



Westinghouse Electric Corporation
Distribution Apparatus Division
Bloomington, Indiana 47401

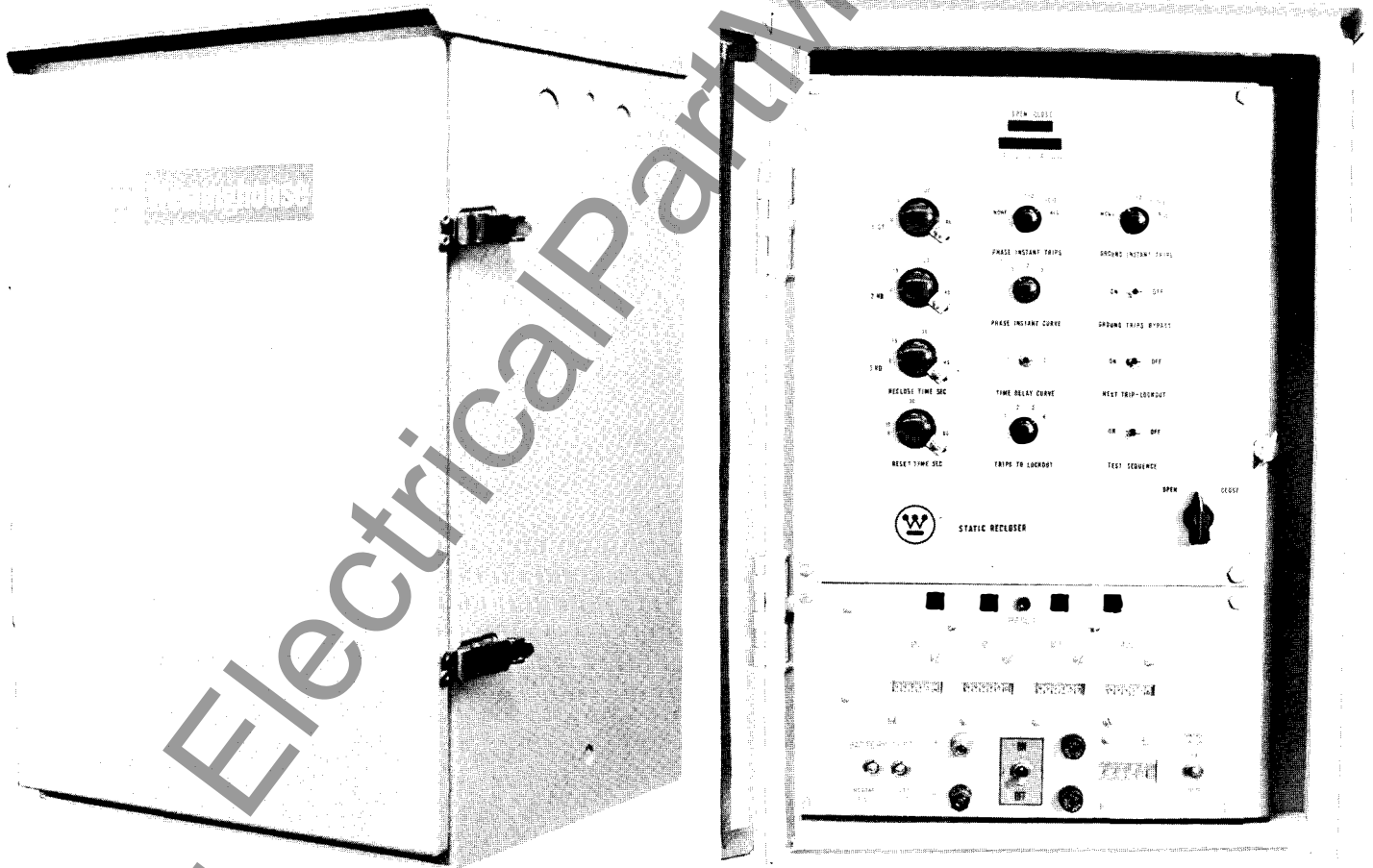
Descriptive Bulletin
38-724

Page 1

December 1976
New Information
E.D.C/1994/DB

Static Control for
All Reclosers

Type MTR Static Overcurrent Protection Package



General

The type MTR static overcurrent protection package can be used on all Westinghouse ES and ESM reclosers.

Benefits

•For ease of field maintenance and trouble shooting, the Westinghouse type MTR static control package can be removed by unplugging a connector and removing four bolts.

•Operating lights show the position of the static counter as well as whether the recloser is open or closed. The standard MTR package also includes a lockout indicator light.

•The MTR static control provides seven test points to enable the user to monitor the various control functions.

•The MTR control and recloser are factory assembled and tested as a unit which reduces installation time.

•Faulted phase and ground indicators as well as counters are available as accessories and can all be mounted in the standard size 1 cabinet. The phase targets automatically reset and indicate the phase or phases that last tripped the recloser. This aids the user in locating a permanent fault quickly. The counters monitor the number of times each phase caused the recloser to operate which may help find the source of a temporary fault.

