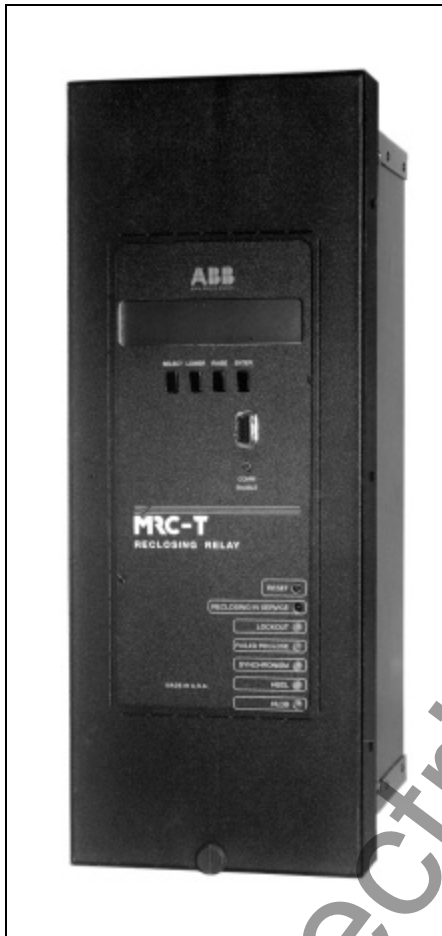


Effective: September 1996

Mailed to: E, D, C/40-100C, 41-400B

Multi-Zoned Distance
Device Number: 79, 25

Type MRC-T Microprocessor Transmission Line Reclosing Relay



Introduction

MRC-T is designed for the Protection Engineer. It enables the engineer to apply the functional capabilities of the MRC-T to meet specific reclosing requirements. Records are available in the relay to enable the engineer to evaluate the scheme used following an operation.

The MRC-T is designed for System Operations. Its flexibility provides the system operating department the ability to meet different reclosing requirements throughout the entire system. Changes are made easily as system conditions change.

The MRC-T is designed for the Maintenance and Construction Engineer. The MRC-T's compact drawout design, with front panel operator interface and built-in test switches, provide for easy testing and maintenance. The hardware design uses minimum components with proven reliability. Self-checking diagnostics and failure alarms can maximize time between periodic maintenance. Its retrofit design simplifies the MRC-T installation using the same panel cutout as older electromechanical units.

The MRC-T is designed for Utility Management. It provides management a means to effectively address cost-reduction and high in-service goals by taking advantage of microprocessor technology and features of the MRC-T.

Application

The MRC-T relay is a numerical reclosing system, with internal synchronism check. All measurements and logic are performed by digital means, using a microprocessor. It is designed for use on transmission lines to control reclosing of a breaker following tripping by protective relays. Where a separate relay is preferred to the reclosing function being included in a distance relay package, the MRC-T offers full flexibility in allowing the primary or secondary relay to be disabled without affecting the reclosing function.

Basic Features

- Single-shot or multiple-shot reclosing. 1 - 4 Instantaneous or time delay reclosures
- Analysis of successful and unsuccessful reclosures, magnitudes and angles of voltages in the check scheme as required
- Selectable restriction of the number of reclosures within a given time period due to restricted capability of the circuit breaker (closing resistors)
- Selectable reclosing initiated by 52b

contact and/or external input

- Selectable parameters for each reclose shot to be independently configured
- Flexible programmable inputs and outputs aid in matching existing reclosing schemes
- Where retrofit relay must fit into the panel cutout of an older electromechanical relay

MRC-T may be programmed for any number of reclosures up to four shots.

Each reclosure can be independently configured for reclose initiation (RI) by 52b, and/or external RI input. Reclose block by external RB input. Reclose dead time, settable from 0.01 seconds to 250 seconds. Reclose for HLDB, HBDL, and/or synchronism check with a wait time for successful check scheme to occur.

Using the programmable logic, many functions can be added to the emulate other reclosing functions. Four inputs can be programmed by a Boolean logic equation to operate one of two output contacts. For example, the equation $Ab + Cd = \text{repre}$ represents: if input A is true AND input B is not true, OR input C is true AND input D is not true, an output will occur. Time delay can be added for pickup and dropout of the selected output. An output contact can then be programmed to initiate reclosing through reclose initiate input.

An LCD display can be supplied for viewing and applying settings, viewing target data (two most recent targets), viewing statistical data, performing functional tests, and indicating status of reclosing cycle. In addition, all the above functions can be performed via the communications ports.

