QD-CT Series Multi-Channel AC Current Acquisition Module

Troubleshooting Guide

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> This guide is for technical personnel. Basic installation & wiring please refer to Quick Start Guide.
>
> For explosion-proof versions, follow ATEX/IECEX safety rules before inspection.

WARNING: High voltage hazard. Always disconnect power before inspecting or servicing. ESD protection required.

Revision History

Rev.	Date	Changes	Author
A	2026-10-30	Initial release	Qidian
B	[TBD]	[TBD]	[TBD]

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1. Preface & Scope

1.1 Applicable Product Series

This Troubleshooting Guide applies to the following QD-CT series products:

Model	Channels	Terminals (CT Input)	Dimensions (L x W x H)
QD-CT-4	4 channels	C1~C4 (Terminals 5~8)	98 x 92 x 42 mm
QD-CT-8	8 channels	C1~C8 (Terminals 5~12)	148 x 92 x 42 mm
QD-CT-12	12 channels	C1~C12 (Terminals 5~16)	168 x 92 x 42 mm
QD-CT-16	16 channels	C1~C16 (Terminals 5~20)	198 x 92 x 42 mm

1.2 Applicable Personnel

This guide is intended for:

- Certified electrical engineers
- After-sales technical support personnel
- Customer technical engineers with electrical training

1.3 Document Objective

The purpose of this guide is to:

- Distinguish between field issues, parameter configuration problems, and device hardware failures
- Provide systematic step-by-step diagnosis procedures
- Reduce unnecessary returns (RMA) caused by misdiagnosis
- Enable field technicians to resolve common issues on-site

1.4 Reference Documents

Document	Description
Datasheet	Complete electrical specifications, terminal definitions, dimensions
Quick Start Guide	Installation, wiring, basic configuration procedures
Communication Manual	Modbus-RTU protocol details, register map,

Document	Description
	communication examples

1.5 Required Test Equipment

Equipment	Purpose
Digital Multimeter	Voltage, current, resistance measurements
Standard Signal Source (4-20mA / 0-10V)	Input signal simulation for testing
Oscilloscope (optional)	Signal waveform analysis, noise diagnosis
RS-485 to USB Adapter	PC communication debugging
Upper Computer Configuration Software	Parameter configuration and monitoring
USB-RS485 Debug Cable	PC-to-device connection
Insulation Resistance Tester	Isolation voltage testing (explosion-proof / isolation versions)
ESD Wrist Strap	Electrostatic discharge protection during handling

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2. General Safety Instructions

WARNING - Danger

- **Power off before working:** Always disconnect power supply before inspecting, wiring, or servicing the module. Working on energized equipment may result in electric shock or equipment damage.
- **Explosive atmosphere:** For explosion-proof versions, do NOT open the housing in hazardous areas. If a fault is suspected, power off immediately and evacuate the hazardous area. Do not attempt disassembly.
- **ESD protection:** Handle the module with proper electrostatic discharge (ESD) precautions. Use an ESD wrist strap when handling the module outside of its housing.
- **Do not exceed ratings:** Do not apply test voltages or signals beyond the specified ratings. Overvoltage or overcurrent may cause permanent damage or create safety hazards.

NOTE

- **Isolate external equipment:** Before diagnosing the module itself, isolate external loads, PLCs, sensors, and bus lines. Perform isolated bench testing on the module independently.
- **Document everything:** Record fault symptoms, firmware version, wiring photos, and environmental conditions before contacting technical support. This information significantly accelerates troubleshooting.

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3. Fault Classification

This guide uses a four-tier fault classification system to distinguish responsibility and streamline the resolution process.

Class A: Configuration Fault (Parameter Setting Issue)

- **Definition:** The device hardware is functioning correctly. The issue is caused by incorrect parameter configuration (address, baud rate, range settings, etc.).
- **Responsibility:** Customer can resolve independently.
- **Resolution:** Review and correct configuration parameters via Modbus registers or upper computer software.
- **Examples:** Wrong Modbus address, incorrect baud rate, parity mismatch, range misconfiguration.

Class B: Field Wiring / Environment Fault (External Issue)

- **Definition:** The device hardware is functioning correctly. The issue is caused by external factors such as wiring errors, grounding issues, electromagnetic interference, power supply problems, sensor faults, or environmental conditions.
- **Responsibility:** Customer needs to resolve field-side issues.
- **Resolution:** Correct wiring, improve grounding, reduce interference sources, replace faulty external sensors, or adjust environmental conditions.
- **Examples:** Loose terminal connections, shield not grounded, power supply noise, CT mismatch, nearby VFD interference.

Class C: Recoverable Device Fault

- **Definition:** The device has a temporary software/firmware issue that can be resolved without hardware replacement.
- **Responsibility:** Can be resolved by field technician or remote support.
- **Resolution:** Power cycle, factory reset, firmware reflash, or parameter recovery.
- **Examples:** Module freeze, corrupted parameters, communication stack hang, configuration error recovery.

Class D: Hardware Failure (Irreversible Damage - Requires RMA)

- **Definition:** The device has suffered permanent hardware damage requiring replacement or factory repair.
- **Responsibility:** Manufacturer (if under warranty and not voided by misuse).
- **Resolution:** Initiate RMA process. Replace unit.
- **Examples:** Burned components, isolated breakdown, permanent channel damage, connector damage from overvoltage.