•The spring close-spring open stored energy mechanism allows the recloser to be manually closed in on an energized line.

•The MTR solid state control can utilize any trip or close voltage source.

•Reclose and reset times are adjustable by a dial. Any time setting between 6 and 60 seconds is possible on all operations except the first reclose operation which can be set from instantaneous to 60 seconds.

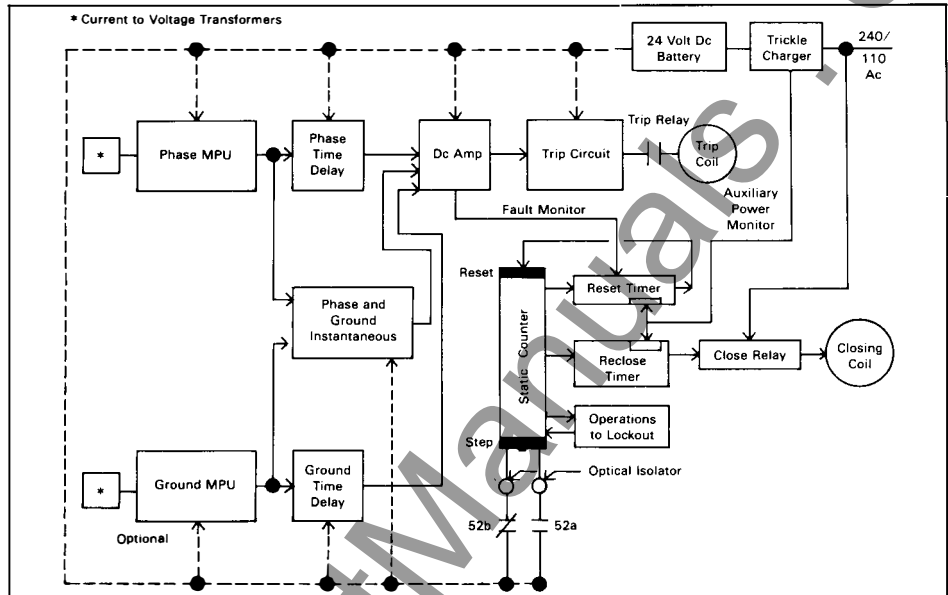
•Reset after successful reclose is a standard feature of the MTR static control.

•A toggle switch chooses one of the two phase time delay curves that are available on each board. A rotary switch selects one of the three instantaneous curves that are also available on each phase board.

•A selector switch determines which of the operations on the ground unit will be instantaneous.

•The phase and ground time curve boards are identical to the boards used on the previous design static control.

•Cold load pickup is incorporated in the control switch. By holding the control switch in the close position, the minimum trip is increased by a factor of 2.5 enabling the user to energize most feeders without first dropping load.



•The MTR control includes a test sequence switch to check the operation of the recloser and control.

•The MTR control includes the standard feature of "next trip lockout" to prevent reclosing. This switch, when moved to the "on" position, prevents reclosing and trips the recloser on the instantaneous curve.

Description of Operation (See Block Diagram)

Three bushing current transformers provide current sensing for the static control. The primaries of the three current transformers are connected to the bushing current transformers. The secondary voltages are fed through full wave bridges connected in parallel. This connection results in a maximum voltage network which feeds the phase and ground minimum pickup circuit. The voltage supplied to the phase curve shaping network is proportional to the magnitude of the fault current on any phase.

After a time delay, determined by the fault magnitude, the curve shaping network sends a signal to the d.c. amplifier which in turn energizes the trip coil through the contact of a trip relay.

The logic of the static control is derived from the static counter. The static counter is the static equivalent of a mechanical stepping relay which is set to allow the recloser to interrupt and automatically reclose a predetermined number of times. The position of the static counter in its cycle determines whether the tripping sequence will be instantaneous or time delayed as well as the length of the reclosing time.

The reclosing timer circuit energizes the close coil through the contacts of a closing relay. The

reclosing time delay circuit is quick resetting permitting the same circuit to be used for all reclosing intervals.

The reset timer is energized through a 'b' contact of the auxiliary switch when the recloser closes and the current level is less than minimum trip.

When current is in excess of the minimum trip setting, a signal from the d.c. amplifier disables the reset timer preventing it from resetting the counter. This fault monitor circuit makes possible reset times less than the maximum time delay trip without fear that the recloser may not lockout in the event of a low current fault.

When optional ground tripping is supplied, a fourth current to voltage transformer is connected to the bushing current transformer neutral to detect circuit unbalance. The secondary voltage of this transformer is also applied to a full wave bridge. The output voltage is applied to the d.c. amplifier through the ground trip minimum pickup and curve shaping network.

