Remote Reclosing Device with Insulation Control

MT51SD Series

User Manual

Remote Reclosing Device with Insulation Control



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Intended Users	Design, installation, commissioning, and maintenance personnel

Safety Information

DANGER: Before installation, wiring, maintenance, or removal, disconnect the relevant power supply, take measures to prevent accidental re-energization, and verify that the equipment is de-energized. Installation and maintenance must be performed only by qualified personnel familiar with low-voltage distribution equipment.

WARNING: Automatic reclosing may re-energize the load while unattended. Enable this function only in circuits where automatic restoration of power is permitted following a risk assessment and will not pose a risk to personnel or equipment.

IMPORTANT NOTE: This manual covers product installation, configuration, and operation. The compatible circuit breaker models, firmware behavior, certification scope, and site application conditions shall be as specified for the supplied product, on its nameplate, in the project technical documentation, and in applicable standards.

Contents

1 Document Information

2 Product Overview

3 Product Identification and Panel

4 Installation and Wiring

5 Operating Modes and Local Control

6 Indicators and Status

7 Automatic Reclosing Function

8 RC1 / RC2 Control Logic

9 Insulation Monitoring Function

10 Output Contacts and Remote Status

11 Modbus Communication

12 Commissioning and Functional Verification

13 Troubleshooting

14 Technical Specifications

15 Maintenance and Decommissioning

Appendix A MR / ER Reclosing Programs

1 Document Information

1.1 Scope

This manual applies to the MT51SD series remote reclosing device with insulation control. The product can be used with designated MATIS series MCBs, RCCBs, or RCBOs. Refer to the verified compatibility list for approved combinations.

1.2 Intended Readers

- Design engineers for low-voltage distribution systems
- Switchgear and control cabinet assembly personnel
- Field installation, commissioning, and maintenance personnel
- Engineers integrating the device into a supervisory system via RS485 or local I/O

1.3 Document Conventions

Label	Meaning
DANGER	Failure to avoid this hazard may result in serious personal injury.
WARNING	May result in risks to personnel, equipment, or the system.
NOTICE	Important information about installation, configuration, or functional limitations.

2 Product Overview

2.1 Product Description

The MT51SD is an intelligent accessory that integrates automatic reclosing, remote control, and status feedback. By default, insulation monitoring is linked only to the automatic reclosing sequence. Local C1/C2 control, RS485 remote closing, and manual mechanical closing do not trigger insulation monitoring. This linkage can be adjusted through project-specific firmware configuration.

2.2 Main Features

- MR / ER reclosing programs and user-defined modes
- C1 / C2 local control inputs
- RS485 Modbus RTU remote control and parameter readout

- Insulation monitoring before automatic reclosing and IM Fault status
- Configurable potential-free dry contact outputs
- Auto / Manu / Lock operating and maintenance modes
- Electrical interlock, unlock, and End of Cycle status management

2.3 System Integration

The MT51SD does not replace upstream protection devices for short-circuit, overload, or residual current. Configure the reclosing strategy according to the type of protective device, the cause of tripping, load characteristics, and on-site safety requirements.