Hot and dead voltage thresholds and maximum angle for synchronism-check, time delays and reset times are settable.

The MRC-T can go to lockout for a failure

to close within a set time. Close contacts remain closed for duration of close delay unless the breaker closes sooner.

Inputs are available to:

- Pause the reclosing scheme and resume when input is released
- Skip a shot and move to the next one
- Drive to lockout
- Block reclosing
- Indicate 52b status

The MRC-T also has "counter" functions to:

- Limit the time required for a complete reclosing cycle.
- Limit the total number of reclosures the relay can initiate.
- Limit the number of reclosures within a set time period.

A selectable follow-breaker feature forces the reclosing cycle to follow the 52b input, whether the MRC-T or another device closed the breaker. The MRC-T will go to lockout following the set number of reclosures instead of pumping for a mechanical failure in the breaker.

Reclosing event records list the reclosure number, time, result, voltages and angles.

Statistical data contains the number of each reclosures and number of lockouts.

Self-checking software is provided with a front panel indicating LED and output alarm contact failure occur.

The MRC-T can also be used to supervise a manual close of the breaker with a separately selectable internal voltage check and/or synchro-verifier scheme.

The MRC-T is housed in an FT-32 Flexitest Case with built-in FT test switches. Flexitest Cases, consisting of an outer chassis and an inner chassis, provide drawout construction which simplifies maintenance work and retrofit applications.

Horizontal or vertical mounting is available. The MRC-T can be mounted in a 19" rack with the use of an adapter plate.

The outer chassis of the FT-32 case, is where all input/output signals are surge protected. All external connections are made through the rear of the case.

The outer chassis consists of 2 surge protection modules, a backplane surge protection module, a metal case, FT-switches and a communication interface consisting of a PONI (INCOM or RS232C) mounted on the back of the case, from the inside, on the backplane module.

The inner chassis consists of a frame, 2 switchjaws and the following modules:

- I/O Module (Bottom): Consisting of 4 contact input opto-isolators and 2 output relays.
- I/O Module (Top): Consisting of 4 contact input opto-isolators and 4 output relays.
- Microprocessor Module: Consisting of a microcontroller (16 bits Intel 80C196 operating at 10 MHz), two EPROM program memory chips; two RAM chips, and EEPROM for data retention, a real time clock with a chip battery and indication LED's.
- Power Supply/I/O Module This is an isolated switching power supply capable of supplying +5 Vdc for microcontroller and surrounding IC logic, ± 12 Vdc for reference voltages and +24 Vdc for communication. The two analog inputs for synchronism check, 4 contact inputs and 2 contact outputs for programmable logic are also contained in this module. Three different styles of power supply boards are required to accommodate the input voltage ranges.
- Man-machine interface/display module (Optional): Consisting of a 2-line, 16 character per line Liquid Crystal Display (LCD), and four push-buttons for setting data entries (Figure 1-12).
- Front RS232C Communication Module (Optional): providing front RS232C Communication interface to microprocessor module (Figure 1-13).

Standard front panel indication consists of a target reset push-button and six LEDs which indicate:

- Reclosing In Service
- Lockout
- Failed Reclose
- Synchronism
- HBDL (Hot Bus Dead Line)
- HLDB (Hot Line Dead Bus)

The optional front panel man-machine interface contains a 2 line x 16 character LCD and four push-button for data entry and retrieval.

Integral self-checking software includes the following functions:

- a. Program Memory Check-sum
Immediately upon power-up, the relay does a complete EPROM check-sum of program memory. Afterwards, the MRC-T continually verifies the program memory check-sum.
- b. Power Up RAM Check:
Immediately upon power-up, and continuously thereafter the relay does a complete test of the RAM data memory.
- c. EEPROM Check:
Settings are stored in EEPROM in three identical arrays. These arrays are continuously checked by the program. If any of the three array entries disagree, an EEPROM failure is detected.

Relay Communications

Special communications software, RCP, is provided for obtaining fault, metering and current settings data as well as sending settings to the MRC-T. RCP can best be described as a user friendly way of using a personal computer (PC) to communicate with ABB protective relays by way of pull-down menus. By coupling a computer with the appropriate communications hardware, it is possible to perform all relay setting and data interactions. RCP is required to communicate with the MRC-T via the communication port(s). Refer to the RCP Instruction Manual, I.L. 40-603, for detailed information.