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4. Indicator Status Reference

4.1 LED Indicator Definitions

LED	Name	Normal Status	Abnormal Status	Initial Fault Class
POW	Power	Constant ON	OFF = No power supply / Power fault	A/B (check wiring first)

LED	Name	Normal Status	Abnormal Status	Initial Fault Class
RUN	Run	Flashing (approx. 1Hz)	OFF = Module fault / Not started / Firmware crash	C/D
RX	Receive	Flashing when receiving data	Constant OFF during expected communication = No data received	A/B (check communication)
TX	Transmit	Flashing when transmitting data	Constant OFF during expected communication = No data transmitted	A/B (check communication)

4.2 Detailed LED States

POW (Power LED):

State	Meaning	Action
Constant ON	Power supply normal (DC 24V within 20-28V range)	No action needed
OFF	No power or power supply fault	Check DC 24V at terminals 1&2, verify polarity
Flickering/Flashing	Power supply unstable or out of range	Check power supply quality, ripple voltage <5%

RUN (Run LED):

State	Meaning	Action
Flashing (~1Hz)	Module running normally	No action needed
OFF	Module not started or firmware crash	Power cycle; if persists, Class C/D fault
Constant ON (not flashing)	Startup failure or firmware error	Power cycle; if persists, Class C/D fault

RX/TX (Communication LEDs):

State	Meaning	Action
Flashing intermittently	Normal communication activity	No action needed
Constant ON	May indicate continuous data transmission (check master configuration)	Verify master device is not sending continuous polls
Constant OFF	No communication activity	Check address/baud settings, A/B wiring, termination

5. Fault Diagnosis Table

Group 1: Power Supply Related Faults

Fault 1.1: POW LED Off, No Response After Power-On

Item	Description
Fault Phenomenon	After connecting power, the POW LED does not illuminate. The module shows no signs of life (RUN LED off, no communication response).
Possible Root Causes	1. Power supply not connected or faulty 2. Power supply voltage outside range (DC 20-28V) 3. Reverse polarity connection 4. Loose terminal connection 5. Blown internal fuse (rare) 6. Internal power circuit failure
Step-by-Step Diagnosis	1. Verify DC power supply output voltage with multimeter at power supply terminals (should be 20-28V DC) 2. Check power supply polarity: Terminal 1 = +24V, Terminal 2 = 0V/GND 3. Check terminal tightness - re-tighten terminals 1 and 2 4. Try a known-good power supply 5. Measure voltage directly at module terminals (to rule out cable drop)
Solution	Correct power supply connection, ensure voltage is within 20-28V DC range, fix loose connections, replace faulty power supply
Fault Class	B (if wiring/power supply issue) / D (if module internal fault after ruling out all external causes)
Remarks	The module has built-in reverse polarity protection. Reverse connection will not cause damage but will prevent operation.

Fault 1.2: POW LED Flickering, Repeated Restart

Item	Description
Fault Phenomenon	POW LED flickers, module powers on and off repeatedly. RUN LED may briefly flash then go off, then repeat.
Possible Root Causes	1. Power supply voltage unstable or dropping under load 2. Power supply ripple voltage exceeding 5% 3. Power supply insufficient current capacity (module draws up to 100mA) 4. Loose power connection causing intermittent contact 5. Short circuit in downstream wiring 6. Internal

Item	Description
	power regulation fault
Step-by-Step Diagnosis	1. Measure power supply voltage at module terminals while module is attempting to start - watch for voltage sag 2. Check power supply current rating (should be >100mA) 3. Inspect power cables for damage or loose connections 4. Disconnect all CT wires and communication lines, power module alone 5. If stable with loads disconnected, reconnect loads one by one to find culprit
Solution	Replace with adequate power supply (DC 24V, >150mA capacity), fix loose connections, isolate shorted downstream circuits
Fault Class	B
Remarks	Long cable runs can cause voltage drop. Calculate: V_drop = I x R_cable. For 100mA over 100m of 0.5mm2 cable, drop may be significant.

Fault 1.3: Power-On Self-Test Failure, ERR LED Stays On

Item	Description
Fault Phenomenon	Upon power-up, the module completes self-test but ERR LED (if equipped) stays constant ON. RUN LED may not flash. Module may not respond to communication.
Possible Root Causes	1. Internal hardware self-test failure (ADC, memory, or processor) 2. Firmware corruption 3. CT input short circuit on one or more channels 4. Over-temperature condition (module >50C) 5. Power supply voltage out of specification during startup
Step-by-Step Diagnosis	1. Check operating temperature - ensure ambient is within -10C~50C 2. Disconnect all CT inputs (C1-Cn terminals), power cycle 3. If module recovers, reconnect CTs one by one to identify faulty channel 4. Try different power supply 5. Check for visible damage (burnt components, smell)
Solution	If disconnecting CTs resolves the issue, replace faulty CT. If module still fails with all CTs disconnected, Class D hardware fault - initiate RMA.
Fault Class	B (if CT fault) / C (if firmware issue - try factory

Item	Description
	reset) / D (if hardware failure)
Remarks	Factory reset (Modbus register 0x02FF, write 0x5A) may recover from firmware corruption. Power cycle required after reset.