3 Product Identification and Panel

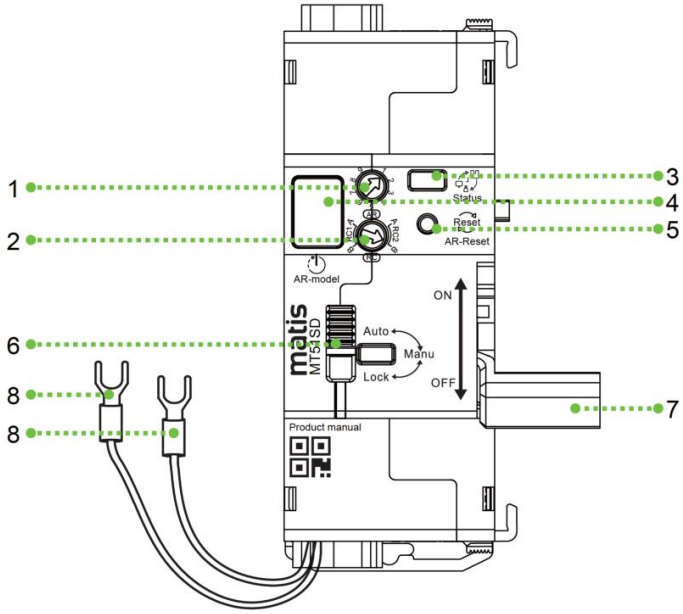


Figure 3-1 MT51SD Front Panel and Interface Locations

No.	Name	Description
1	AR Reclosing Mode Selector	Selects the corresponding MR0–MR9 / ER0–ER9 program.
2	RC Control Mode Selector	Selects between RC1 and RC2 control logic.
3	Status Indicator	Indicates operating, waiting, insulation fault, lockout, and other statuses.
4	Reclosing Attempt Display	Displays the attempt count for the current program.
5	RESET	Resets statuses that permit reset. See this manual for the long-press function.
6	Auto / Manu / Lock	Operating mode and mechanical maintenance lockout.

No.	Name	Description
7	Opening/Closing Handle	Operates or indicates local mechanical opening and closing.
8	Insulation Monitoring Leads	Connects to the specified points in the monitored circuit.

4 Installation and Wiring

PRE-INSTALLATION CHECK: Verify that the product model, compatible circuit breaker, control power supply, cable specifications, and on-site system type match the design documents. Wiring while energized is strictly prohibited.

4.1 Upper Terminals (6–11)

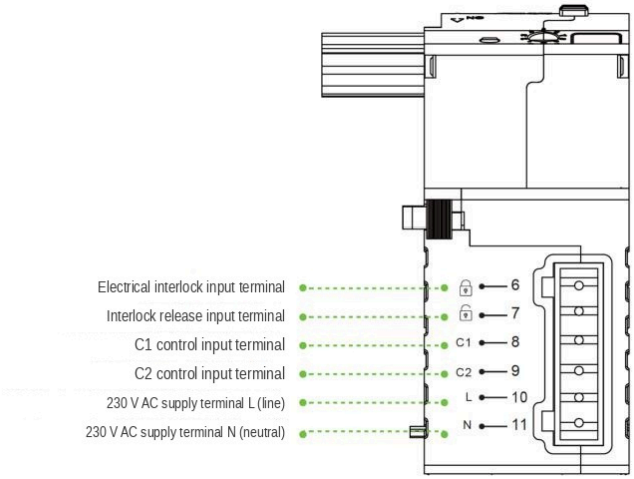


Figure 4-1 Upper Terminals (6–11) and Control Inputs

Term.	Label	Description
6	LOCK / Electrical Interlock	Electrical interlock input. Interrupts or inhibits automatic reclosing. Whether C1/C2 and RS485 are also interlocked depends on the configuration.
7	UNLOCK / Interlock Release	Unlock input. Releases electrical interlocks that can be cleared. The input duration must meet the product requirements.
8	C1	Local maintained-control input.
9	C2	Local pulse / remote enable input. Its exact behavior depends on the RC mode.

Term.	Label	Description
10	L	AC 230 V control power supply line conductor.
11	N	AC 230 V control power supply neutral conductor.

4.2 Lower Terminals (1–5)

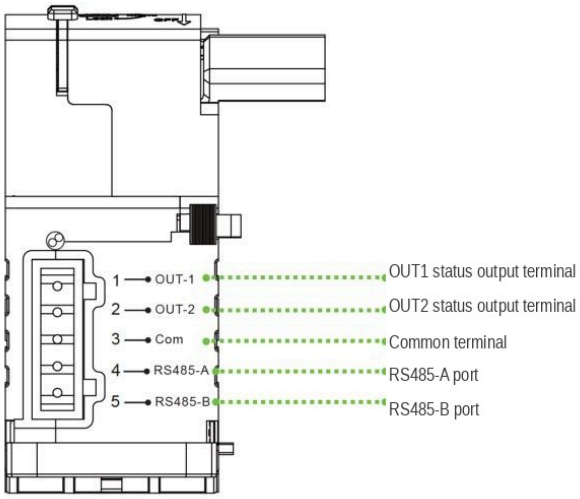


Figure 4-2 Lower Terminals (1–5), RS485, and Output Interfaces

Terminal	Label	Description
1	OUT1	Potential-free dry contact output 1; function is determined by the output mode configuration.
2	OUT2	Potential-free dry contact output 2; function is determined by the output mode configuration.
3	COM	Common terminal for OUT1 / OUT2.
4	RS485-A	Modbus RTU communication A.
5	RS485-B	Modbus RTU communication B.