Basic System

- Selectable 1-4 reclosing shots
- Reclosure dead time (settable for each reclose) 0.01 - 250 seconds
- Selectable reclosing initiate signal for each reclose:
52b only
Reclose Initiate (RI) only
52b or RI
52b and RI
- Reclosure block feature setting selectable for each reclose
- Ac or dc control circuit power
- Close contact closure energizing time (reset by removal of 52b) 0.01 - 2 seconds
- Separate synchronism/voltage check devices can be used to control MRC-T reclosing through the "Switches" inputs and allows:
Hot Line Dead Bus (HLDB) voltage check and/or
Hot Bus Dead Line (HBDL) voltage check and/or
Synchronism (Sync) to be used with:
Maximum Wait Time for voltage check or Sync, 0 - 990 seconds
Minimum Sync Condition Time Duration, 0.01 - 20 seconds for any reclose sequence
- Drive to Lockout input for manual trips and breaker failure or bus lockout relay input.
- Reclosure skip input
- Hold input to freeze reclosing cycle
- Failed reclose timer:
1 - 250 seconds
- Maximum cycle timer:
1 - 990 seconds
- Follow Breaker function (52b status monitored during reclosing sequence)
- Breaker operation and maintenance monitoring:
Settable cumulative reclosures before alarm, 0 - 990 reclosures
Breaker limit operations:
Maximum reclosures (Max Count) in set Duration time, 0 - 250 reclosures
Duration time limit, 1 - 250 minutes
Recovery time, after Max Count exceeded, 1 - 250 minutes
- Reclosure event records (recorded as targets)
Reclosure number
Number of attempts to completion
Result, successful or lockout

- Time of event
Synchronism information (if synchronism used)
- Real time clock time stamps reclosing events
- Four programmable inputs (any combination of OR's and AND's)
- Two programmable logic outputs (fed by the programmable inputs)
- Alarms for:
Relay Failure
Intermediate LOCKOUT
Reclosure Failure
Reclosure LOCKOUT
Reclosing in Progress

Optional Features

- Internal Sync/voltage checking logic including:
Settable "hot" voltage range
30 - 70 volts for 70 volt input relay or
50 - 120 volts for 120 volt input relay
- Settable "dead" voltage range
0 - 30 volts for 70 volt input relay or
0 - 50 volts for 120 volt input relay
- Settable HLDB and/or HBDL and/or Sync for each reclosure sequence
- Settable maximum angle for synchronism, 0 - 60 degrees
- Maximum Wait Time for voltage check or Sync, 0 - 990 seconds or infinite time
- Minimum Sync Condition Time Duration, 0.01 - 20 seconds
- Line and bus voltage input for either 70 volts or 120 volts
- Man-Machine Interface consisting of 2 X 16 character LCD display. Review or reset breaker operations counters, review settings and targets
- Review results of self-checking test
Display status of relay, Ready, Disabled or Lockout
Display reason for relay being in Lockout state
Test output contacts, input circuit integrity and LED operation
- Front communications port, RS232C, 9 pin DCE connector, settable for 300 - 19,200 bits/second
- Choice of rear communications port, either RS232C or INCOM network type (default is RS232C)
- Horizontal or vertical mounting
- Choice of 48, 125 or 250 volts dc control power

Specifications

General:

Rated ac Voltage
70 Vrms L-N (60Hz)
63.5 Vrms L-N (50Hz)
Continuous 1.5 x nominal voltage
10 Second 2.5 x nominal voltage
Rated Frequency 50 or 60 Hz

DC Power:

Nominal	Operating Range
48/60 Vdc	38-70 Vdc
110/125 Vdc	88-145 Vdc
220/250 Vdc	176-290 Vdc

Burdens:

Dc	7W normal
Ac	0.02 VA @ 70 Vac/phase

Contacts Ratings:

Close Contact	30 A Make
Other Outputs	3A Continuous
Interrupt	0.1 A Resistive
Contacts also meet IEC - 255-6A, IEC - 255-12, IEC - 255-16, BS1 42-1982.	

Dimension and Weight:

Height	15.125"
Width	5.876"
Depth	6.625"
Weight	19 lbs.

Environmental:

Ambient Temperature Range	
For operation	-200C to +60'C
For storage	-40'C to +80'C

Dielectric Test Voltage 2.8 Kv, dc, 1 minute (ANSI C37.90, IEC 255-5).

Impulse Withstand Level 5Kv peak, 1.2/50 microsecond, 0.5 joule (IEC 255-5).

Fast Transient Surge Withstand Capability 4Kv, 5/50 nanoseconds (IEC 801-4); 5Kv 10/150 nanoseconds (ANSI C37.90.1).