Group 2: Analog Input / Sensor Side Faults

Fault 2.1: Input Signal Present But Module Reads Zero

Item	Description
Fault Phenomenon	AC current is flowing in the monitored conductor (verified by reference meter), but the module reports 0A (or near 0) on the corresponding channel.
Possible Root Causes	1. CT not connected to correct channel terminals 2. CT secondary wires disconnected or loose 3. CT aperture not closed properly (not clamped shut) 4. Conductor not passed through CT aperture 5. CT internal open circuit (failed transformer) 6. Module input channel damaged
Step-by-Step Diagnosis	1. Verify CT is physically clamped shut on the conductor 2. Check CT secondary wires (S1/S2) are connected to correct channel terminals (C1-Cn) 3. Check terminal tightness at CT input terminals 4. Measure CT secondary output with multimeter (should show low impedance, typically <10 ohms) 5. Swap CT with a known-good channel 6. Read version register 0xF600/0xF601 to verify module is responding at all
Solution	Reconnect CT wires properly, ensure CT is fully closed, replace faulty CT, or if module input channel is damaged, initiate RMA
Fault Class	B (if wiring/CT issue) / D (if module channel damaged)
Remarks	CT wires can be connected in either direction (no polarity). The module measures true RMS AC current.

Fault 2.2: Input Signal Fixed / Not Following Sensor Changes

Item	Description
Fault Phenomenon	The module reading is stuck at a fixed value and does not change when the actual current

Item	Description
	changes.
Possible Root Causes	1. CT secondary circuit open (wire broken or disconnected) 2. CT saturated (current exceeds range) 3. Module ADC channel failure 4. Conductor passing through CT multiple times (wrong turns ratio) 5. DC component in AC signal (outside 20Hz-1kHz range)
Step-by-Step Diagnosis	1. Verify actual current is within measurement range (AC 0-50A) 2. Check CT secondary wiring continuity 3. Verify conductor passes through CT only once (single pass) 4. Check if signal contains DC component or harmonics (use oscilloscope) 5. Test with known-good CT on same channel 6. Test known-good CT on this channel
Solution	Replace faulty CT, ensure single-pass installation, verify signal frequency is within 20Hz-1kHz range
Fault Class	B (CT or signal issue) / D (if module ADC damaged)
Remarks	The QD-CT series frequency range is 20Hz-1kHz. Signals outside this range (e.g., DC, sub-harmonics) may cause inaccurate or frozen readings.

Fault 2.3: Input Reading Drifts / Fluctuates / Noisy

Item	Description
Fault Phenomenon	Module readings fluctuate unpredictably, show noise, or drift over time. Readings may jump between values rather than showing stable measurement.
Possible Root Causes	1. Electromagnetic interference (EMI) from nearby VFDs, contactors, or high-frequency devices 2. Shield cable not grounded or improperly grounded (two-point grounding creating ground loop) 3. Power supply ripple or noise 4. Loose CT connections 5. CT placed too close to strong electromagnetic sources 6. Cable too long without proper termination
Step-by-Step Diagnosis	1. Disconnect CT input, inject known stable signal from standard current source - if stable, external interference is culprit 2. Check shield grounding - should be single-point grounded at master end 3. Check power supply quality with oscilloscope

Item	Description
	(ripple <5%) 4. Move CT cables away from power cables (maintain >10cm separation) 5. Verify all terminal connections are tight 6. Check if fluctuation correlates with nearby equipment switching
Solution	Separate power and signal cables, implement single-point shield grounding, add power line filter, reposition CT away from interference sources, use twisted pair cable
Fault Class	B
Remarks	Variable frequency drives (VFDs) and contactors are the most common interference sources in industrial environments.

Fault 2.4: Input Over-Range Alarm / Open Circuit Detection

Item	Description
Fault Phenomenon	Module reports over-range condition or open circuit alarm on one or more channels. Reading may show maximum value or error code.
Possible Root Causes	1. Actual current exceeds measurement range (AC 0-50A) 2. CT ratio mismatch (using CT with different ratio than configured) 3. CT secondary open circuit (wire disconnected) 4. CT internal fault (open winding) 5. Module input circuit damage
Step-by-Step Diagnosis	1. Measure actual current with reference clamp meter - verify it is within 0-50A range 2. Verify CT ratio matches module configuration (default 1000/1) 3. Check CT secondary wiring continuity 4. Test with known-good CT 5. Check if alarm persists on different channel with same CT
Solution	Use CT with appropriate ratio for the measured current, repair open circuits, replace faulty CT, or if module input is damaged, initiate RMA
Fault Class	B (CT mismatch or wiring) / D (if module input damaged)
Remarks	The module can handle 1.2x rated current continuously and 5-10x rated current instantaneously without damage.

Fault 2.5: One Channel Normal, Another Channel Shows No Input (Multi-Channel Models)

Item	Description

Item	Description
Fault Phenomenon	On multi-channel models (QD-CT-8/12/16), one or more channels show normal readings while other channels show zero, fluctuating, or error readings.
Possible Root Causes	1. CT not connected or disconnected on faulty channel(s) 2. CT faulty on specific channel(s) 3. CT aperture not fully closed on specific channel(s) 4. Module input channel damaged (less common) 5. Internal wiring fault within module (rare)
Step-by-Step Diagnosis	1. Verify CT connections on all channels (C1-Cn terminals) 2. Swap CT from good channel to faulty channel - if problem follows CT, CT is faulty 3. Swap CT from faulty channel to good channel - if problem stays on original channel, module input may be faulty 4. Check terminal tightness on all channels 5. Verify all CTs are properly clamped on conductors
Solution	Replace faulty CT, reconnect loose wires, if module input channel is damaged, initiate RMA
Fault Class	B (CT or wiring) / D (if module channel damaged)
Remarks	This cross-testing method (swapping CTs between channels) is the most effective way to isolate CT faults from module faults.

