OM

OPERATION MANUAL

TH2836 Series

LCR Impedance Analyzer — TH2836 / TH2836A. Covers front-panel operation, measurement setup and system configuration; see the companion SCPI Command Reference for the full remote-command set.

Techmize Electronic GmbH · Ismaning, Germany
Rev. 2026-09

CHAPTER 1

Safety & Compliance

1.1 About this manual

This is the operation manual for the Techmize TH2836 series LCR impedance analyzer, covering the **TH2836** (4 Hz–8.5 MHz) and **TH2836A** (4 Hz–5 MHz) models. Where this manual and the instrument itself appear to disagree, or a described function is not present on your unit, contact Techmize or your authorized distributor (§1.10) before relying on the instrument for measurement decisions.

Techmize/Tonghui continually improves the performance, features and construction of its instruments; content, specifications and accessories described here are subject to change without notice.

1.2 Safety symbols used in this manual

Symbol	Meaning
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 on the instrument's rear-panel ground terminal.

1.3 General safety requirements

The TH2836 series is a Protection Class I instrument: protective earthing of the chassis, via the power cord phase (L) / neutral (N) / ground (E) leads, is essential to safety and must not be defeated.

> **WARNING — ELECTRIC SHOCK**
> Always use a supply outlet with a protective earth contact. To prevent electric shock, ensure the ground wire of the power supply is reliably connected to earth before switching on. Disconnect the power supply before replacing the fuse or opening the case.

Power supply: 100–120 VAC or 198–242 VAC (rear-panel selectable), 47–63 Hz, rated supply capacity not less than 130 VA. Confirm the fuse fitted matches your local supply before connecting — fuse rating T4AL/250V for 110V/60Hz operation, T2AL/250V for 220V/50Hz operation (nominal instrument power consumption 80 VA).

> **CAUTION**
> Use only the fuse rating specified on the rear-panel label. If mains conditions are noisy, fit a power-line filter ahead of the instrument.

Environment. Operate the instrument indoors, at 0–40 °C and ≤75% relative humidity, away from dust, vibration, direct sunlight and corrosive gases; keep the side/rear ventilation openings clear. For storage, keep the instrument in its original packaging at 5–40 °C and ≤85% relative humidity. Keep the instrument and its test leads away from strong electromagnetic fields.

Test fixtures and cables. Use only test fixtures and cables supplied or approved by Techmize/Tonghui. Unapproved fixtures can produce misleading measurement results. Keep fixture contacts and DUT leads clean.

> **WARNING — DISCHARGE THE DUT**
> Discharge polarised or capacitive devices under test before connecting them to the UNKNOWN terminals. Connecting a charged component can damage the instrument and may present a shock hazard.

Warm-up. Allow at least 30 minutes of warm-up after switch-on before relying on the rated accuracy given in Chapter 8. Frequent, unnecessary power-cycling should be avoided.

1.4 Electrical safety test data

Test	Requirement
Insulation resistance	≥ 50 MΩ between mains and chassis under normal conditions; ≥ 2 MΩ under high-humidity conditions
Dielectric strength	Withstands 1.5 kV AC, 50 Hz, for 1 minute between mains and chassis, with no breakdown or flashover
Leakage current	≤ 3.5 mA AC (rms)

1.5 Low Voltage & EMC compliance

The TH2836 series is designed and tested to meet the essential requirements of the following EU directives:

Directive	Harmonised standard(s)
Low Voltage Directive 2014/35/EU	EN 61010-1
EMC Directive 2014/30/EU	EN 61326-1 (Group 1, Class A)

> NOTE
> As a Class A / Group 1 instrument, the TH2836 series is intended for industrial/laboratory environments; it may not provide adequate protection against radio interference in a residential setting.

The CE mark on the rear-panel nameplate indicates conformity with the directives above. A full EU Declaration of Conformity is available from Techmize on request (§1.10).

1.6 WEEE — disposal of electrical and electronic equipment

This instrument must not be disposed of as unsorted municipal waste at the end of its service life. Within the European Union, return it to Techmize, your distributor, or a designated collection point in accordance with the WEEE Directive (2012/19/EU) and its national transposition in your country.

1.7 RoHS compliance

The TH2836 series is designed to comply with Directive 2011/65/EU (RoHS), as amended, restricting the use of certain hazardous substances in electrical and electronic equipment. Supporting documentation is available from Techmize on request.

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 when used within the specified operating conditions.

This warranty does not cover: damage from misuse, accident, unauthorized modification or repair by non-professional personnel; consumable/wear items such as fuses and connectors; or damage from operation outside the environmental limits given in §1.3. Standard test fixtures and cables are covered by their own applicable warranty terms.

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.

1.10 Manufacturer & EU contact

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Registration

Managing Director: Haohua Zhao
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CHAPTER 2

Out of the Box

Checks and connections to make before first use.

2.1 Unpacking

After opening the box, check the instrument for transport damage before powering it on. Confirm contents against the packing list below; contact Techmize or your distributor promptly if anything is missing or damaged.

Standard contents: 1× TH2836-series LCR impedance analyzer (model as ordered) · 1× 3-wire power cable · 1× this operation manual · 1× test report · 1× warranty certificate. Keep the original packaging for storage or return shipment.

2.2 Connecting the power supply

Item	Value
Supply voltage	100–120 VAC or 198–242 VAC, rear-panel selectable
Supply frequency	47–63 Hz
Recommended supply capacity	≥ 130 VA
Power consumption	80 VA (nominal)

Match the phase (L), neutral (N) and protective-earth (E) leads of the supply cable to the instrument's power inlet, and confirm the fitted fuse matches your local supply (§1.3) before connecting.

2.3 Connecting a test fixture

Use only a test fixture or cable supplied or approved by Techmize/Tonghui. Connect it to the four front-panel UNKNOWN terminals — **Hcur** (current-source high), **Hpot** (voltage-sense high), **Lpot** (voltage-sense low), **Lcur** (current-source low) — and keep both the fixture contacts and the DUT's leads clean for good electrical contact.

2.4 Starting the instrument for the first time

1. Connect the power cable at the rear panel.
2. Press the **POWER** switch at the front-left of the instrument.
3. A splash screen shows the company logo, instrument model and firmware version while the instrument loads, then the display opens on the <Measurement Display> page.