4.3 Wiring Guidelines

- Use twisted-pair cable for the RS485 bus and install a termination resistor according to the site topology.
- Route control inputs separately from power circuits to reduce interference.
- Connect the insulation monitoring leads as specified for the product. Do not connect them to an impermissible potential.
- The output contacts provide status signals only. Do not use them to directly drive loads exceeding their rated capacity.

5 Operating Modes and Local Control

5.1 Auto / Manu / Lock

Pos.	Permitted Functions	Main Restrictions
Auto	Automatic reclosing, remote control, and status readout; insulation monitoring during the automatic reclosing sequence Insulation monitoring	Subject to safety conditions such as electrical interlocking and program lockout restrictions.
Manu	Local mechanical operation and status readout	Automatic reclosing is disabled; remote control is restricted by the device logic restrictions.
Lock	Maintenance lockout / padlock	All electrically operated or automatic closing is disabled; for maintenance and servicing only.

5.2 AR Reclosing Mode Selection

The AR selector is used to select the reclosing program number. See Appendix A for the MR / ER programs. The selected program must be compatible with the protective device type, the connected load, and site safety requirements.

5.3 RC Control Mode Selection



Figure 5-1 RC1 / RC2 Control Mode Selector

Mode	Description	C1	C2	RS485
RC1	Local control is primary	Maintained control: closed → close ; open → open	Pulse toggle	Available, subject to local status and interlock logic

Mode	Description	C1	C2	RS485
RC2	Central remote control is primary, with local override	Local maintained control / override	Remote enable or coordination with central control	Primary control source, subject to local override and interlock logic

5.4 RESET

Operation	Function
Press and hold for ≥3 s	Resets reclosing / fault statuses that permit reset and re-enters the control logic.
Press and hold for ≥10 s	Restores factory settings. Back up the parameters and obtain site authorization before performing this operation.

6 Indicators and Status

Interpret the status indicators together with the current operating mode, circuit breaker position, fault outputs, and supervisory system status. Do not determine site safety based on a single indicator color alone.

Priority	Indication	Typical Meaning
1	Steady red	Lock / End of Cycle / high-priority status requiring manual intervention. Refer to the firmware status word for details.
2	Slow flashing yellow	Electrical interlock active.
3	Slow flashing green	Unlock / reset in progress.
4	Steady yellow	IM Fault; insulation monitoring failed.
5	Slow flashing red	Automatic reclosing is pending.
6	Steady green	Automatic reclosing is enabled and operating normally.

7 Automatic Reclosing Function

7.1 Start Conditions

- The device is in Auto mode;
- An uncommanded trip is detected and the start conditions of the selected program are met;
- No electrical interlock or mechanical lockout is active;
- The insulation monitoring result meets the program's acceptance criteria;
- The selected program has remaining reclosing attempts.

SAFETY RESTRICTION: Do not interpret an MR program compatible with MCBs / RCBOs as permission to automatically re-energize after every short-circuit or overload trip. Automatic restoration must be determined according to the trip cause, device type, applicable standards, and an on-site risk assessment.