Group 3: Output Side Faults

Fault 3.1: No Communication Output (No RS-485 Response)

Item	Description
Fault Phenomenon	Master device (PLC/SCADA/PC) cannot communicate with the module. No response to Modbus read commands. RX/TX LEDs may be off or behave abnormally.
Possible Root Causes	1. RS-485 A/B wires disconnected or reversed 2. Modbus address mismatch between master and module 3. Baud rate mismatch 4. Parity/data bits/stop bits mismatch 5. RS-485 bus overloaded (too many devices) 6. RS-485 cable too long (>1200m) 7. Missing or incorrect termination resistors 8. RS-485 transceiver chip damaged 9. Module firmware crash
Step-by-Step Diagnosis	1. Check RS-485 A (Terminal 3) and B (Terminal 4)

Item	Description
	wiring continuity 2. Verify module address matches master configuration (default address = 1) 3. Verify baud rate matches (default = 9600bps) 4. Check parity settings (default = None) 5. Disconnect all other devices from bus, test with single module 6. Measure bus voltage (should be ~2-5V differential with termination) 7. Try different RS-485 cable 8. Power cycle module
Solution	Correct wiring, match communication parameters, add termination resistors, reduce bus load, replace faulty RS-485 cable, or if module RS-485 port is damaged, initiate RMA
Fault Class	A (parameter mismatch) / B (wiring/cable issue) / C (firmware crash - power cycle) / D (hardware fault)
Remarks	Default communication parameters: Address=1, Baud=9600, No parity, 8 data bits, 1 stop bit. Parameter changes require power cycle to take effect.

Fault 3.2: Intermittent Communication / Timeout / Unstable

Item	Description
Fault Phenomenon	Communication works occasionally but drops out periodically. Modbus responses are delayed or lost. CRC errors may be reported by master.
Possible Root Causes	1. RS-485 bus reflection (missing termination resistors) 2. Cable quality issues (unshielded, poor twist rate) 3. Ground potential differences between devices 4. Electromagnetic interference on bus 5. Too many devices on bus (exceeding drive capability) 6. Baud rate too high for cable length 7. Conflicting device addresses 8. Power supply noise coupling into communication lines
Step-by-Step Diagnosis	1. Verify 120 ohm termination resistors at both ends of RS-485 bus 2. Check cable type - should be shielded twisted pair 3. Check cable length - should not exceed 1200m (reduce baud rate for longer cables) 4. Verify all device addresses are unique 5. Reduce number of devices on bus 6. Check for ground loops - isolate ground references 7. Separate RS-485 cables from power cables 8. Try lower baud rate (e.g., 9600 instead of

Item	Description
	115200)
Solution	Install proper termination resistors, use shielded twisted pair, reduce bus length/devices, lower baud rate, improve grounding, separate cable routes
Fault Class	B
Remarks	For RS-485 bus distances >1200m, an RS-485 repeater is required. Recommended maximum is 32 devices per bus for reliable communication.

Fault 3.3: Can Connect But Data Read Is Garbled / Incorrect

Item	Description
Fault Phenomenon	Communication link is established (module responds), but the data values read are garbled, nonsensical, or don't match actual measurements.
Possible Root Causes	1. Baud rate mismatch (partial - may connect but data corrupted) 2. Parity configuration mismatch 3. Data format misunderstanding (unsigned integer vs. float, scale factor) 4. CRC error due to interference 5. Master software parsing error 6. Register address offset error
Step-by-Step Diagnosis	1. Verify baud rate, parity, data bits, stop bits match on both ends 2. Verify data format: QD-CT outputs unsigned integer with 0.1A scale factor (value = register x 0.1A) 3. Check register addresses - current data starts at register 0x0000 4. Use a known-good Modbus scanner to verify raw data 5. Check CRC error count in master device 6. Verify no address offset error in master configuration
Solution	Match all communication parameters exactly, verify data format interpretation, use proper Modbus scanner for verification, check cable quality
Fault Class	A (configuration) / B (cable/interference)
Remarks	Example: If register 0x0000 reads 2500, the actual current = 2500 x 0.1A = 250.0A. Note: This exceeds the 50A range, so typical readings for 0-50A range would be 0-500.

Fault 3.4: Can Read But Cannot Write / Parameters Not Saved After Power Cycle

Item	Description

Item	Description
Fault Phenomenon	Master can read data from module successfully, but write commands (to change address, baud rate, etc.) either fail or the new values are lost after power cycle.
Possible Root Causes	1. Write protection enabled (if applicable) 2. Incorrect write command format (function code, register address, data) 3. Parameter change requires power cycle to take effect (not performed) 4. Flash memory corruption 5. Insufficient write time (command sent too quickly) 6. Bus interference during write operation
Step-by-Step Diagnosis	1. Verify write command format: Function Code 06 (Write Single Register) or Function Code 10 (Write Multiple Registers) 2. Verify register address is correct (0x0200 for address, 0x0201 for baud rate, 0x0202 for parity) 3. After writing, power cycle the module (required for parameter changes to take effect) 4. Wait 5-10 seconds after power-on before attempting communication 5. Try writing different registers to isolate issue 6. Try factory reset (0x02FF = 0x5A) then reconfigure
Solution	Use correct write command format, always power cycle after parameter changes, if flash memory corrupted, factory reset or initiate RMA
Fault Class	A (command format) / C (firmware - factory reset) / D (flash memory hardware fault)
Remarks	IMPORTANT: All communication parameter changes (address, baud rate, parity) require a power cycle to take effect. The module does not apply changes until re-powered.