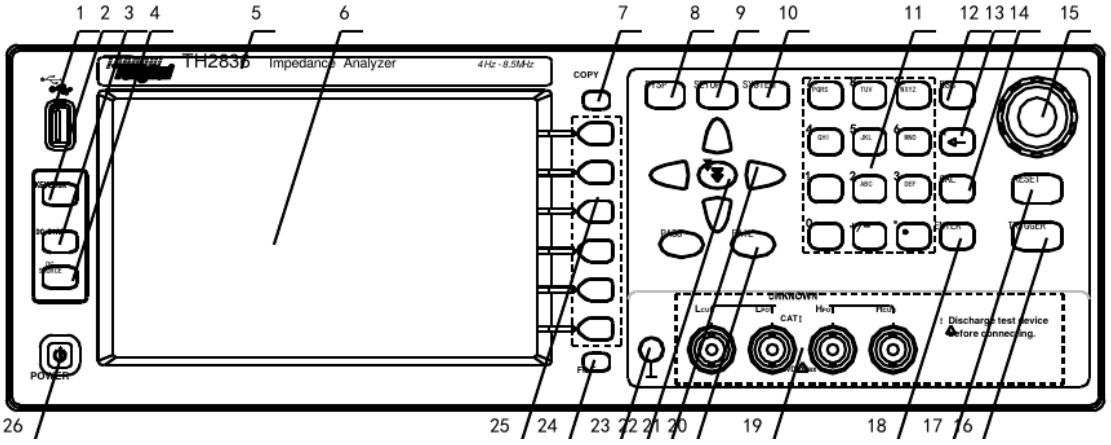
> **NOTE**
> If power-on password protection is enabled, the instrument prompts for the power-on password before continuing. The factory-set default power-on password is `2836`; it can be changed from the operator's own settings once logged in (§6.1).

Allow at least 30 minutes of warm-up before relying on the rated accuracy (§1.3, Chapter 8).

CHAPTER 3

Getting to Know the Instrument

3.1 Front panel



Front panel — TH2836

1 **USB HOST** — connects a USB flash drive for saving/recalling setup files, screen captures and logs.

2 **[KEYLOCK]** — locks/unlocks the front-panel keys; illuminates automatically when the instrument is under remote control (HANDLER, USB Device, LAN, etc.). If password protection is set, unlocking requires the password.

3 **[DC BIAS]** — enables/disables the DC bias output; illuminated when bias output is active. Inactive on pages where bias cannot be applied.

4 **[DC SOURCE]** — reserved.

5 **Trademark & model** — instrument brand and model designation.

6 **LCD** — 7", 800×480 colour capacitive touchscreen showing measurement results, conditions and status.

7 **[COPY]** — saves the current screen as an image to USB storage.

8 **[DISP]** — opens the measurement display pages (Chapter 4).

9 **[SETUP]** — opens the measurement setup pages (Chapter 5).

10 **[SYSTEM]** — opens the system setup pages (Chapter 6).

11 **Numeric keypad** — digits 0–9, decimal point and +/– for data entry.

12 **[Esc]** — exit/cancel key.

13 **[←]** — backspace; deletes the last digit entered.

14 **[CAL]** — reserved.

15 **Knob** — rotate to move the cursor/change values; press to confirm and save an entry.

16 **[TRIGGER]** — manually triggers a measurement in MAN trigger mode.

17 **[RESET]** — terminates an automatic scan in progress; no effect on other pages.

18 **[ENTER]** — terminates and confirms a data entry using its default unit.

19 **UNKNOWN terminals** — four-terminal-pair test connection: Hcur, Hpot, Lpot, Lcur.

20 **PASS/FAIL LEDs** — comparator result indication.

21 **Cursor keys** — move the cursor between fields on the LCD.

22 **Jump keys** — jump the cursor quickly between page regions.

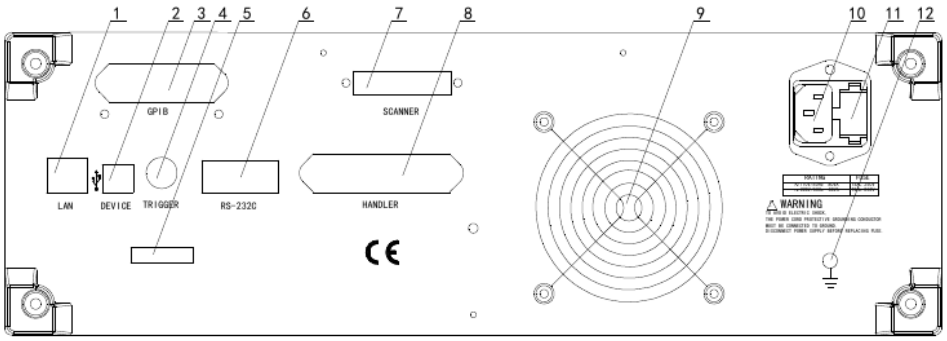
23 **Ground terminal** — chassis ground for protective/shield connections.

24 **[FILE]** — quick access to the file-management page.

25 **Softkeys** — six context-sensitive keys; the current function of each is labelled on-screen beside it.

26 **POWER** — power switch.

3.2 Rear panel



Rear panel — TH2836

1 **LAN** — network interface for control and communication over a network.

2 **USB DEVICE** — USB communication interface for PC control.

3 **GPIB (IEEE-488)** — optional PC communication interface.

4 **TRIGGER** — external trigger input (e.g. foot switch).

5 **Sequence label** — manufacture date, serial number and manufacturer.

6 **RS-232C** — serial PC communication interface.

7 **SCANNER** — reserved.

8 **HANDLER** — outputs bin-sort results to automatic handling equipment (§6.3).

9 **Air vent** — heat dissipation; keep clear.

10 **Electric socket** — AC power inlet.

11 **Fuse holder** — fuse orientation switches between 110V/220V operation.

12 **Ground terminal** — chassis protective/shield ground.

3.3 Display zones

The TH2836 uses a 7" capacitive touchscreen, divided into four zones on every page:

Zone	Contents
Page area	Name of the current page (e.g. "MEAS DISPLAY").
Softkey area	Function labels for the current softkeys; changes with cursor position and page.
Result/condition area	Test result(s) in large characters, plus current test conditions (function, frequency, level, range, speed, bias).
Assistant area	System alert messages and prompts.

3.4 Main menu keys and corresponding pages

Key	Opens
[DISP]	<Measurement Display> · <Bin No. Display> · <Bin Count Display> · <List Sweep Display> · <Save Log>
[SETUP]	<Test Setup> · <User Correction> · <Limit Setting> · <List Setting→> (List Parameter Setting, List User Correction, List Display Setting) · <Tools>
[SYSTEM]	<System Settings> · <Network Settings> · <HANDLER Settings> · <Channel Settings> · <Default Settings> · <System Reset>

3.5 Basic operation

1. Use the menu keys ([DISP], [SETUP], [SYSTEM]) and softkeys to reach the desired page.
2. Use the cursor keys to move to the field to set; the active field highlights with a blue background.