Static Control Features Panel Construction

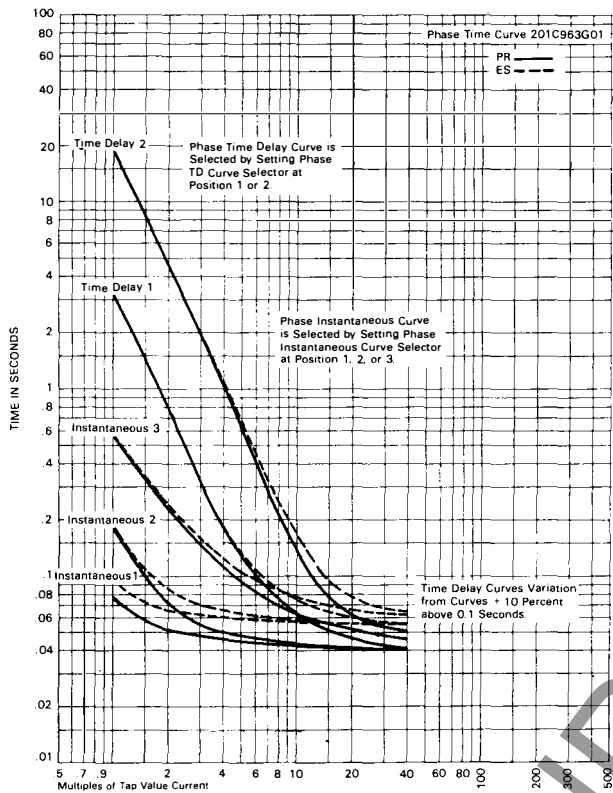
The front panel of the static control is designed and clearly marked to simplify changes in the control setting of the recloser as system demands vary. The major components of the MTR static control are:

- MTR Control Panel
- Static Phase Protection Unit
- Static Ground Fault Unit
- Faulted Phase Indicator Unit
- Ground Fault Indicator Unit
- Remote Trip and Close Unit



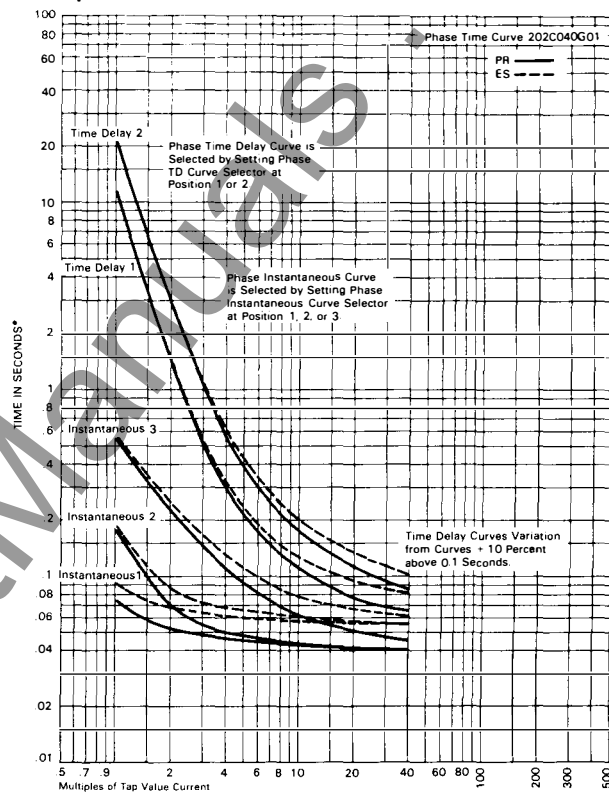
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Standard Phase Time Curve



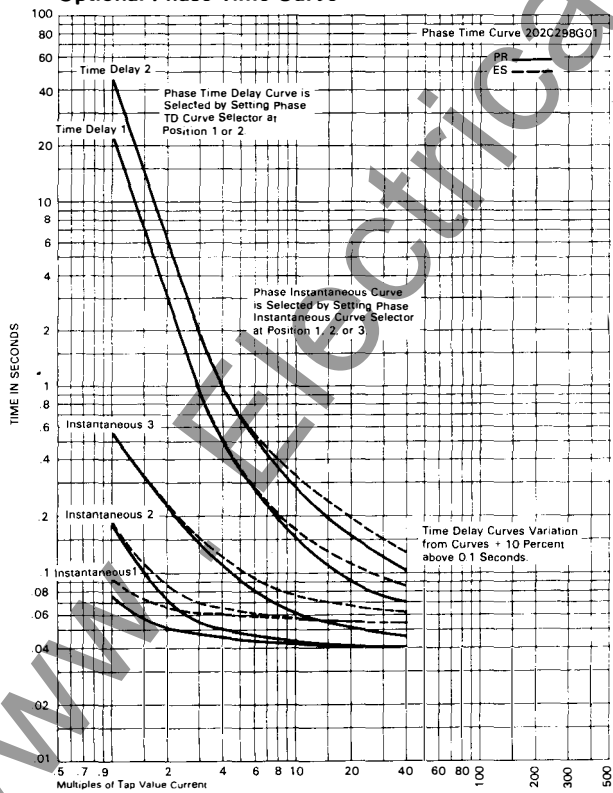
Phase Tripping Clearing Time-Current Characteristics

