3 Temperature accuracy — PT500 sensor *(TH2516 only)* — 1 year

Temperature range	Resolution	Accuracy
−99.9 – 39.9 °C	0.1 °C	±0.45% Rd ± 0.8 °C
40.0 – 250.0 °C	0.1 °C	±0.45% Rd ± 1.5 °C

6.3.4 Temperature accuracy — analog voltage input *(TH2516 only)* — 1 year

Input voltage range	Displayed temperature range	Resolution	Accuracy
0–2 V	−99.9–999.9 °C	1 mV	±1% Rd ± 3 mV

Rd = displayed reading.

6.3.5 Temperature-correction factor K

Multiply the basic 1-year accuracy figures above by K when operating outside 23 °C ±5 °C (but within the 0–40 °C operating range of §1.3):

Ambient temperature	K
0–5 °C	4
5–18 °C	2
18–28 °C	1
28–35 °C	2
35–40 °C	4

6.3.6 Resolution & measurement-display format

Resistance is displayed with up to 5 significant digits (floating decimal, per range); temperature is displayed with 4 digits and 1 decimal place. See §6.1–6.2 above for the resolution figure at each individual range.

PART II

Remote Control & Handler

Covers the RS232C, USBTMC and USBVCOM remote interfaces and the HANDLER interface for automated test integration. The full SCPI and MODBUS command tables are issued separately as the *TH2516 Series SCPI/MODBUS Command Reference*.

CHAPTER 7

Remote Control

The TH2516 series can be controlled remotely over RS232C (SCPI or MODBUS protocol), USBVCOM (SCPI or MODBUS), or USBTMC (SCPI). For the complete SCPI command set and MODBUS register map, see the companion *TH2516 Series SCPI/MODBUS Command Reference*.

7.1 RS232C

Item	Specification
Pin assignment	TXD = pin 2, RXD = pin 3, GND = pin 5
Baud rate	9600 / 19200 / 28800 / 38400 / 96000 / 115200 (§5.1)
Data format	No parity, 8 data bits, 1 stop bit
Protocol	SCPI or MODBUS, selectable (§5.1)
SCPI command termination	LF (0x0A)
Max. command length	2 KB per command string

7.2 USBTMC

USBTMC-USB488 and USB2.0 compliant. Requires a LabVIEW-compatible VISA/USBTMC driver on the host PC; once installed, the instrument appears in Windows Device Manager as a USB test and measurement device.

7.3 USBVCOM

Presents a virtual COM port over the rear-panel USB DEVICE connector. Requires the Tonghui USB-VCOM driver (available from the Tonghui website); once installed, the instrument appears as a "USB Vcom Port" in Device Manager and can be addressed as an ordinary serial port.

7.4 RS485 (via external converter)

An RS232-to-RS485 converter module (available separately through Techmize/Tonghui sales) allows multi-drop RS485 operation. Messages use the format `<address>@<command>`, with the instrument replying `<address>@<response>` — for example, sending `1@*IDN?` returns `1@Tonghui,TH2516,Version:2.4.7`.

> **NOTE**
> The instrument's RS485 interface does not support the MODBUS protocol. This is a limitation of the RS485 physical interface specifically, not a contradiction of MODBUS support over RS232C and USBVCOM described above.

7.5 Command-set overview

The instrument supports both SCPI and MODBUS command sets over RS232C (selectable via <System Setup>, §5.1); USBVCOM supports SCPI and MODBUS, and USBTMC carries SCPI. SCPI commands are organized into subsystems — display (`DISP`), function/range (`FUNC`), aperture/averaging (`APER`), trigger (`TRIG`), fetch (`FETC`), temperature/TC-Δt (`TEMP` , TH2516 only), comparator (`COMP`), BIN (`BIN`), statistics (`STAT`), and system (`SYST`) — plus the common commands `*RST` , `*TRG` and `*IDN?` . MODBUS access uses function code `0x10` (write) and `0x03` (read) against a fixed holding-register map covering the same functions.