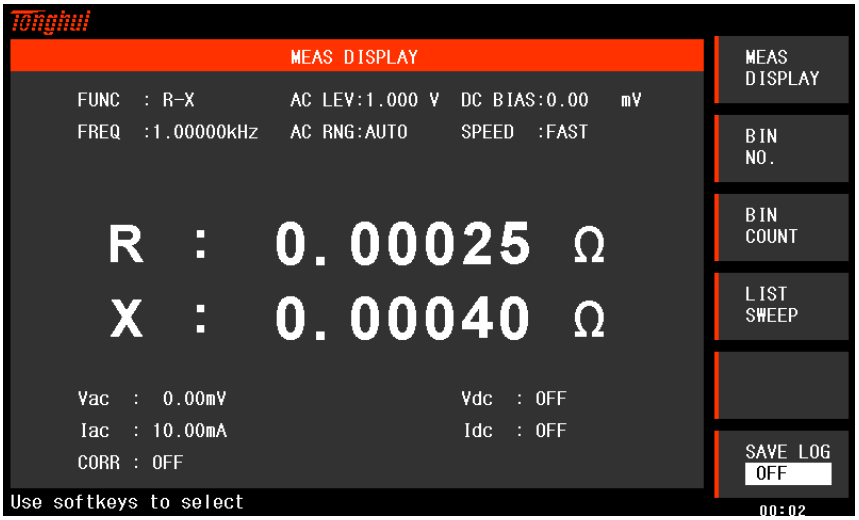
3. Use the knob (rotate to change, press to confirm) or the numeric keypad plus a units softkey to enter a value. Pressing [ENTER] instead of a units softkey applies the default unit for that field (Hz, V or A).

CHAPTER 4

[DISP] Functional Module

The four measurement-display pages reached from the front-panel [DISP] key.

4.1 <Measurement Display> page



<Measurement Display> page

Six fields are set directly on this page: **Function, Frequency, AC/DC Level, AC/DC Range, Speed, DC Bias**. The result area also monitors signal-source voltage/current (Vac, Iac), DC-bias voltage/current (Vdc, Idc), and open/short/load correction on/off status — these are set on the <Measurement Settings> or <User Correction> screens.

4.1.1 Test function

The TH2836 measures a primary and a secondary parameter simultaneously each cycle.

Primary parameter	Available combinations
Cp	Cp-D · Cp-Q · Cp-G · Cp-Rp
Cs	Cs-D · Cs-Q · Cs-Rs
Lp	Lp-Q · Lp-D · Lp-G · Lp-Rp · Lp-Rd · Lp-Z
Ls	Ls-D · Ls-Q · Ls-Rs · Ls-Rd · Ls-Z
Z	Z-θ° · Z-θr
Y	Y-θ° · Y-θr
R	R-X · Rp-Q · Rs-Q
G / DCR	G-B (no secondary submenu) · DCR (no secondary parameter)

Main parameters: |Z|, |Y|, L, C, R, G, DCR. Secondary parameters: D, Q, Rs, Rp, X, B, θ, Rd. Move the cursor to the Function field and use the Cp-…→ / Cs-…→ / Lp-…→ / Ls-…→ / Z-…→ softkeys (press ↓ for Y-…→ / R-…→ / G-B / DCR) to navigate the parameter tree; press ← to return one level.

4.1.2 Test frequency

Test frequency range: **4 Hz – 8.5 MHz** (TH2836) or 4 Hz – 5 MHz (TH2836A); minimum resolution 0.001 Hz.

Frequency range (F)	Resolution
4 Hz < F < 99.999 Hz	0.001 Hz
100 Hz < F < 999.99 Hz	0.01 Hz
1 kHz < F < 9.9999 kHz	0.1 Hz
10 kHz < F < 99.999 kHz	1 Hz
100 kHz < F < 999.99 kHz	10 Hz
1 MHz < F ≤ 8.5 MHz	100 Hz

Set the frequency with the `++ / + / − / −−` coarse/fine softkeys, or enter a value directly with the numeric keypad and a Hz/kHz/MHz units softkey.

4.1.3 AC test level

Level range: **5 mV – 2 V** (5 mV – 1 V above 1 MHz). The set voltage is the open-circuit value; the set current is the short-circuit value.

Voltage level	Resolution
5 mVrms – 100 mVrms	100 µVrms
100 mVrms – 1 Vrms	1 mVrms
1 Vrms – 2 Vrms	10 mVrms

When Auto Level Control (constant level, §5.1.3) is on, an asterisk "*" follows the displayed level value. Switching between voltage and current units requires numeric entry plus a units softkey — INCR/DECR alone cannot switch units.

4.1.4 Test range

15 ranges: 0.1 Ω, 1 Ω, 10 Ω, 20 Ω, 50 Ω, 100 Ω, 200 Ω, 500 Ω, 1 kΩ, 2 kΩ, 5 kΩ, 10 kΩ, 20 kΩ, 50 kΩ, 100 kΩ. Softkeys: **AUTO** (auto-range), **HOLD** (lock current range), **Add +** / **Decrease −** (step the held range).

4.1.5 DC bias

The TH2836 provides a built-in DC bias of **0 – ±10 V**. Press the front-panel [DC BIAS] key to enable the configured output (the key illuminates when bias is active). Set the level with the Add +/Decrease − softkeys or the numeric keypad plus a units softkey (mV, V, µA, mA, A).

4.1.6 Test speed

Test speed depends on integration time, average count, measurement delay and display update time. Three speeds are available:

Speed	20 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	8.5 MHz
Fast	380 ms	100 ms	20 ms	7.7 ms	5.7 ms	5.6 ms	5.6 ms
Medium	380 ms	180 ms	110 ms	92 ms	89 ms	88 ms	88 ms
Slow	480 ms	300 ms	240 ms	230 ms	220 ms	220 ms	220 ms

Reference conditions: locked range, monitors off, 0 s delays, average = 1, correction and DC bias off.

4.1.7 Other functions — decimal-point display

Results display as six digits with a floating decimal point by default. Move the cursor to the primary or secondary result to access: **decimal auto** (restore floating position), **decimal lock** (fix the current position), **+ / −** (shift the locked position one digit), and a font-size toggle (large → small → off). The lock clears automatically on a function change or a deviation-mode change.

4.2 <Bin No. Display> page

Displays the sorted bin number in large characters with the test result shown smaller. Only the Compare on/off field is set here; limits are configured on <Limit Table Settings> (§5.3).