7.2 Basic Sequence

1. An uncommanded trip occurs.

2. Wait for RT.

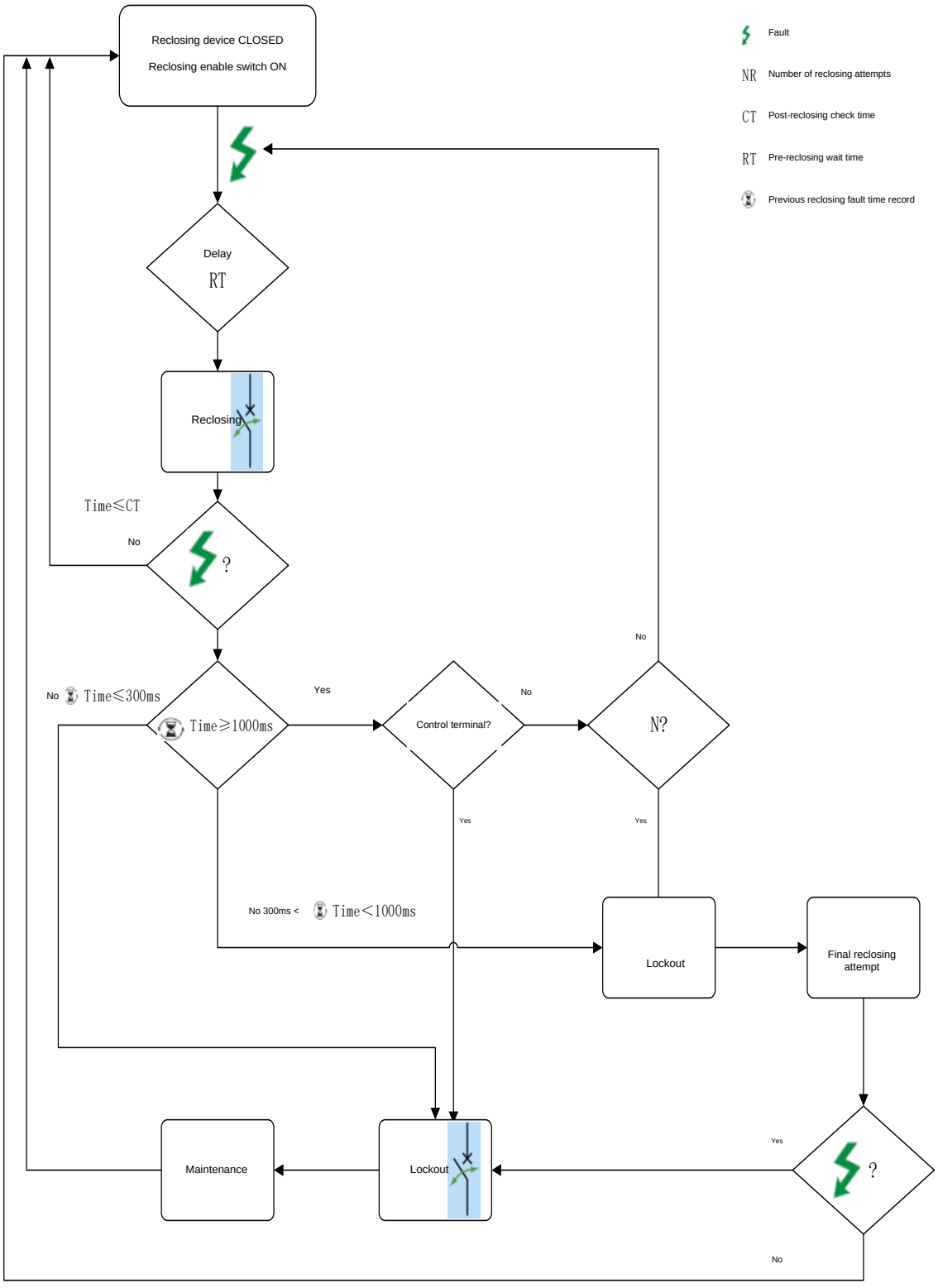
3. Perform insulation monitoring.