Group 4: Communication Faults (RS-485 / Modbus-RTU)

Fault 4.1: Complete Communication Failure - No Response

Item	Description
Fault Phenomenon	Master sends Modbus commands but receives no response from the module. No RX/TX LED activity observed.
Possible Root Causes	1. Power supply issue (module not powered) 2. RS-485 A/B wiring disconnected or shorted 3.

Item	Description
	Modbus address set to 0 (broadcast address, may not respond to individual polls) 4. Baud rate completely mismatched 5. RS-485 transceiver chip damaged 6. Module firmware crashed 7. Bus short circuit affecting all devices
Step-by-Step Diagnosis	1. Verify POW LED is ON (module is powered) 2. Check A/B terminal connections with multimeter (continuity test) 3. Disconnect module from bus, connect directly to PC via USB-RS485 adapter 4. Try default address (1) and default baud rate (9600) 5. Power cycle module 6. If still no response with direct connection, module may have RS-485 transceiver failure
Solution	Repair wiring, correct address/baud settings, isolate module from bus for testing, if module RS-485 port is damaged, initiate RMA
Fault Class	B (wiring) / A (address/baud settings) / C (firmware crash) / D (hardware fault)
Remarks	As a diagnostic step, always try direct PC-to-module connection to rule out bus-wide issues.

Fault 4.2: Module Responds But Data Values Are All Zero

Item	Description
Fault Phenomenon	Module responds to Modbus queries (communication works), but all channel current readings return 0 (or near 0).
Possible Root Causes	1. No current flowing in any monitored circuit 2. All CTs disconnected or faulty 3. All CT apertures not closed properly 4. Module ADC or signal processing fault 5. Data register mapping error in master software 6. Firmware issue
Step-by-Step Diagnosis	1. Verify actual current is flowing in monitored circuits (use clamp meter) 2. Check CT connections on all channels 3. Verify CTs are properly clamped on conductors 4. Read version registers (0xF600/0xF601) to confirm module is responding 5. Check master software register mapping configuration 6. Power cycle module
Solution	Ensure current is flowing, reconnect CTs properly, verify master software configuration, power cycle module
Fault Class	B (CT/wiring) / A (master software config)

Item	Description
Remarks	Always verify actual current flow with a reference instrument before concluding module fault.

Group 5: System / Firmware Faults

Fault 5.1: RUN LED Not Running, Module Frozen, No Response

Item	Description
Fault Phenomenon	Module appears frozen. RUN LED is not flashing (may be off or constant). Module does not respond to Modbus commands.
Possible Root Causes	1. Firmware crash/hang 2. Watchdog timer timeout 3. Excessive electromagnetic interference causing processor fault 4. Power supply voltage dip during operation 5. Internal processor or memory failure
Step-by-Step Diagnosis	1. Power cycle the module (disconnect power for 30 seconds, then reconnect) 2. If recovered, check if issue recurs - if intermittent, investigate power quality and EMI 3. If module does not recover after power cycle, try factory reset 4. If still unresponsive, module has hardware fault
Solution	Power cycle (most common fix for firmware hang). If recurring, investigate power supply quality and EMI environment. If unresponsive after power cycle, initiate RMA.
Fault Class	C (recoverable - power cycle) / D (if hardware fault)
Remarks	Firmware crashes are relatively rare but can occur in high-EMI environments. Ensuring proper grounding and shielding can prevent recurrence.

Fault 5.2: Parameter Save Failure / Parameters Restore After Reboot

Item	Description
Fault Phenomenon	After writing new parameters (address, baud rate, etc.), the values appear to be written successfully but revert to previous values after power cycle.
Possible Root Causes	1. Write command incomplete or corrupted 2. Flash memory wear/damage 3. Power interrupted during write operation 4. Parameter change requires power cycle to save (not performed) 5. EEPROM/Flash memory failure

Item	Description
Step-by-Step Diagnosis	1. After writing parameter, wait 2 seconds before power cycling 2. Ensure power supply is stable during write operation 3. Try writing different parameters to isolate 4. Try factory reset (0x02FF = 0x5A) then reconfigure 5. If issue persists after factory reset, flash memory may be damaged
Solution	Ensure stable power during writes, always power cycle after parameter changes, if flash memory damaged, initiate RMA
Fault Class	A (operation procedure) / C (firmware - factory reset) / D (flash memory hardware fault)
Remarks	The module stores parameters in non-volatile memory. Parameter changes take effect after power cycle. Always ensure stable power supply during write operations.

Fault 5.3: Factory Reset Fails

Item	Description
Fault Phenomenon	Factory reset command (write 0x5A to register 0x02FF) does not restore default parameters. Module continues to operate with corrupted configuration.
Possible Root Causes	1. Write command not properly formatted 2. Flash memory sector damaged 3. Power interruption during reset 4. Firmware corruption preventing reset routine 5. EEPROM/Flash hardware failure
Step-by-Step Diagnosis	1. Verify write command: Function Code 06, Register 0x02FF, Value 0x5A 2. After sending reset command, power cycle the module 3. Verify default parameters are restored (Address=1, Baud=9600, No parity) 4. If reset fails repeatedly, flash memory may be physically damaged
Solution	Retry factory reset with stable power supply. If reset consistently fails, module requires factory repair - initiate RMA.
Fault Class	A (command error) / C (firmware - retry) / D (flash memory hardware fault)
Remarks	WARNING: Factory reset will erase all customer-configured parameters. Backup current configuration before performing reset.