Primary result	Secondary result	Sorted to (AUX on)	Sorted to (AUX off)
Pass	Pass	BIN1–BIN9	BIN1–BIN9
Fail	—	BIN OUT	BIN OUT
Pass	Fail	AUX bin	BIN OUT

Up to 10 bins: BIN1–BIN9 (primary-parameter limits) plus BIN OUT; one secondary-parameter limit pair. When fitted with the HANDLER accessory, results can drive automatic sorting equipment (§6.3).

4.3 <Bin Count Display> page

Shows the running count for each bin. The count on/off/reset field is the only settable field here; nominal value, limits and the AUX switch are monitor-only (set on <Limit Table Settings>). Softkeys: **ON**, **OFF**, **Reset count** (confirms Yes/No before zeroing all counts).

4.4 <List Sweep Display> page

Supports up to **10 scan points**, each with its own full set of test conditions. Points sweep automatically and each result is compared against its own limit. Two fields are settable here: scan **Mode** (SEQ or STEP — sweep all points on one trigger, or one point per trigger) and the displayed **parameter page** (cycle with the left/right keys once activated). Points themselves are configured on <List Sweep Settings> (§5.4).

Default displayed columns: Frequency, AC Level, DC Bias, Function, primary-parameter result, and Comparison result (PASS/FAIL) — more columns can be added on <List Display Settings>.

CHAPTER 5

[SETUP] Functional Module

Measurement setup, user correction, limit-table and list-sweep configuration.

5.1 <Measurement Settings> page

Reached by [SETUP]. Shares Function/Frequency/AC Level/AC Range/Speed/DC Bias with <Measurement Display> (§4.1) and adds the fields below.

5.1.1 Trigger mode

Mode	Behaviour
INT	Continuous, automatically repeating measurement (default).
MAN	One measurement per front-panel [TRIGGER] press.
EXT	One measurement per positive-edge pulse on the HANDLER interface.
BUS	One measurement per `TRIGger:SOURce BUS` + trigger command over the remote interface; not selectable from the front panel.

A trigger received while a measurement is in progress is ignored.

5.1.2 Automatic Level Control (constant level)

Adjusts the actual level across/through the DUT to match the set value. Constant-voltage range: 5 mVrms–1 Vrms; constant-current range: 5 µArms–10 mArms. If the level setting falls outside these ranges the function is automatically set OFF.

5.1.3 Trigger delay / step delay

Both programmable 0–60 s, 1 ms resolution. **Trigger delay** is the wait from the trigger event to the start of excitation — useful for a HANDLER fixture to seat the DUT. **Step delay** is the wait between applying the drive signal and the start of measurement. DCR and Ls-Rd/Lp-Rd measurements use two or three measurement cycles (positive/negative voltage), so the effective step delay is multiplied accordingly.

5.1.4 DC bias level monitoring

VDC/IDC monitoring fields display the actual bias voltage/current present at the DUT (shown in the Vdc/Idc fields on <Measurement Display>). Set each ON/OFF independently.

5.1.5 Average

Averages 2 or more measurements; range 1–255, step 1. Set with Add+/Minus− softkeys or numeric entry + [ENTER].

5.1.6 Automatic bias (BIAS) polarity

For varactor-diode testing. In **AUTO** mode the instrument senses the diode's connection via an internal ~1 V bias and automatically reverses the DC bias polarity to correctly bias the diode regardless of which way round it is connected, removing the need to check polarity before connecting. In **FIX** mode the set bias polarity is applied unconditionally. AUTO is shown with a "*" after the bias value; it has no effect while DC bias is OFF.

5.1.7 DC resistance range & level

DCR has 13 test ranges: 10 Ω, 20 Ω, 50 Ω, 100 Ω, 200 Ω, 500 Ω, 1 kΩ, 2 kΩ, 5 kΩ, 10 kΩ, 20 kΩ, 50 kΩ, 100 kΩ — set with the same AUTO/HOLD/Add+/Decrease− softkeys as the AC range. DC level (test voltage): 100 mV–2 V (100 µV resolution below 1 V, 1 mV above).

> **NOTE**
>
> DCR, and Ls-Rdc/Lp-Rdc, measure two cycles (positive and negative test voltage). Setting DC range to HOLD/AUTO also sets DCI range and AC range to HOLD/AUTO automatically. If a DCR-type measurement starts while DC bias is on, the bias is automatically cut off; for Lp-Rdc/Ls-Rdc, DC bias cannot be enabled at all.

5.1.8 DC bias current range & isolation

Standard DCI ranges: 20 µA, 200 µA, 2 mA, 20 mA, 100 mA (DCI isolation must be ON to set the DCI range). When bias-current isolation is **ON**, up to 100 mA may flow through the DUT. When **OFF**, the maximum allowed bias current depends on the AC test range:

Test range	10 Ω	30 Ω	100 Ω	300 Ω	1 kΩ	3 kΩ	10 kΩ	30 kΩ	100 kΩ
Max. current	2 mA	2 mA	2 mA	2 mA	1 mA	300 µA	100 µA	30 µA	10 µA

> **CAUTION**
> Bias-current isolation, when on, affects test accuracy. Turn it OFF when testing high-impedance components at low frequency with a small bias current.

5.1.9 Deviation and reference

Displays a deviation from a reference instead of the raw reading, for either or both parameters:

Mode	Formula
ΔABS	ΔABS = X − Y (X = current reading, Y = reference)
Δ%	Δ% = (X − Y) / Y × 100 [%]

Move the cursor to Reference A/B and either press **Measurement** with the reference component connected (auto-populates the reference from a live measurement) or key the value in directly; then set Deviation A/B to ABS, % or Off.

5.2 <User Correction> page

Eliminates stray admittance, spurious series impedance and gain/offset error from the test fixture and leads. Two correction types, which can be combined: **full-frequency open/short correction** (interpolated across 65 fixed calibration points for TH2836, 58 for TH2836A) and **single-point open/short/load correction** at up to **201** user-set frequencies. When both are active at the same frequency, point-frequency data takes priority.

5.2.1 Open-circuit correction

Removes errors from stray conductance (G, B) in parallel with the DUT. With the fixture open (no DUT connected), press **Open Circuit Full Frequency Clear** — takes ~30 seconds across the 65/58 fixed points; the instrument interpolates open-circuit data at other frequencies/ranges from these points. **Abort** cancels and keeps the previous data. **DCR Open** runs the equivalent correction for the DC-resistance function. Set **ON**/**OFF** to enable/disable applying the correction.

5.2.2 Short-circuit correction

Removes errors from parasitic series impedance (R, X). With the shorting plate (TH26010) fitted, press **Short Circuit Full Frequency Clear** (~30 seconds, same 65/58 fixed points). **DCR Short** runs the DC equivalent.