Oscillatory Surge Withstand Capability 2.5 Kv, 1 MHz (ANSI C37.90.1, IEC255-6).

EMI Volts/Meter Withstand 25MHz-1GHz, 10 V/m Withstand (proposed ANSI C37.90.2).

MRC-T CATALOG NUMBERS

MOUNTING

- Horizontal
- Vertical

BATTERY VOLTAGE

- 48 Vdc
- 125 Vdc
- 250 Vdc

RECLOSING

- Multi-shot Reclosing
- Multi-shot Reclosing w/sync-check (70 V input)
- Multi-shot Reclosing w/sync-check (120 V input)

PROGRAMMABLE LOGIC (I/O)

- 2 Relays w/(1) Form-C Contact

COMMUNICATIONS PORT (Rear)

- Flexible (PONI-rear mounted)
- INCOM Network
- RS232C (Default)
- RS232C with IRIG-B/Input

FRONT PANEL INTERFACE

- LCD Display
- RS232C Port (9-Pin DCE Connector)
- Both
- None

RELAY COLOR

- Black (Default Color)
- Beige

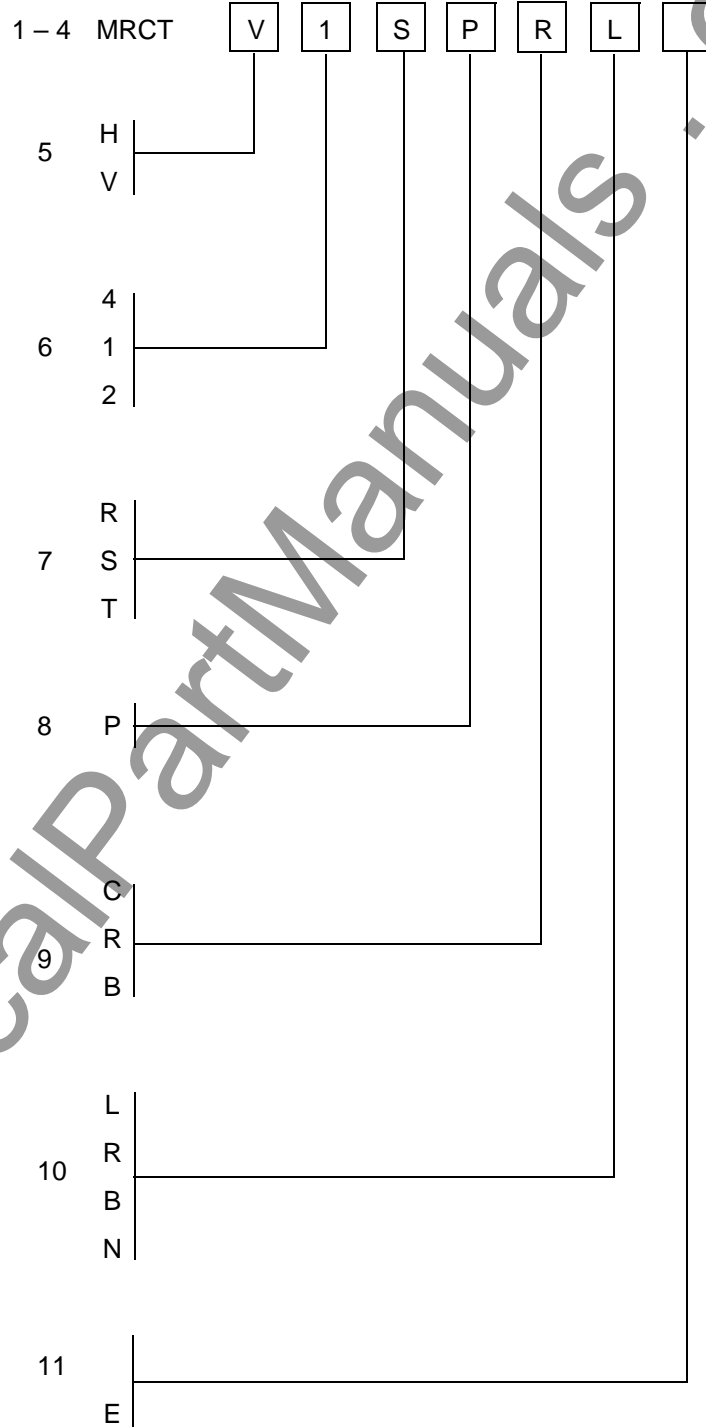


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