Optional Phase Time Curve

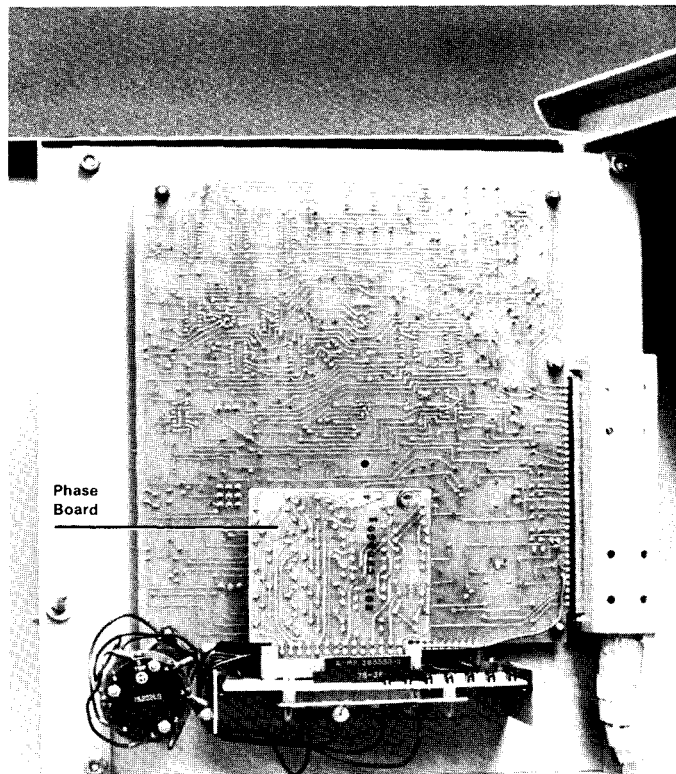


Phase Tripping Clearing Time-Current Characteristics

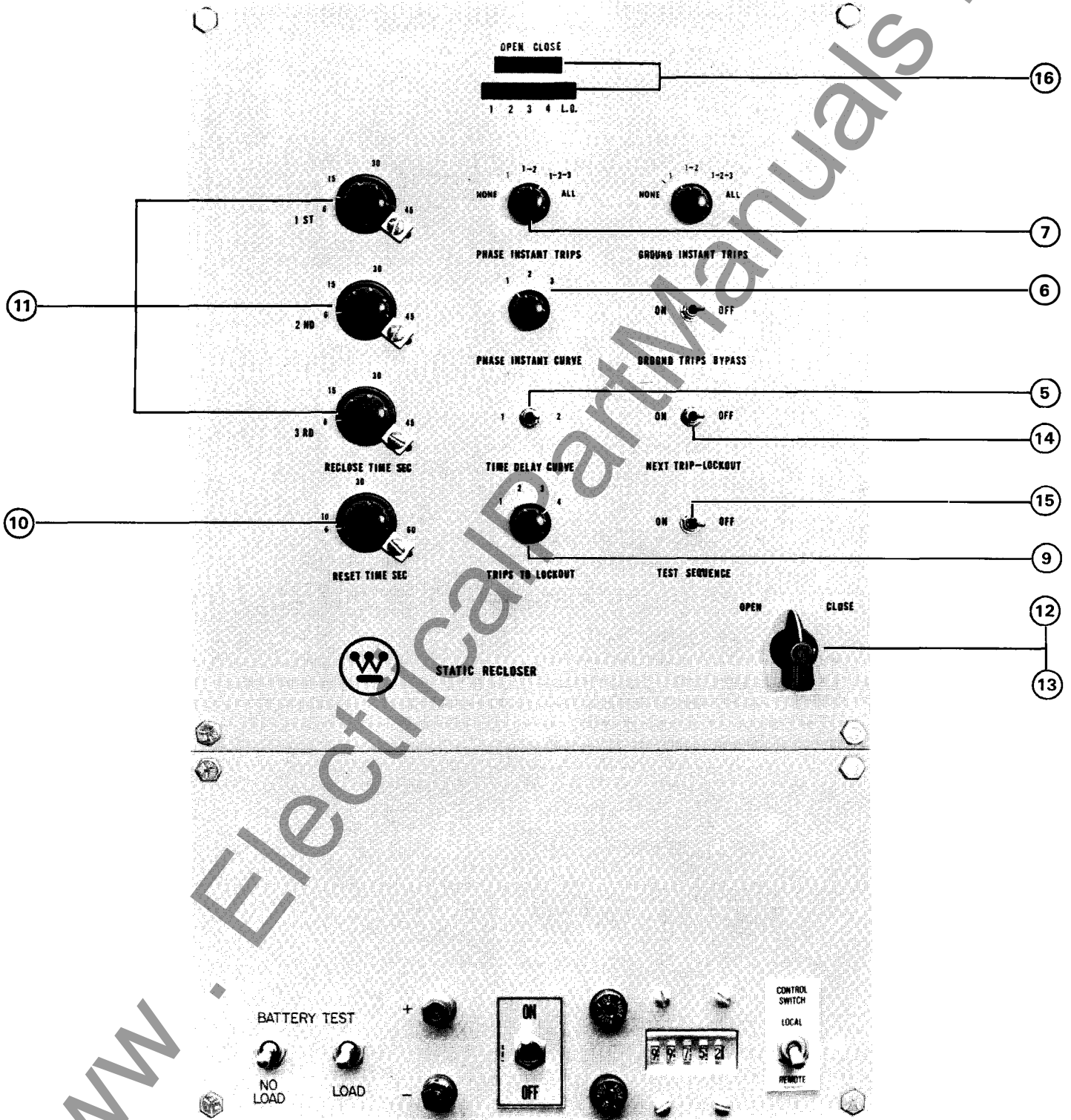
Optional Phase Time Curve



Phase Tripping Clearing Time-Current Characteristics



Phase Time-Current Curve Mounted on Rear of Front Panel



Typical MTR Panel



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MTR Control Panel

The standard MTR control panel includes the power switch, recloser electric operations counter, battery test device, and control fuses. The faulted phase and ground indicators and counters and the remote-local switch are also mounted on this panel when specified.

- (1) Power Switch—allows control to be disconnected by moving the toggle switch to the "off" position.
- (2) Battery Test Device—this feature provides the user with a convenient method to check the condition of the 24 volt d.c. Ni-CAD battery with a standard voltmeter. Panel mounted test jacks, 10 ohm load resistor, and two test switches are included to permit load and no-load testing.
- (3) Fuses—protects low voltage circuit.
- (4) Electric Operations Counter—cyclometer dial records each recloser operation.

Static Phase Protection Unit

This unit provides conventional three phase overcurrent protection. By accepting the same minimum trip on ground faults, this unit can also be connected to provide phase and ground overcurrent protection. This is accomplished by utilizing a two phase and one ground overcurrent relay scheme. If a different value of ground minimum trip is required, the static ground fault unit must also be purchased.