5.2.3 Load correction

Uses the transfer coefficient between the actual measured value and a standard reference value at a set frequency to remove residual error — it does not perform open/short-style subtraction, and is valid only for components of the same nominal specification used to derive it. Set the standard's function in the Function field, enter its reference values in Reference A/B, connect the standard and press **Load Correction**. The actual measured result appears in the Load A/B monitor fields.

5.2.4 Cable

Selectable cable lengths: 0 m, 1 m, 2 m. 0 m and 1 m calibration data ship with the instrument; 2 m data requires factory customisation.

5.2.5 Single-point user calibration

Point-frequency open/short/load correction for up to **201** user-specified frequencies. Select the correction point (1–201, step/++/−−/− softkeys), move to Frequency, set ON, enter the frequency, then run **Open Single Frequency Clear**, **Short Circuit Single Frequency Clear** and/or **Load Correction** for that point.

5.2.6 Clear correction data

Clears all 201 points of point-frequency correction data at once, after a Yes/No confirmation prompt.

5.3 <Limit Table Settings> page

Configures the comparator: up to 9 bin limits for the primary parameter (BIN1–BIN9) plus one limit pair for the secondary parameter. Results sort into up to 10 bins (BIN1–BIN9, BIN OUT). Especially useful with the HANDLER interface for automatic sorting.

5.3.1 Adjust parameters (swap)

Swaps which parameter gets the 9-bin treatment, e.g. Cp-D swaps to D-Cp so D is sorted on 9 bins and Cp becomes the 1-bin secondary.

5.3.2 Limit mode

Mode	Basis
%TOL	Percentage deviation from the nominal value.
ABS TOL	Absolute deviation from the nominal value.
SEQ MODE	Limits are the raw test-value range itself, entered low→high in sequence.

In tolerance modes, limit ranges may overlap or leave gaps between bins, and the lower limit need not be below the nominal value. In sequential mode, enter bins from smallest to largest or DUTs will all fall into the first bin wide enough to catch them.

5.3.3 Nominal value

Required for tolerance modes; optional in sequential mode. Enter with numeric keys plus a p/n/µ/m/k/M/ `*1` units softkey (`*1` auto-selects F, H or Ω to match the primary parameter).

5.3.4 Comparator on/off & auxiliary bin

COMP enables sorting into BIN1–BIN9 + BIN OUT. **AUX** (auxiliary/subsidiary bin) governs the secondary-parameter limit: with AUX ON, a DUT that passes the primary limit but fails the secondary limit sorts to the AUX bin instead of BIN OUT.

5.3.5 Upper and lower limits

In tolerance mode, enter each bin's lower limit; the upper limit derives automatically (symmetric around nominal) and the cursor advances to the next bin. In sequential mode, enter each bin's lower and upper limit explicitly; each bin's lower limit inherits the previous bin's upper limit. When the cursor is on a limit field in non-entry state, **Clear Row** clears the current row and **Clear Table** clears the entire limit list (BIN1–9 and the secondary pair).

5.4 <List Sweep Settings> page

Reached via [SETUP] → List Setting→, with three sub-pages: List Parameter Setting, List User Correction, List Display Setting. Unlike instruments that can only sweep one variable, each of the up to **10 scan points** can have its full parameter set — frequency, level, bias, function, speed, average, and more — configured independently, with support for single- or multi-channel operation (up to **8 channels**).

5.4.1 List parameter setting

Field	Description
Scanning points	1–10, forced to start from point 1. "Clear All Scanned Points" restores defaults.
Scanning mode	SEQ (all points per trigger) or STEP (one point per trigger) — same as §4.4.
Channel mode	Single or Multi (up to 8 channels).
Step delay	Delay from completing one scan-step measurement to starting the next — useful when driving an external DC-bias current source (e.g. TH1779A) that needs settling time. Additive with the delay set on <Measurement Settings>.
Nominal / limit mode / A,B upper & lower limits	Per-point sorting reference and %TOL/ABS TOL limits.
Frequency, AC Level, DC Bias, DC Level, Function, Speed, Average, AC/DC/DCI Range, DCI Isolation	Same fields and ranges as <Measurement Settings> (§5.1), set independently per scan point.

5.4.2 List user correction

Open/short/load correction per sweep point, configured the same way as <User Correction> (§5.2).

5.4.3 List display settings

Chooses which fields appear on <List Sweep Display> (§4.4) and their display order — any of Frequency, AC Level, DC Bias, Function, primary/secondary parameter, Comparison, DC Level, AC/DC/DCI Range, Channel, A/B limits, Speed, Nominal, Delay, Average, can be toggled on/off.

CHAPTER 6

[SYSTEM] Functional Module & File Management

6.1 <System Settings> page

Reached by [SYSTEM]. Settings on this page save automatically and persist across power cycles.

Field	Description
Meter functions	Displays/controls the current instrument function (bridge only).
Key signal	Key-press click sound, ON/OFF.
Qualified / Bad signal	PASS/FAIL alarm tone: HIGH LONG, HIGH SHORT, LOW LONG, TWO SHORT, or OFF.
Display language	English or Chinese.
Password	OFF · Lock System (power-on + file protection, keylock unlock protection) · Lock File (file protection only) · Lock Setup (protects the Setup pages) · Modify Password. Factory default: `2836` .
Bus mode	RS232C, GPIB (requires the optional GPIB board), LAN, USBTMC, or USBCDC.
GPIB address	Set with Add+/Minus− softkeys; only meaningful when the GPIB option is fitted.
Talk only	Streams every result over the active bus without addressing; disables PC control while ON.
Bias source	**INT** — built-in bias, 0–±10 V / 0–±100 mA. **External** — controls up to eight TH1779A bias current sources for up to 400 A total; requires a TH1779A connected.
Baud rate	RS-232C rate, 9.600 k – 115.200 k, set with Add+/Minus−.
Time	Sets the instrument's real-time clock.

6.2 <Network Settings> page

Configures the LAN port: **DHCP** (automatic IP assignment, if supported by the connected router/switch), **IP address**, **subnet mask**, **gateway** and **TCP/IP port number**. Settings save automatically and persist across power cycles.

6.3 <HANDLER Settings> page

The HANDLER interface outputs sorting results to automatic component-handling equipment and accepts an external trigger. Move the cursor to the HANDLER field and press [ON] to enable it; each pin can be configured as Off Low, Off High, Level Low, Level High, Pulse High or Pulse Low as required by the application.

6.3.1 Signal line definition — Bin comparison function

Compare outputs: /BIN1–/BIN9, /AUX, /OUT, /PHI (primary result above high limit), /PLO (primary result below low limit), /SREJ (secondary result out of limit). **Control outputs:** /INDEX (analog measurement complete), /EOM (measurement + comparison data valid), /ALARM (instrument power-down). **Control inputs:** /EXT.TRIG (external trigger, ≥1 µs pulse), /Keylock.