4. If the test passes, wait for CT.

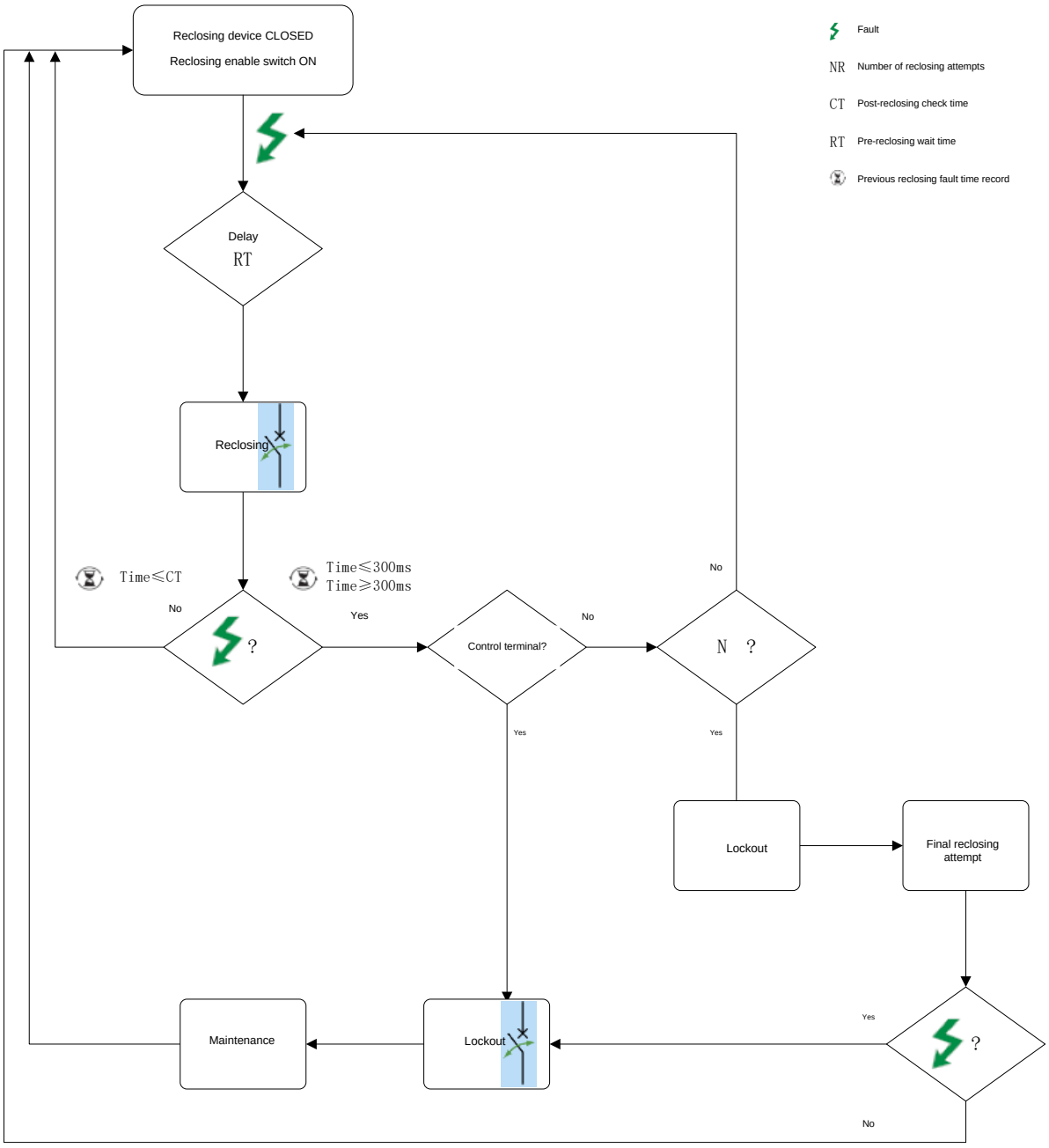
5. Issue a closing command.

6. If another trip occurs, record the failed attempt according to the program and proceed to the next waiting period.

7. Enter End of Cycle when the program termination condition is met.



Applicable to MCBs or RCBOs



Applicable to RCCBs or RCBOs

7.3 Parameter Definitions

Parameter	Name	Description
RT	Reclosing wait time	The waiting period after a trip and before the next insulation monitoring test / reclosing preparation.
CT	Closing delay	The delay between a successful insulation monitoring test and actual closing.
NR	Maximum Number of Reclosing Attempts	The maximum number of reclosing attempts permitted after the current trip.

8 RC1 / RC2 Control Logic

8.1 Control Sources

Source	Description
Local control	C1 / C2 inputs.
Central control	RS485 Modbus commands.
Automatic control	Internal reclosing logic.