Curve shapes can be changed by substitution of the phase board. Each phase board provides two time delay curves and three instantaneous curves as shown on page 3.

- (5) Phase Time Delay Curve—either of the two time delay curves may be selected by setting a toggle switch on the control panel.
- (6) Phase Instantaneous Curve—any one of the three instantaneous phase curves may be selected with the three position rotary switch on the control panel.
- (7) Phase Instantaneous Trip Selector—the static control has five different settings for instantaneous operations. Instantaneous trip operations (zero to four) may be selected by setting a selector switch on the front panel.

(8) Phase Minimum Trip—a minimum trip resistor establishes the trip current for each phase. These three resistors are mounted on a panel in the back of the cabinet and are easily disconnected by removing two mounting screws. There are several minimum trip values available as described in A.D. 38-723, page 8.

(9) Operations to Lockout—the number of operations to lockout is set by turning the selector switch to one of the four available positions.

(10) Reset Time—the reset time can be set at any value from 6 to 60seconds by an adjustable dial.

(11) Reclose Times—adjustable by a dial on the control panel to any value within the time range indicated below:

Operation	Time Range
1st	Instantaneous to 60 seconds
2nd	6 to 60 seconds
3rd	6 to 60 seconds

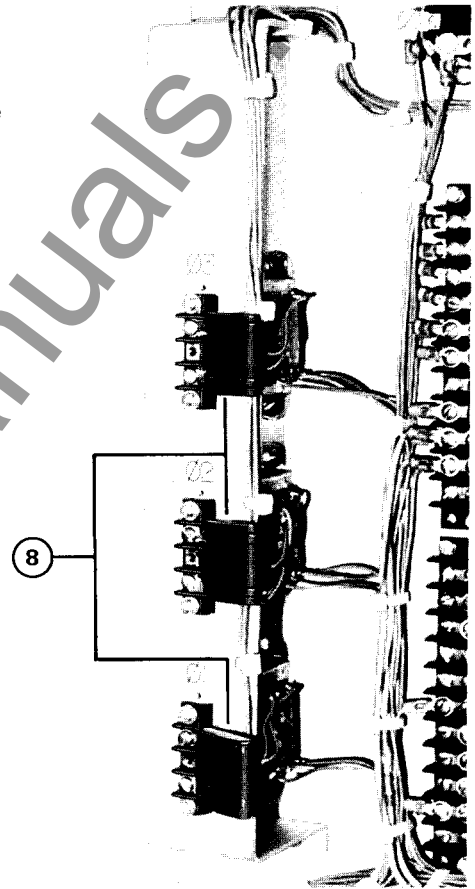
(12) Control Switch—the control switch permits the operator to electrically trip or close the recloser.