Pin(s)	Signal	Description
1–9	/BIN1–/BIN9	Sorted-bin result outputs (open-collector).
10	/OUT	Out-of-tolerance / reject output.
11	/AUX	Auxiliary-bin output.
12–13	/EXT.TRIG	External trigger input (rising-edge pulse) when trigger mode = EXT.
14–15	EXT.DCV2	External DC supply for /EXT.TRIG, /Keylock, /ALARM, /INDEX, /EOM.
16–18	+5V	Internal +5V (discouraged — keep load <0.3A, wiring away from noise).
19	/PHI	Primary result above the BIN1–9 high limit.
20	/PLO	Primary result below the BIN1–9 low limit.
21	/SREJ	Secondary result outside its high/low limit.
22–24	NC	Not connected.
25	/KEY LOCK	Locks all front-panel keys while asserted.
27–28	EXT.DCV1	Pull-up supply for /BIN1–9, /AUX, /OUT, /PHI, /PLO, /SREJ.
29	/ALARM	Asserted on power interruption.
30	/INDEX	Asserted when the analog measurement finishes (safe to swap DUT) — comparison result not yet valid until /EOM.
31	/EOM	Asserted once measurement and comparison data are valid.
32–33	COM2	Ground reference for EXT.DCV2.
34–36	COM1	Ground reference for EXT.DCV1.

6.3.2 Signal line definition — list-scan comparison function

When list-scan comparison is active, pins 1–10 (/BIN1–/BIN9, /OUT) instead report per-point IN/OUT (pass/fail) for each of the 10 scan points, and /AUX asserts if any point in the list fails. In **SEQ** mode, /INDEX asserts after the last point's analog measurement and /EOM asserts once the whole sweep's comparison data is valid. In **STEP** mode, /INDEX and /EOM assert after each individual point.

6.3.3 Electrical characteristics

Output signal	Output LOW	Output HIGH	Max. current
Comparison signals (/BIN1–9, /AUX, /OUT, /PHI, /PLO)	≤ 0.5 V	+5 to +24 V	6 mA
Control signals (/INDEX, /EOM, /ALARM)	≤ 0.5 V	+5 to +24 V	5 mA

Each output is an open-collector optocoupler; line voltage is set by a pull-up resistor on the HANDLER board, jumper-selectable between the internal +5V supply and an external EXT.DCV1/EXT.DCV2 supply. /EXT.TRIG and /Keylock inputs are opto-isolated.

6.3.4 Timing

Interval	Min.	Max.
T1 — trigger pulse width	1 µs	—
T2 — measurement start delay	200 µs	Display time + 200 µs
T3 — trigger wait time after EOM	0 µs	—

Typical comparison time ≈ 1 ms. Typical display-page time: Component Measurement Display ≈ 8 ms, Bin No. Display ≈ 5 ms, Bin Count Display ≈ 0.5 ms. For list-scan sequential (SEQ) sweeps, comparison + display time is ≈ 4.5 ms.

6.3.5 Comparison-function operation procedure

1. Press [SETUP] → Limit Setting to configure the nominal value and bin limits (§5.3).

2. Move to the Compare field and press [ON].
3. Press [DISP] → Bin No. Display or Bin Count to run production testing.

For list-scan comparison, configure sweep mode/points/limits on <List Sweep Settings> (§5.4), then run from <List Sweep Display> (§4.4).

> **NOTE — maximising HANDLER throughput**
> Lock the range to the largest expected value instead of AUTO; turn the Vac/Iac monitors off on <Measurement Settings>; run production testing from <Bin Count Display>.

6.4 <Channel Settings> page

Sets each channel's active-level polarity (active low or active high) for multi-channel list-sweep operation (§5.4).

6.5 File management

Reached via [FILE] or [SYSTEM] → File Management. The instrument stores complete instrument setups as `*.STA` files — internally up to **40** files, or up to **500** files on an external USB flash drive.

Each `*.STA` file captures: all <Measurement Settings> fields (function, frequency, level, range, speed, bias, trigger mode, constant level, delays, average, bias polarity, DC range/level, DCI isolation, monitoring, deviation test A/B); the Bin-Count on/off state; all <Limit Table Settings> fields (function, nominal, comparison method, AUX, comparator on/off, all bin limits); and all <List Sweep Settings> fields (mode, per-point parameters, all limits and sort modes) plus the current display-page format.

USB flash-drive support	Requirement
Standard	USB 1.0/1.1 mass storage
Capacity	32 MB / 256 MB / 2 GB / 4 GB
File format	FAT16 or FAT32 (format with Windows)

Finding a file: turn the knob or use [↑]/[↓] to step one at a time, [←]/[→] to page; or use the softkeys **File Name Lookup** / **File Serial Number Search**.

Saving: configure the instrument as desired, press [FILE] and move to the target slot (or type its number), press **Save** → **Yes**, then enter a file name and press [ENTER].

Loading: press [FILE], move to the file, press **Load** → **Yes**; the display returns to the page the file was saved from.

Copying to USB: press [FILE], select one or more files with [ENTER], then press **Copy to E:** — a progress bar shows copy status; ensure the USB drive meets the requirements above and is not write-protected.

CHAPTER 7

Measurement Operations & Examples

7.1 Zero correction

7.1.1 Full-frequency clearing

1. [SETUP] → User Correction.
2. Move to Open; keep the fixture open (no DUT), press **Open Full Frequency Clear**; wait for completion.
3. Press **ON** to enable open correction.
4. Fit the shorting plate (TH26010).
5. Move to Short; press **Short Circuit Full Frequency Clear**; wait for completion, then press **ON**.
6. Move to Load; press **OFF** (unless load correction is also required).
7. Move to Frequency; press **OFF** to disable point-frequency correction (so the interpolated full-sweep data is used instead).

7.1.2 Point-frequency zeroing

Example: zeroing at a single test frequency of 5.5 kHz.

1. [SETUP] → User Correction; set Open and Short to ON, Load to OFF.
2. Select a correction point (1–201), move to Frequency, set ON, and enter `5.5kHz`.
3. Keep the fixture open; press **Open Single Frequency Clear**.
4. Fit the shorting plate; press **Short Circuit Single Frequency Clear**.

7.2 Correct connection with the DUT

The instrument has four test terminals — Hcur, Lcur (current sampling), Hpot, Lpot (voltage sampling) — each with its own shield, to minimise stray-ground capacitance and EM interference. Connect Hc/Hp and Lc/Lp as separate pairs directly to the DUT leads for a true four-terminal measurement; for low-impedance DUTs especially, Hp/Lp should sense the voltage actually present at the DUT rather than adding lead impedance to the reading.