Fault 5.4: Firmware Update Failed / Abnormal Function After Update

Item	Description
Fault Phenomenon	Firmware update process fails mid-way, or module behaves abnormally after successful-looking update (wrong functionality, communication failure, etc.).
Possible Root Causes	1. Power interruption during firmware write 2. Corrupted firmware file 3. Baud rate mismatch during update 4. Insufficient update time (timeout) 5. Flash memory damage 6. Incompatible firmware version
Step-by-Step Diagnosis	1. Verify firmware file integrity (checksum) 2. Verify update tool settings match module requirements 3. Ensure stable power supply during update 4. Try update at lower baud rate 5. Check if module enters boot loader mode (if supported) 6. If module is completely unresponsive, flash memory may be corrupted
Solution	Retry update with verified firmware file and stable connection. If module is bricked, may require JTAG recovery at factory or initiate RMA.
Fault Class	A (update procedure) / C (recoverable - retry update) / D (flash memory hardware fault)
Remarks	Only authorized engineers should perform firmware updates. Use only firmware files from official sources. Interrupted updates can brick the module.

Group 6: Special Faults

Fault 6.1: Isolation Voltage Alarm / Insulation Degradation

Item	Description
Fault Phenomenon	Module reports isolation fault or insulation resistance below specification. May accompany erratic behavior or communication issues.
Possible Root Causes	1. Moisture ingress into module housing 2. Contamination on PCB (conductive dust, chemical exposure) 3. Insulation breakdown due to overvoltage event 4. Physical damage to housing allowing moisture entry 5. Age-related insulation degradation
Step-by-Step Diagnosis	1. Visually inspect module for signs of moisture,

Item	Description
	corrosion, or damage 2. Check operating environment - temperature, humidity, contaminants 3. Measure isolation resistance with insulation resistance tester (between power/input/output) 4. Compare with specification (1.5kV isolation rating) 5. If moisture detected, dry module in controlled environment and retest
Solution	Improve environmental conditions, seal ingress points, replace module if insulation has permanently degraded
Fault Class	B (environmental) / D (if insulation permanently damaged)
Remarks	Standard version IP20 rating. For harsh environments, consider optional sealed versions. Operating humidity: 35%-85% RH, non-condensing.

Fault 6.2: Explosion-Proof Version - Seal Integrity Check Failed

Item	Description
Fault Phenomenon	Explosion-proof version module shows seal integrity issues, or ATEX/IECEx certification verification fails.
Possible Root Causes	1. Housing seal damaged or degraded 2. Cable gland not properly tightened 3. Cover not properly sealed after opening 4. Excessive thermal cycling damaging seals 5. Unauthorized modification of housing
Step-by-Step Diagnosis	1. Visually inspect all seals, gaskets, and cable glands 2. Verify cable glands are properly tightened per manufacturer specification 3. Check cover sealing surface for damage 4. Verify no unauthorized modifications have been made 5. Perform pressure test if equipment available
Solution	Replace damaged seals/gaskets with approved parts, properly tighten cable glands, re-seal cover per specification. If certification is compromised, module must be replaced or recertified by manufacturer.
Fault Class	B (installation/maintenance) / D (if housing structurally compromised)
Remarks	ATEX/IECEx certified versions require specific

Item	Description
	seals and cable glands. Unauthorized parts or modifications void certification and may create explosion hazards. Only qualified personnel should service explosion-proof equipment.

6. Standard Isolation Test Procedure

This section describes the standardized bench test procedure to isolate device faults from field issues. This is the most important diagnostic procedure for reducing unnecessary RMA returns.

Step 1: Disconnect All Field Wiring

- Disconnect power supply (Terminals 1 & 2)
- Disconnect RS-485 communication (Terminals 3 & 4)
- Disconnect all CT inputs (Terminals 5+)
- Verify all connections are physically disconnected

Step 2: Apply Power Supply

- Connect a known-good DC 24V power supply (20-28V range)
- Verify voltage at module terminals with multimeter
- Confirm POW LED is constantly ON

Step 3: Apply Known Input Signal

- Connect a standard current source or signal generator to one CT input channel
- Apply a known stable current within the measurement range (e.g., 10A, 25A, 50A)
- Record the applied current value

Step 4: Measure Output / Read Communication

- Connect RS-485 adapter to PC
- Read the corresponding data register via Modbus-RTU
- For Channel 1: Read register 0x0000 (value x 0.1A = actual current)
- Compare module reading with standard source reading

Step 5: Evaluate Results

Test Result	Conclusion	Action
Module reading within spec (plus/minus 0.5% FS)	Module is OK - issue is field-side (Class B)	Investigate field wiring, sensors, environment
Module reading out of spec or no response	Module has hardware fault (Class D)	Initiate RMA process

Step 6: Document and Report

- Record all test data, photos, and observations

- Complete RMA form if hardware fault confirmed
- Ship module with test documentation to manufacturer

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7. Recovery Operations

7.1 Soft Reset (Power Cycle)

Procedure: 1. Disconnect power supply from module (remove DC 24V) 2. Wait at least 30 seconds for capacitors to discharge 3. Reconnect power supply 4. Wait 5-10 seconds for module initialization 5. Verify POW LED constant ON and RUN LED flashing

When to use: Module frozen, unresponsive, intermittent communication issues, after firmware update.

7.2 Factory Reset

WARNING: Factory reset will erase ALL customer-configured parameters including: - Communication address - Baud rate - Parity settings - Any other custom configuration

Always backup current configuration before performing factory reset.