(13) Cold-Load Pickup Switch—the minimum trip setting is raised to a value two and one-half times the minimum trip setting by holding the control switch in the closed position. The control returns to the normal minimum trip setting when the control switch is released.

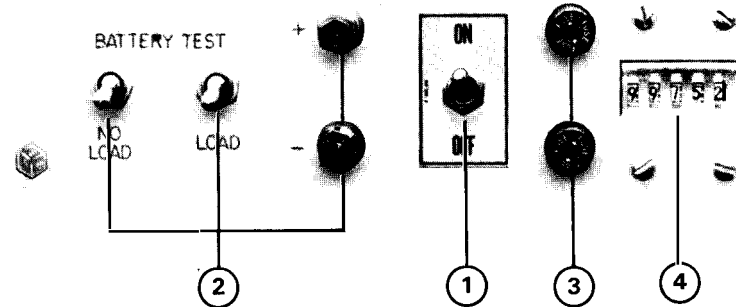
(14) Next Trip Lockout Switch—this switch sets the control to operate and lockout on the instantaneous curve and cancels the reclosing function of the control.

(15) Test Sequence Switch—this switch is used to check the operation of the recloser and control. If the control and recloser are operating properly, the recloser will trip and close in its programmed operating sequence.

(16) Indicator Lights—the top set of lights indicates whether the recloser is open or closed. The lower array of indicator lights shows the sequence state of the static counter, including lockout.



Phase Minimum Trip Resistors Mounted on Rear Panel



MTR Standard Control Panel

Static Ground Fault Unit

Ground fault protection with a minimum trip setting different than the phase minimum trip setting is available as an optional feature.

Each ground curve board provides one instantaneous and one time delay curve. Several ground curve boards are available as shown on page 7.

(1) Ground Instantaneous Trip Selector—any number of ground instantaneous operations, zero to four, may be selected by a dial setting on the front of the control panel.

(2) Ground Minimum Trip—a ground minimum trip resistor establishes the ground trip current. This resistor is mounted similar to the phase minimum trip resistors. Several minimum trip values are available as described in A.D. 38-723, page 8.

(3) Ground Trip Bypass—this switch in the "on" position blocks ground tripping.

Faulted Phase Indicator Unit

This unit indicates which phase or phases last tripped the recloser. A subsequent trip on a different phase resets the previous phase

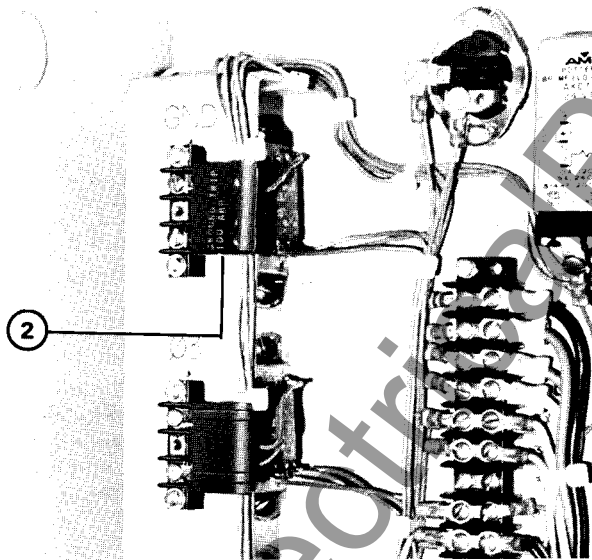
target or targets. The faulted phase indicator unit may also be reset manually by pushing the reset button.

Ground Fault Indicator Unit

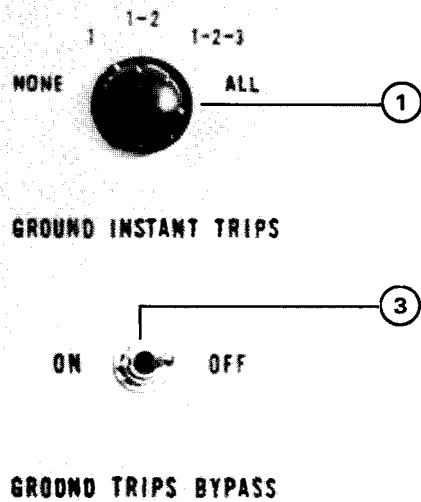
A target indicates when a ground fault trips the recloser. The target can only be reset manually by pushing the button.

Remote Trip and Close Unit

The remote trip and close unit enables the user to trip and close the recloser from a remote location. This unit blocks the reclose function when the recloser is tripped from the remote location.