Hc+Hp and Lc+Lp may be tied together ahead of the DUT (effectively two-terminal) only when lead/contact resistance R_{lead} is negligible against the tested impedance — as a guide, $R_{lead} < Z_x/1000$ for <0.1% added error.

A Kelvin test lead performs well up to about 10 kHz; above that, a rigid test fixture is preferred, since at high frequency small changes in lead position change the stray inductance/capacitance at the test end. Whichever fixture is used, it should have low distributed impedance, low contact resistance, and a reliable open/short state for correction — open-circuit clear "0" with the same terminal spacing as the DUT connection, short-circuit clear "0" with a low-impedance shorting plate (or Hc–Lc and Hp–Lp directly joined, then tied together).

> **WARNING**
> For a polarised DUT, connect its high-potential terminal to Hc/Hp and its low-potential terminal to Lc/Lp; discharge polarised components before connecting them.

7.3 Eliminating the effect of stray impedance

For high-impedance DUTs (e.g. small capacitance), stray capacitance to a nearby ground plane adds a parallel error path. Placing a grounded shield conductor between the high and low test ends, connected to any conductive surface beneath the DUT, minimises this coupling.

For low-impedance DUTs (e.g. small inductance, large capacitance), the larger current in Hc/Lc makes contact resistance and electromagnetic coupling the dominant error sources — contact resistance affects the resistive part of the reading, coupling affects the reactive part. A four-terminal-pair connection, where the current in Hc/Lc and their shields flows in equal and opposite directions so the magnetic fields cancel, minimises this effect.

7.4 Example — testing an inductor

Setting	Value
Function	Ls-Q
Frequency	5.5 kHz
Level	1.5 Vrms
Output impedance	100 Ω

1. Power on (§2.4). On <Measurement Display>, set Function to Ls-Q (Function → Ls-…→ → Ls-Q), Frequency to 5.5000 kHz, Level to 1.5 V.
2. Attach the test fixture (e.g. TH26005) to the UNKNOWN terminals.
3. Perform point-frequency zeroing at 5.5 kHz (§7.1.2).
4. Insert the inductor under test and read the result on <Measurement Display>.

If results look wrong: check the inductor's contact with the fixture, the fixture's contact with the instrument, and redo the open/short correction. When using sweep (interpolated) correction, point-frequency correction must be set OFF (§7.1).

7.5 Example — multi-frequency list-scan capacitor test

Frequency	Compare parameter	Low limit	High limit
1 kHz	Cp	325.0 nF	333.0 nF
10 kHz	D	0.0001	0.0003
100 kHz	D	0.0060	0.0100

Function Cp-D, level 1 Vrms; alarm on failure = HIGH LONG.

1. On <Measurement Display>, confirm Function = Cp-D, Level = 1.000 V.
2. [SETUP] → List Setting → List Parameter Setting. Set scan point 1: Frequency 1.0000 kHz, Function Cp-D, A lower/upper limit 325.000n / 333.000n.
3. Set scan point 2: Frequency 10.0000 kHz, B lower/upper limit 100.000µ / 300.000µ (0.0001 / 0.0003).
4. Set scan point 3: Frequency 100.0000 kHz, B lower/upper limit 0.0060 / 0.0100.
5. [SYSTEM] → System Settings → Bad Signal → HIGH LONG.
6. Attach the test fixture (e.g. TH26005); run full-frequency zeroing (§7.1.1).
7. [DISP] → List Sweep. The instrument scans continuously, displays results per point, and sounds an alarm on an H (over) or L (under) result.

7.6 Example — comparator setup for capacitor sorting

Capacitor 0805CG271 (270 pF), sorted into J/K grade by capacitance, with a loss (D) check on the side.

Parameter	Value
Main / sub parameter	Cp / D
Frequency / Level / Speed	100 kHz / 1 V / SLOW
Limit mode / Nominal	%TOL / 270 pF
BIN1 (J)	−4.6% to +4.8%
BIN2 (K)	−9% to +10%
Secondary limit (D), AUX	0.0000–0.0015, AUX = ON
Trigger / Alarm	EXT (external) / FAIL beep HIGH LONG

At 100 kHz this capacitance presents >1 kΩ, so the parallel equivalent (Cp) is the correct mode. With AUX on, a part that passes the capacitance window but fails the loss check is diverted to the AUX bin instead of being rejected outright.

1. On <Measurement Display>, select Cp-D and set frequency/level/speed.
2. [SETUP] → Measurement Settings → Trigger = EXT.

3. [SETUP] → Limit Setting: Nominal 270 pF, Mode %TOL, enter BIN1/BIN2 and secondary limits, COMP = ON, AUX = ON.
4. [SYSTEM] → System Settings → Bad Signal = HIGH LONG.
5. [DISP] to return to the measurement display when done.

7.7 Example — load correction

Standard: Cp = 11 nF, D = 0.0005 at 100 kHz.

1. [SETUP] → User Correction; set Open, Short and Load all ON; Function = Cp-D.
2. Move to Frequency; set ON; enter 100.000 kHz.
3. Enter Reference A = 11.0000 nF, Reference B = 0.00050.
4. Select the correction point.
5. With the fixture open (kept clear of hands/interference), press **Open Single Frequency Clear**.
6. Fit the shorting plate (TH26010); press **Short Circuit Single Frequency Clear**.
7. Insert the standard capacitor; press **Load Correction**.

> **NOTE**
> Load correction is valid only for devices of the same specification as the standard used to derive it; redo it after changing specification.

CHAPTER 8

Performance & Specifications

Ratings apply after the warm-up period given in §1.3, with correction performed after warm-up, DC bias off, and range set to AUTO unless stated otherwise.

8.1 Measurement function

Symbol	Meaning	Symbol	Meaning
C	Capacitance	D	Dissipation factor
L	Inductance	Q	Quality factor
R	Resistance	θ	Phase angle
Z	Impedance	DCR	DC resistance
Y	Admittance	X	Reactance
G	Conductance	B	Susceptance

Equivalent circuit: series or parallel. Range: AUTO or manual (HOLD/INCR/DECR). Test-terminal connection: four-terminal pair (Hcur, Lcur, Hpot, Lpot). Trigger: internal, external (HANDLER), manual (front-panel [TRIGGER]), or bus. Delay: 0–60 s, 1 ms steps. Averaging: 1–255. Display: 6 digits, up to 999999.

Speed (≥10 kHz)	Rate	Time/reading
Fast	≈130/s	7.7 ms
Medium	≈11/s	92 ms
Slow	≈4/s	230 ms

Medium and Fast speeds slow down below 10 kHz — see the per-frequency table in §4.1.6.