Procedure via Modbus: 1. Send Modbus Write Single Register command (Function Code 06) 2. Register address: 0x02FF (decimal 767) 3. Write value: 0x5A (decimal 90) 4. Power cycle the device (disconnect and reconnect power) 5. Verify default parameters are restored: - Address: 1 - Baud rate: 9600bps - Parity: None - Data bits: 8 - Stop bits: 1

Procedure via Upper Computer Software: 1. Connect to module via USB-RS485 adapter 2. Launch configuration software 3. Navigate to “Factory Reset” or “Restore Defaults” function 4. Confirm reset operation 5. Power cycle the device

7.3 Zero and Full-Scale Calibration

Note: The QD-CT series modules are factory calibrated and generally do not require field calibration. Calibration should only be performed if measurement accuracy is verified to be out of specification during bench testing.

Zero Calibration (Zero Adjustment): 1. Ensure no current is flowing (CT input = 0A) 2. Read the module output value via Modbus 3. If offset > 0.5% FS, zero calibration may be needed 4. Use upper computer software to perform zero adjustment (if supported)

Full-Scale Calibration (Span Adjustment): 1. Apply known full-scale current (e.g., 50A) via standard source 2. Read module output value 3. If error > plus/minus 0.5% FS, span calibration may be needed 4. Use upper computer software to perform span adjustment (if supported)

7.4 Firmware Re-flash

WARNING: Firmware update should only be performed by authorized engineering personnel. Incorrect firmware can permanently damage the module.

Procedure: 1. Obtain correct firmware file from manufacturer (verify version compatibility) 2. Connect module to PC via USB-RS485 adapter 3. Launch manufacturer-provided firmware update tool 4. Select firmware file and update port settings 5. Initiate update - do NOT disconnect power during update 6. Wait for update completion (typically 30-60 seconds) 7. Power cycle module 8. Verify firmware version via register 0xF600/0xF601 9. Perform factory reset to clear any corrupted parameters

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8. Return Material Authorization - RMA

8.1 RMA Qualification Criteria

A device may be accepted for RMA repair/replacement if ANY of the following conditions are met:

- Device fails isolated bench test (Section 6) with confirmed correct power supply and input signals
- Visible physical damage: burnt components, blackened terminals, cracked housing
- Confirmed isolation breakdown (insulation failure)
- Permanent channel damage that cannot be resolved by restart or calibration
- Firmware corruption that cannot be recovered by factory reset or reflash

8.2 Conditions Not Covered Under Warranty

The following conditions are NOT covered under standard warranty and may incur repair charges:

- Damage from incorrect power supply connection (wrong voltage, reverse polarity beyond protection)
- Damage from wiring errors (high voltage connected to signal terminals, overvoltage from external sources)
- Damage from overcurrent conditions exceeding module ratings
- Unauthorized opening of housing, modification, or tampering
- Firmware flashed with non-official or incorrect version
- Damage from corrosive environments, water ingress, condensation
- Physical damage from impact, dropping, or improper handling
- Performance issues caused by selecting wrong model for application (wrong range, wrong channels)
- Damage from operating outside specified environmental conditions

8.3 RMA Submission Requirements

When submitting a device for RMA, the customer must provide:

Item	Description
1. Product Model & Serial Number	Complete model number (e.g., QD-CT-8) and serial number from label
2. Firmware Version	Read from registers 0xF600/0xF601

Item	Description
3. Fault Description	Detailed description of fault symptom, when it occurs, under what conditions
4. LED Status	Photos or description of LED indicator states during fault
5. Wiring Diagram	Photo or diagram of field wiring connections
6. Field Photos	Photos of installation environment, module condition, connections
7. Bench Test Records	Results of isolation test (Section 6) if performed
8. Purchase Order Number	Original purchase order or invoice number

8.4 RMA Shipping Requirements

- Package module in anti-static bag
- Use original packaging if available, or equivalent protective packaging
- Include all RMA documentation inside package
- For explosion-proof versions: Follow specific shipping regulations for hazardous location equipment
- Affix RMA number prominently on package exterior
- Use tracked shipping method
- Insurance recommended for high-value shipments

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9. FAQ - Frequently Asked Questions

Q1: The reading is not accurate. Is the device broken?

A: Not necessarily. Before concluding hardware failure, check: - CT ratio matches module configuration (default 1000/1) - CT is properly clamped on conductor - Actual current is within measurement range (0-50A) - No EMI interference from nearby equipment - Power supply voltage is stable (20-28V DC) - Perform bench test (Section 6) to isolate device from field issues

Q2: Why does the PLC read a different value than the configuration software?

A: This is usually a data format issue: - QD-CT outputs unsigned integer with 0.1A scale factor - Example: Register value 250 = 250 x 0.1A = 25.0A - Ensure both PLC and software use the same scale factor - Check if PLC is using integer vs. float interpretation - Verify register addresses match between PLC and software

Q3: Should the shield cable be grounded at one end or both ends?

A: For RS-485 communication, shield should be grounded at **one end only** (typically the master/end station end). Two-point grounding can create ground loops that introduce noise and cause communication errors.

Q4: One device works on the bus alone but communication fails when multiple devices are connected?

A: Common causes: - Duplicate device addresses (each device must have unique address 1-255) - Bus overloaded (recommended max 32 devices) - Missing termination resistors (120 ohm at both bus ends) - Cable too long for baud rate (max 1200m at 9600bps) - Ground potential differences between devices - Faulty device on bus pulling down the bus lines

Q5: The module works fine but readings drift over time. What could cause this?

A: Possible causes: - Temperature drift (module operating near temperature limits) - Power supply ripple increasing over time - CT degradation (aging transformer) - Accumulated contamination on PCB - Loose connections that worsen with thermal cycling - Recommend: Perform calibration if drift exceeds plus/minus 0.5% FS, check environment, inspect connections

Q6: Can I use third-party CTs with this module?