Ground Minimum Trip Resistor Mounted Above Phase Minimum Trip Resistors on Rear Panel



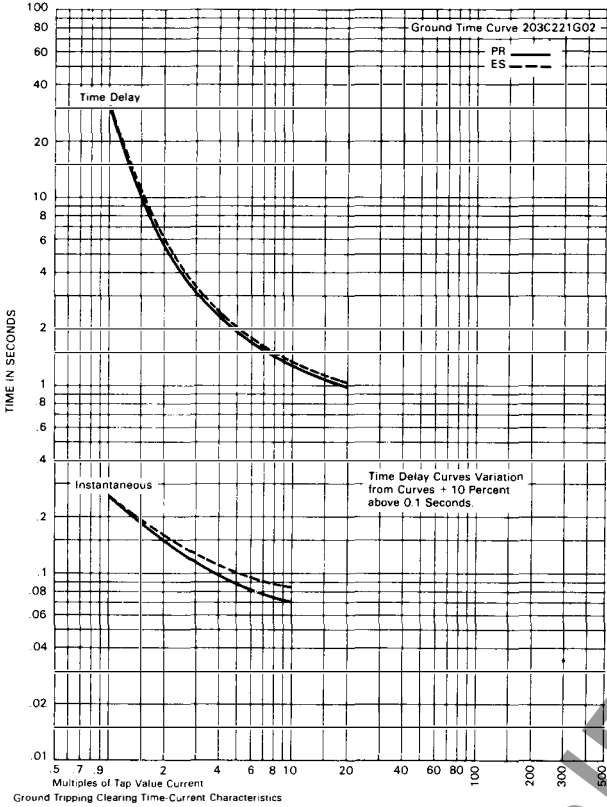
Portion of Static Panel Showing Ground Fault Unit Switches

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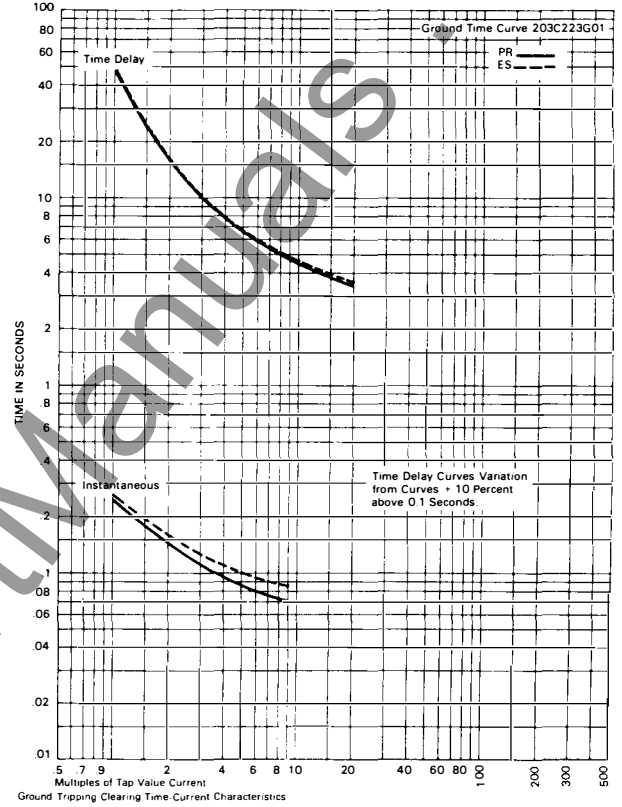


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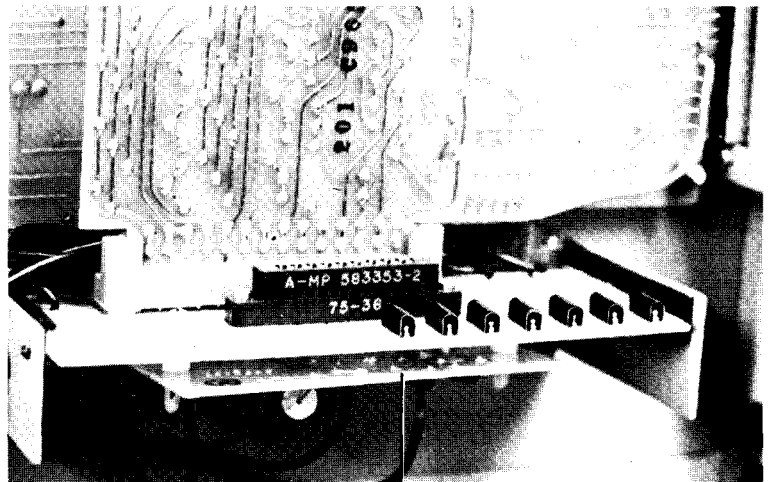
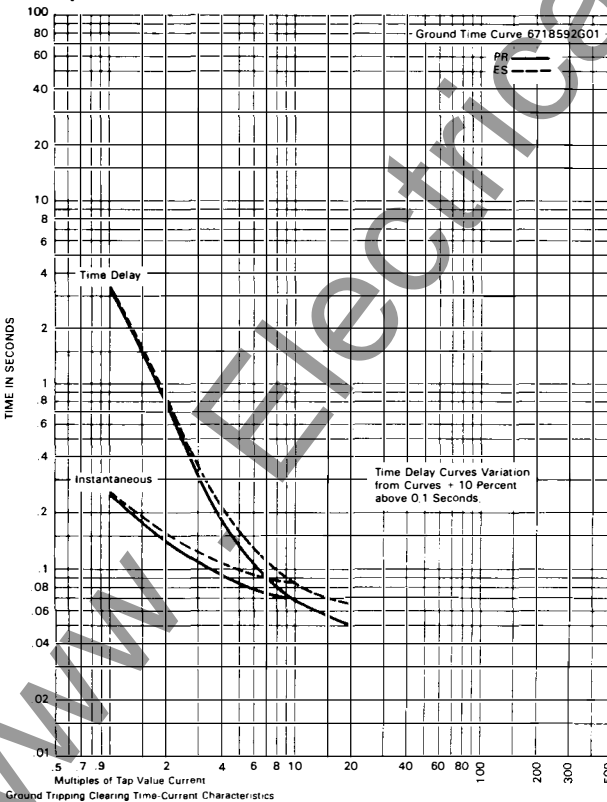
Standard Ground Time Curve