8.2 Test signal

Parameter	Value
Test signal	Sine wave, frequency accuracy 0.01%
Frequency range	4 Hz – 8.5 MHz (TH2836) / 4 Hz – 5 MHz (TH2836A)
Minimum resolution	0.01 Hz
Signal mode	Normal (set level may sag under load) or Constant Level (internal level auto-adjusts to hold the set value at the DUT)
Output impedance	100 Ω ± 2%

Signal	Mode	Range	Accuracy	Step
Voltage	Normal	5 mVrms–2 Vrms	±(10% × setting + 2 mV)	100 µV
	Constant	10 mVrms–1 Vrms	±(6% × setting + 2 mV)	
Current	Normal	50 µArms–20 mArms	±(10% × setting + 10 µArms)	1 µA
	Constant	100 µArms–10 mArms	±(6% × setting + 10 µArms)	

Monitor	Range	Frequency	Accuracy
Voltage	5 mVrms–2 Vrms	≤ 1 MHz	±(5% × reading + 0.5 mVrms)
	5 mVrms–1 Vrms	> 1 MHz	±(10% × reading + 0.5 mV)
Current	50 µArms–20 mArms	≤ 1 MHz	±(5% × reading + 5 µA)
	50 µArms–10 mArms	> 1 MHz	±(10% × reading + 5 µA)

Parameter	Display range
L	0.00001 µH – 99.9999 kH
C	0.00001 pF – 9.99999 F
Z, R, X, DCR	0.00001 Ω – 99.9999 MΩ
Y, B, G	0.00001 µS – 99.9999 S
D	0.00001 – 9.99999
Q	0.00001 – 99999.9
θ	−179.999°–179.999° (−3.14159–3.14159 rad)

DC bias source	Value
Voltage	0 V – ±10 V; resolution 0.5 mV; accuracy ±(1% × setting + 5 mV)
Current	0 mA – ±100 mA; resolution 5 µA; accuracy ±(5% × setting + 50 µA)

8.3 Measurement accuracy

Measurement accuracy combines stability, temperature coefficient, linearity, repeatability and calibration interpolation error, checked after ≥30 minutes' warm-up, correct open/short clearing, DC bias off, and range on AUTO. The basic accuracy A_e for |Z|, |Y|, L, C, R, X, G, B follows:

$$Ae = \pm[\ A + (Ka + Kaa + Kb \cdot Kbb + Kc) \times 100 + Kd\ ] \times Ke \quad [\%]$$

where A is the base accuracy figure, Ka/Kb are impedance-proportionality factors (negligible above/below 500 Ω respectively), Kaa/Kbb/Kd are cable-length factors, Kc is a calibration-interpolation term (zero exactly at a calibrated frequency point), and Ke is a temperature de-rating factor outside 18–28 °C. D, Q, θ, G, Rp and Rs accuracies derive from A_e by the standard LCR formulas, valid while the corresponding D or Q value is ≤ 0.1 (Q×D < 1 for the Q formula).

Test frequency	Basic accuracy A (typical, 0.3–1 Vrms, medium/slow speed)
1 kHz / 1 MHz	0.05%
2 MHz	0.1%
5 MHz	0.5%
8.5 MHz	1.0%

A is roughly doubled for 100 Hz ≤ f < 300 Hz and ×2.5 below 100 Hz; add 0.15 for an inductor with |Zm| < 200 Ω tested at 100 Hz < f ≤ 10 MHz with 5 mVrms < Vs ≤ 2 Vrms. The full Ka/Kb/Kc/Kd/Ke factor tables (impedance- and cable-length-dependent) are in the manufacturer's source documentation — contact Techmize for the complete tables if your application needs the exact figure at a specific impedance/frequency/cable-length combination outside these typical conditions.

DCR accuracy	Value
$Ae = A \times (1 + Rx/5M\Omega + 16m\Omega/Rx)\ [\%] \pm 0.2\ m\Omega$	
A (medium/slow speed)	0.25
A (fast speed)	0.5

8.4 Performance test conditions

Functional and accuracy checks use standard capacitors (100 pF–1 µF, 0.02%), AC/DC standard resistors (10 Ω–100 kΩ, 0.02%) and standard inductors (100 µH–100 mH, 0.02%) against the accuracy limits in §8.3, at 1 Vrms, AUTO range, 0 V bias, SLOW speed, after correct open/short clearing. See the manufacturer's source documentation for the complete performance-test procedure if formal acceptance testing is required.

APPENDIX

Terms, Quick Reference & Support

A.1 Terms and symbols

Term	Meaning
Hcur / Hpot	Current-source high / voltage-sense high test terminal
Lcur / Lpot	Current-source low / voltage-sense low test terminal
Cp / Cs	Capacitance, parallel / series equivalent circuit
Lp / Ls	Inductance, parallel / series equivalent circuit
ALC	Automatic Level Control (constant-level mode)
DCI	DC bias current (range/isolation)

A.2 Front-panel key quick reference

Key	Function
[DISP]	Measurement display pages (Chapter 4)
[SETUP]	Measurement setup pages (Chapter 5)
[SYSTEM]	System setup pages (Chapter 6)
[TRIGGER]	Manual trigger (trigger mode = MAN)
[DC BIAS]	Enables/disables DC bias output
[KEYLOCK]	Locks/unlocks the front panel
[RESET]	Stops an automatic sweep in progress
[COPY]	Screen capture to USB
[FILE]	Quick access to file management

A.3 Remote control

The TH2836 series supports SCPI-style remote commands over RS-232C, USB (USBTMC/USBCDC), LAN and optional GPIB. The full command set — DISPlay, FREQuency, VOLTage, CURRent, AMPLitude, OUTPut, BIAS, FUNCtion, LIST, APERture, TRIGger, FETCh?, CORRection, COMParator, MMEMory subsystems, plus IEEE-488.2 common commands — is documented separately in the companion **TH2836 Series SCPI Command Reference**.

Task	Command
Identify the instrument	`*IDN?`
Reset to power-on state	`*RST`
Set the measured parameter	`FUNCtion:IMPedance <fn>`
Set frequency / level	`FREQuency <value> · VOLTage <value>`
Trigger and read a result	`TRIGger:SOURce BUS then TRIGger and FETCh?`
Run open/short correction	`CORRection:OPEN · CORRection:SHORt`
Save/load a setup file	`MMEMory:STORe:STATe · MMEMory:LOAD:STATe`

A.4 Contact, warranty and support

Warranty: two years from delivery, per §1.8. For service, calibration, accessories, or the extended-range accuracy figures referenced in §8.3, contact Techmize using the details below.

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