8.2 RC1 Timing

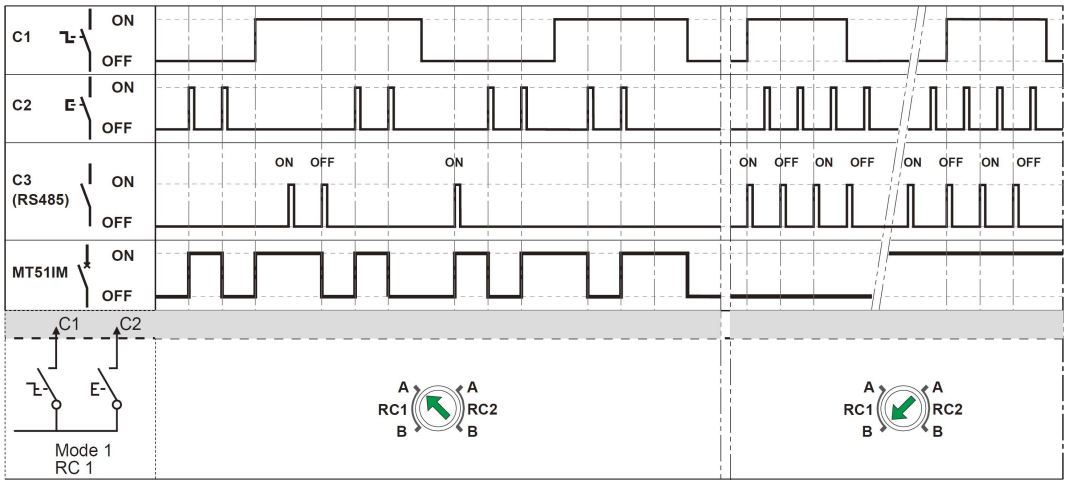


Figure 8-1 RC1 Timing Diagram

8.3 RC2 Timing

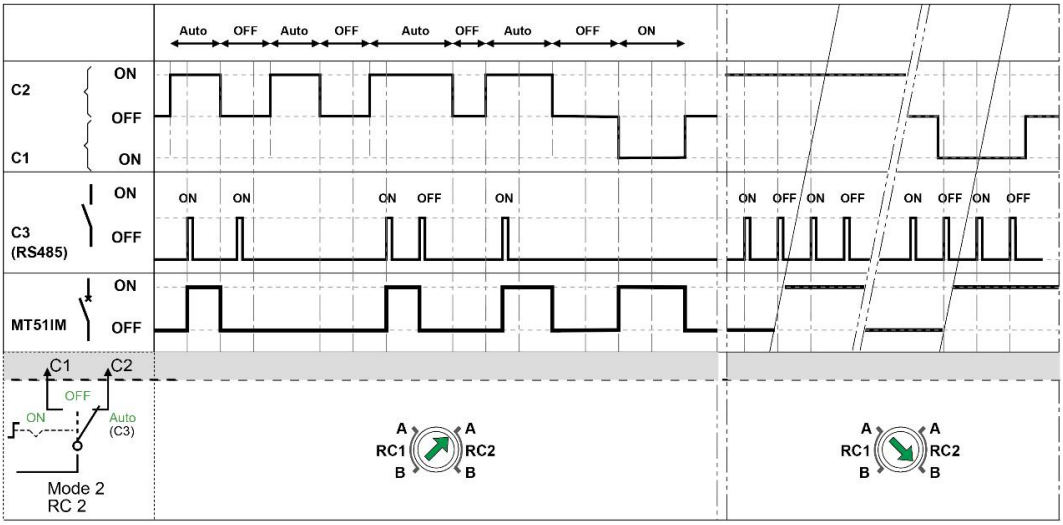


Figure 8-2 RC2 Timing Diagram

8.4 Command Conflict Handling

When valid commands are issued successively from multiple control sources, the device applies a “last command wins” rule. Safety states such as local maintenance lockout, mechanical lockout, electrical interlock, and End of Cycle have higher priority. No control command may bypass a safety lockout.

9 Insulation Monitoring Function

9.1 Functional Description

Insulation monitoring evaluates the load-side insulation condition to earth during the automatic reclosing sequence. If the test result does not meet the acceptance criteria, the device remains open and outputs IM Fault.