A: It is strongly recommended to use manufacturer-supplied CTs. Third-party CTs may have different secondary output characteristics (current source vs. voltage source, burden impedance) that are not compatible with the module input circuit. Using incompatible CTs may result in inaccurate readings or damage.

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10. Technical Support & Contact

Contact Information

Item	Details
Company Name	Anhui Qidian Automation Technology Co.,ltd
Website	www.qidiansensor.com
Email	Sa;es008@qd-zdk.com
Sales Hotline	+86 19715617532
Technical Support	https://www.qidiansensor.com/contactus.html
Support Hours	v

Submitting a Support Request

To receive the fastest technical support response, please provide:

1. **Product model** (e.g., QD-CT-8)
2. **Firmware version** (from registers 0xF600/0xF601)
3. **Detailed fault description** (what happens, when, under what conditions)
4. **LED indicator status** (photos if possible)
5. **Wiring photos** (field installation)
6. **Bench test results** (if performed per Section 6)
7. **System configuration** (PLC model, gateway model, software used)

8. **Purchase order number**

Disclaimer

Full technical data, Modbus register map, and complete specifications are available in the official QD-CT Series Datasheet. This Troubleshooting Guide covers systematic fault diagnosis and resolution procedures. For detailed electrical specifications, refer to the Datasheet.

Specifications and information are based on the latest product information available at time of publication. Manufacturer reserves the right to modify product designs, specifications, or materials without prior notice.

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11. Appendix

Appendix A: Terminal Pin Quick Reference

Terminal	Label	Function	Wire Color Recommendation
1	24V	Power +24V DC	Red
2	0V	Power 0V/GND	Black
3	A	RS-485+	Green
4	B	RS-485-	White/Blue
5+	C1~Cn	Channel CT inputs	Yellow (per channel)

CT Input Terminals by Model: - QD-CT-4: C1~C4 (Terminals 5~8) - QD-CT-8: C1~C8 (Terminals 5~12) - QD-CT-12: C1~C12 (Terminals 5~16) - QD-CT-16: C1~C16 (Terminals 5~20)

Appendix B: Fault Code Reference

LED Pattern	Meaning	Action
POW OFF	No power	Check DC 24V at Terminals 1&2
POW Flickering	Unstable power	Check power supply quality and ripple
RUN OFF	Module not running	Power cycle; if persists, Class C/D fault
RUN Constant ON	Startup failure	Power cycle; check for short circuits
RX/TX Constant OFF	No communication	Check A/B wiring, address, baud rate
RX/TX Flashing	Normal activity	No action needed

Appendix C: Test Record Template

Test Item	Value/Result	Notes
Date		

Test Item	Value/Result	Notes
Technician		
Module Model		
Serial Number		
Firmware Version (0xF600/0xF601)		
Power Supply Voltage		V DC
Power Supply Current		mA
Applied Test Current		A
Module Reading (Channel 1)		A
Module Reading (Channel 2)		A
Module Reading (Channel N)		A
Communication Baud Rate		bps
Communication Address		
Test Result	PASS / FAIL	
Fault Classification	Class A / B / C / D	
Recommended Action		
Photos Attached	Yes / No	

Appendix D: Default Factory Settings Summary

Parameter	Default Value
Station Address (ID)	1
Baud Rate	9600 bps
Data Bits	8
Parity	None
Stop Bits	1
CT Ratio	1000/1
Measurement Range	AC 0~50A
Resolution	0.1A
Output Data Format	Unsigned Integer (0.1A/count)
Isolation Voltage	1.5kV (Power/Input/Output)
Operating Temperature	-10 deg C ~ +50 deg C
Storage Temperature	-20 deg C ~ +70 deg C
Humidity	35% ~ 85% RH, non-condensing

Appendix E: Common Modbus Commands Reference

Command	Function Code	Example (Address=1)	Description
Read Current Data (4	03 (Read Holding	01 03 00 00 00 04 [CRC]	Read channels 1-4

Command	Function Code	Example (Address=1)	Description
channels)	Registers)		
Read Current Data (8 channels)	03	01 03 00 00 00 08 [CRC]	Read channels 1-8
Read Current Data (12 channels)	03	01 03 00 00 00 0C [CRC]	Read channels 1-12
Read Current Data (16 channels)	03	01 03 00 00 00 10 [CRC]	Read channels 1-16
Set Communication Address	06 (Write Single Register)	01 06 02 00 [NewAddr] [CRC]	Set device address
Set Baud Rate	06	01 06 02 01 [RateCode] [CRC]	Set baud rate (0-8)
Set Parity	06	01 06 02 02 [ParityCode] [CRC]	Set parity (0=None,1=Odd,2=Even)
Factory Reset	06	01 06 02 FF 00 5A [CRC]	Restore factory defaults
Read Firmware Version (Low)	03	01 03 F6 00 00 01 [CRC]	Version low word
Read Firmware Version (High)	03	01 03 F6 01 00 01 [CRC]	Version high word

Baud Rate Code Reference:

Code	Baud Rate
0	1200 bps
1	2400 bps
2	4800 bps
3	9600 bps (Default)
4	19200 bps
5	38400 bps
6	57600 bps
7	115200 bps
8	Auto-detect

Note: [CRC] represents the CRC-16 checksum calculated over the preceding bytes. Parameter changes require power cycle to take effect.

END OF DOCUMENT