Optional Ground Time Curve



Optional Ground Time Curve



Ground Time-Current Curve Mounted on Rear of Front Panel

Ground Curve

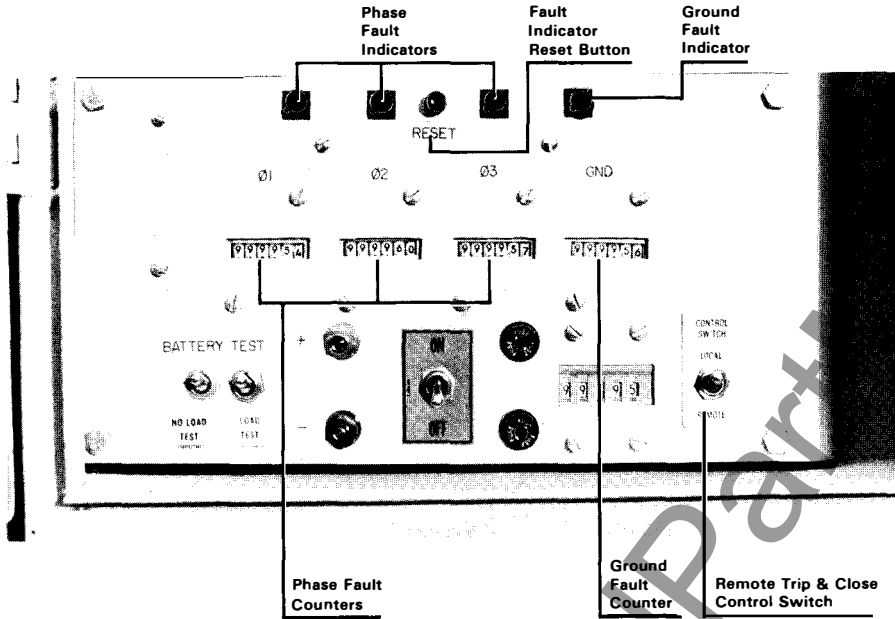


Accessories and Options

The indicator and remote trip and close options are mounted on the MTR control panel. Some accessories are mounted on the MTR control panel while others are mounted inside the cabinet or on a larger panel. The photo shown below displays all the options and accessories that are located on the control panel.

Further Information

Price List	38-720
Descriptive Bulletin	38-721 D WE A
Dimension Sheet	38-722 F WE A
Application Data	38-723
Application Data	38-733-A A WE A

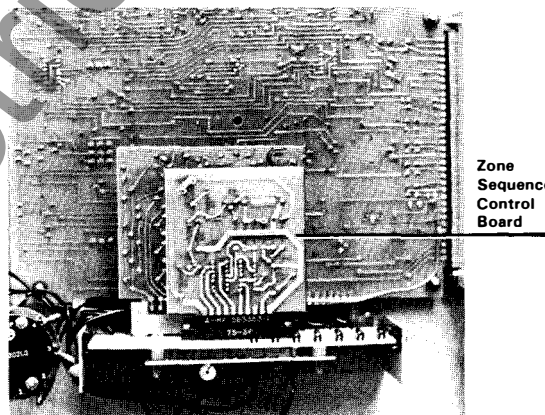


For applications with two static controlled reclosers in series, it is recommended that the recloser nearest the source (upline) be equipped with the zone sequence accessory to maintain the desired coordination sequence of the two reclosers.

The zone sequence control optional accessory is a printed circuit board mounted in front of the phase time-current curve as the following photo shows.

To ensure coordination between the instantaneous curves of the two reclosers, the instantaneous curve of the upline recloser must be slower than the downline recloser. To permit coordination with various types of reclosers, the zone sequence control unit of the MTR control allows the instantaneous trip time to be increased by 3-12 cycles.

If the fault is cleared by the down line recloser, the zone sequence unit of the source recloser only steps the static counter thus keeping the pre-programmed cycle in the proper sequence.



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