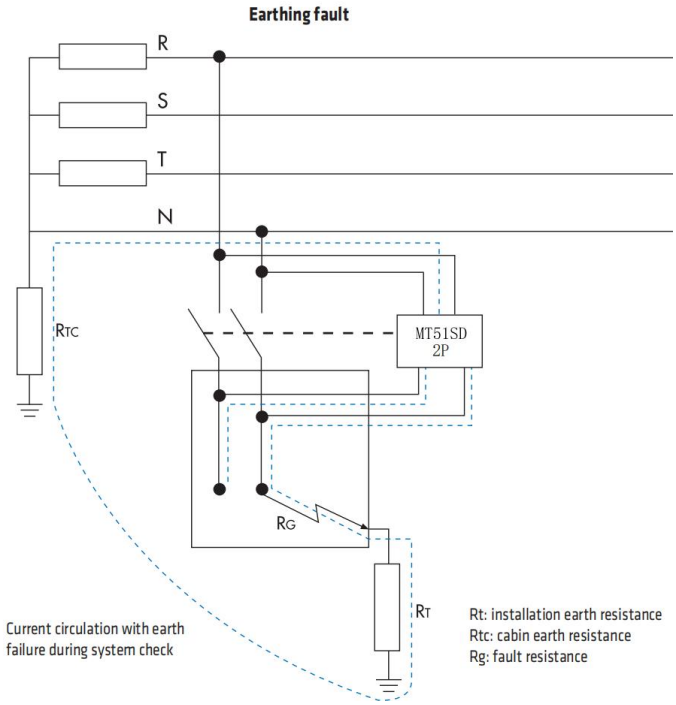


Figure 9-1 Insulation Monitoring Principle

9.2 Trigger Conditions

By default, insulation monitoring is triggered only before automatic reclosing. RS485 remote closing, C1/C2 local control closing, manual mechanical closing, and device power-on do not trigger insulation monitoring. This linkage can be adjusted through project-specific firmware configuration.

Event	Insulation Monitoring Performed
Before automatic reclosing	Yes
RS485 remote closing	No
C1 / C2 closing	No
Manual mechanical closing	No
Device power-on	No

9.3 Test Thresholds and Procedure

Test criteria: When the test resistance Rg ≤ 8 kΩ, automatic reclosing is inhibited and IM Fault is output. When Rg ≥ 16 kΩ, the automatic reclosing sequence may resume.

8. Complete the wiring according to the terminal description and confirm that the circuit breaker is ready for testing.

9. Connect the test resistor at the specified point.

10. Verify that automatic reclosing is inhibited and IM Fault is generated when Rg ≤ 8 kΩ.

11. Verify that operation can resume according to the current program when Rg ≥ 16 kΩ.

12. Remove the test resistor, restore the normal wiring, and record the results.

10 Output Contacts and Remote Status

OUT1 / OUT2 are potential-free dry contacts. The default and optional output modes must match the actual register configuration.

Mode	OUT1	OUT2	Purpose
01	Combined status code	Combined status code	ON / OFF / TRIPPED / IM Fault / End of Cycle / Lock, and other combined statuses.
02	Open / closed status	IM Fault / End of Cycle	Default mode.
03	Open / closed status	IM Fault	Simplified fault output.
04	IM Fault	End of Cycle	Dual fault outputs.

11 Modbus Communication

The MT51SD uses Modbus RTU. For detailed register definitions, frame formats, CRC information, and complete command examples, refer to the separate “MT51SD Communication Protocol.”

Item	Definition in This Manual
Interface	RS485
Protocol	Modbus RTU
Default Address	1
Default Baud Rate	9600 bps
Default Serial Format	8N1

Item	Definition in This Manual
Common Function Codes	0x03 Read Holding Registers; 0x06 Write Single Register

12 Commissioning and Functional Verification

13. Verify the model, compatible circuit breaker, control power supply, and wiring.
14. In Manu mode, verify mechanical opening, closing, and position feedback.
15. Verify Auto / Lock mode switching and interlock behavior.
16. Verify the behavior of C1 / C2 inputs in RC1 / RC2 modes.
17. Verify status readout via RS485 and execute permitted opening / closing commands.
18. Use the specified test resistor to verify insulation monitoring and IM Fault.
19. Verify that OUT1 / OUT2 match the selected output mode.
20. Perform a controlled automatic reclosing test and verify that RT, CT, and NR match the program settings.