Returned measurement data follows a fixed format: a single-parameter result is returned as `<value>,<status>` , a dual-parameter result (e.g. resistance and temperature) as `<value1>,<value2>,<status>` . Status: `−1` = no data, `0` = normal, `+1` = error. An overflow or error reading is returned as `+9.900000E+37` .

For the full command syntax, parameter ranges, the complete MODBUS register map, the CRC16 calculation, and worked communication examples, see the *TH2516 Series SCPI/MODBUS Command Reference*.

CHAPTER 8

Handler Interface

The rear-panel HANDLER port is a 9-pin interface for integrating the TH2516 series into an automatic test system: it accepts an external trigger and outputs the comparator or BIN sorting result together with an end-of-conversion signal.

8.1 BIN output mode (pin assignment)

Pin	Signal
1	START (external trigger input)
2	PASS2
3	FAIL or PASS *(3-bin result; function set by HANDLER3 pin function, §4.7)*
4	Reserved
5	EXT_VCC
6	PASS1
7	PASS3
8	EOC (end of conversion)
9	EXT_GND

8.2 Compare output mode (pin assignment)

Pin	Signal
1	START (external trigger input)
2	FAIL_HI
3	FAIL
4	Reserved
5	EXT_VCC
6	PASS1
7	FAIL_LO
8	EOC (end of conversion)
9	EXT_GND

Output polarity (active-high / active-low) for all signal pins is set by the HDL Polarity field on the <Measurement Setup> page (§4.5).

8.3 Timing

Symbol	Meaning
t1	START trigger pulse width (minimum 10 ms)
t2	One complete measurement time
t3	Sampling time
t4	Data processing / display time (display on ≈ 22 ms, display off ≈ 5 ms)
t5	HDL interval time, 0–2000 ms (0 = off)
t6	Measurement delay, 1–9999 ms
t7	HDL hold time, 0–2000 ms (0 = off)

Sampling time (t3) for the resistance-measurement OVC-off / OVC-on cases follows the same figures as the measurement-time tables in §6.1.1.

8.4 Interface sequence

In automatic (EXT trigger) operation, a START pulse on pin 1 begins a measurement; the instrument asserts EOC on pin 8 and the PASS/FAIL (or BIN) result on the corresponding output pins once the result is valid, holding the result for the configured HDL hold time (t7) before the next trigger is accepted. Both SCPI and MODBUS hosts can read back the same comparator/BIN status over the remote interface instead of, or in addition to, the hardware pins — see the companion Command Reference document for the exact register/command sequence for semi-automatic and fully automatic handler operation.

APPENDIX

Packing, Warranty & Firmware

A.1 Standard accessories

See §2.1 for the full packing list (instrument, TH26050S test cable, EU power cable, PT500 sensor *(TH2516 only)*, spare fuses, documentation).

A.2 Transport & storage

Store the instrument in its original packaging, in a dry, well-ventilated location at 5–40 °C and ≤85% RH, away from corrosive gases, for any extended period of non-use. During transport, protect the instrument from shock, vibration and moisture.

A.3 Firmware upgrade

Firmware is upgraded from a FAT32 USB drive using a model-specific upgrade file. Contact Techmize for the upgrade file and the step-by-step upgrade procedure for your model. Some features described in this manual require firmware version ≥6.1.3 or ≥2.7.0, depending on the function — contact Techmize to confirm the firmware revision fitted to a specific unit.

> **CAUTION**
>
> Do not interrupt power during a firmware upgrade. An interrupted upgrade can leave the instrument inoperable; contact Techmize/Tonghui support for recovery.

A.5 Model quick-reference

Model	Parameters	Temperature / TC-Δt	OVC	Top range
TH2516	R, R-T, T, LPR, LPR-T	Yes (PT500 or analog input)	Yes	2 MΩ
TH2516A	R, LPR	No	Yes	200 kΩ
TH2516B	R	No	No	20 kΩ

A.6 Related documents

- TH2516 Series Datasheet (Techmize)
- TH2516 Series SCPI/MODBUS Command Reference (Techmize, companion to this manual)

A.7 Contacting Techmize

For technical support, accessories, calibration or service, contact Techmize directly or through your authorized Techmize distributor.

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