Commissioning Record: Tests involving automatic re-energization must be performed in an isolated, controlled test circuit with no risk of personnel contact.

13 Troubleshooting

Symptom	Possible Cause	Recommended Check
Failure to Close	Lock / electrical interlock / IM Fault / End of Cycle / control power supply abnormality	Read the mode, fault, and lockout statuses first, then check the control inputs.
Automatic Reclosing Does Not Start	Not in Auto mode, program set to MR0 / ER0, an open command is active, or interlock is active	Verify the mode and program; check the trip source.
No RS485 Response	Address / baud rate / parity mismatch, A/B wires reversed, or bus issue	Check communication parameters, polarity, and termination.
OUT Status Does Not Match	Output mode register configuration differs	Read the output mode configuration and evaluate it according to the corresponding logic.
Persistent Insulation Fault	Actual insulation fault on the load side or incorrect monitoring lead wiring	Keep the device open and inspect the load, PE, and insulation monitoring leads.

14 Technical Specifications

Parameter	Specification
Rated Operating Voltage Uc	AC 230 V
Frequency	50 / 60 Hz
Opening / Closing Operating Time	≤ 0.5 s (excluding reset time)
Impulse Withstand Voltage Uimp	4 kV
Power-Frequency Withstand Voltage	2 kV
Rated Insulation Voltage Ui	500 V
Degree of Protection	IP20 (standalone) / IP40 (inside enclosure)
Mechanical Endurance	≥ 10,000 operations
Operating Temperature	-25 °C ~ +70 °C
Relative Humidity	≤ 95% at +25 °C, non-condensing
Power Consumption	Standby: < 1.5 VA; operating: < 20 VA
Mounting Method	DIN-rail mounting

15 Maintenance and Decommissioning

- Regularly inspect terminal tightness, the enclosure, mechanical linkage, and the status of the compatible circuit breaker.
- If an insulation fault, repeated tripping, or mechanism abnormality occurs, identify and eliminate the root cause. Do not use repeated reclosing to mask the fault.
- During maintenance, use Lock / a padlock and isolate the equipment on site to prevent accidental re-energization.
- Dispose of the product in accordance with local requirements for recycling electrical and electronic equipment and metal materials.

Appendix A MR / ER Reclosing Programs

The following tables list the MR / ER reclosing programs. CT is the delay between a successful insulation monitoring test and actual closing.

Mode	NR	RT (pre-reclosing delay for each attempt)	CT
MR0	0	—	—
MR1	1	30 s	15 min

Mode	NR	RT (pre-reclosing delay for each attempt)	CT
MR2	1	1 min	30 min
MR3	2	1 min / 90 s	15 min
MR4	2	90 s / 3 min	30 min
MR5	2	2 min / 4 min	30 min
MR6	3	90 s / 3 min / 6 min	15 min
MR7	3	2 min / 4 min / 6 min	30 min
MR8	3	2 min / 4 min / 8 min	30 min
MR9	User-defined	Programmable	Programmable
Mode	**NR**	**RT (pre-reclosing delay for each attempt)**	**CT**
ER0	0	—	—
ER1	3	2 / 4 / 8 min	15 min
ER2	6	2 / 4 / 8 min; remaining attempts: 8 min	15 min
ER3	6	10 / 20 / 30 / 60 / 130 / 600 s	15 min
ER4	7	30 s / 1 / 2 / 3 / 4 / 8 / 16 min	15 min
ER5	7	2 / 4 / 8 / 16 / 32 min; remaining attempts: 32 min	15 min
ER6	8	30 s / 1 / 2 / 3 / 4 / 5 / 6 / 7 min	15 min
ER7	8	2 / 4 / 6 min; remaining attempts: 6 min	15 min
ER8	10	90 s; remaining attempts: 90 s	15 min
ER9	User-defined	Programmable	Programmable