



IB 7.3.1.7-2
Issue B

INSTRUCTIONS

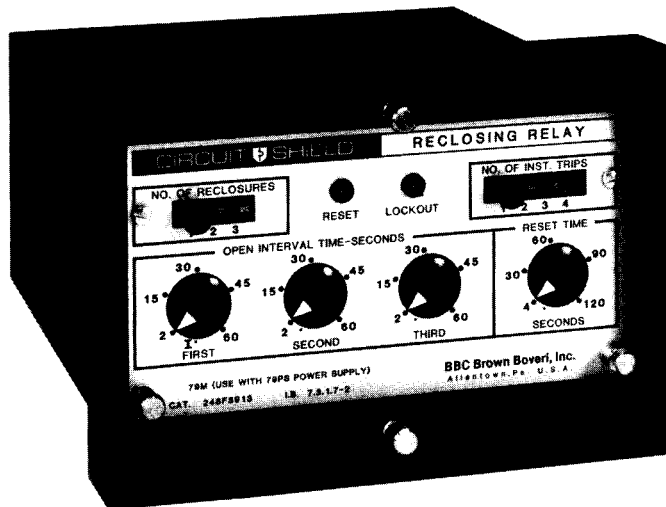
Reclosing Relays

TYPE 79M MULTI-SHOT RECLOSING RELAY

TYPE 79S SINGLE-SHOT RECLOSING RELAY

Catalog Series 448 Test Case

Catalog Series 248 Standard Case



Type 79M

TABLE OF CONTENTS

Introduction.....Page 2
Precautions.....Page 2
Placing Relay into Service.....Page 2
Application Data.....Page 4
Testing.....Page 11
Replacing Obsolete Relays.....Page 14

INTRODUCTION

These instructions contain the information required to properly install, operate, and test the ABB Circuit-Shield™ Type 79M Multi-shot Reclosing Relay and Type 79S Single-shot Reclosing Relay, catalog series 448 and 248.

The relay is housed in a case suitable for conventional semiflush panel mounting. All connections to the relay are made at the rear of the case and are clearly numbered. Relays of the 448 catalog series are similar to earlier designs of the 248 series. Both series provide the same basic functions and are of totally drawout construction; however, the 448 series relays provide integral test facilities.

A companion surface mounted power supply, Type 79PS, is used to provide a regulated 24vdc for the relay, and the logic signals representing the circuit breaker open/closed positions.

All settings are made on the front panel of the relay, behind a removable clear plastic cover. LOCKOUT and RESET indicators are also provided on the front panel.

PRECAUTIONS

The following precautions should be taken when applying these relays:

1. Incorrect wiring may result in damage. Be sure wiring agrees with the connection diagram for the particular relay before energizing.
2. Apply only the rated voltage marked on the nameplate of the Type 79PS power supply.
3. Do not change tap pin settings on the relay unless the relay is in the reset condition, or if the breaker has been manually operated with the breaker control switch to the open position.
4. High voltage insulation tests are not recommended. See section on testing for additional information.
- 5 The entire circuit assembly of the relay is removable. The unit should insert smoothly. Do not use excessive force. Removing the unit with the feeder in service may defeat the instantaneous overcurrent elements or the operation of a on-load tap changer, depending on the connections for your scheme.
6. Follow test instructions to verify that the relay is in proper working order.

CAUTION: *since troubleshooting entails working with energized equipment, care should be taken to avoid personal shock. Only competent technicians familiar with good safety practices should service these devices.*

PLACING THE RELAY INTO SERVICE

1. RECEIVING, HANDLING, STORAGE

Upon receipt of the relay (when not included as part of a switchboard) examine for shipping damage. If damage or loss is evident, file a claim at once and promptly notify Asea Brown Boveri. Use normal care in handling to avoid mechanical damage. Keep clean and dry.

2. INSTALLATION

Mounting:

The outline dimensions and panel drilling and cutout information is given in Fig. 1. The Type 79PS power supply should be mounted on a vertical surface for proper air circulation through its heat sink.

Connections:

Internal connections are shown in Figure 2. Typical external connections are shown in Figure 3.

These relays have metal front panels which are connected through printed circuit board runs and connector wiring to a terminal at the rear of the relay case. The terminal is marked "G". In all applications this terminal should be wired to ground.

Internal selector plugs are provided to set up various operating modes. The relay must be withdrawn from its case and the plugs set properly for the application. See Figure 4 for the locations of the selector plugs. (note: early models of the 248 series did not employ movable links - see instructions on page 11)

Instantaneous Cutout Contact Selector Plug (J1):

The J1 selector link controls the "I" contacts mode of operation. With the J1 selector plug in the "IN" position, the "I" contacts will close on LOCKOUT. With the J1 selector in the "OUT" position, the contacts will remain open until RESET occurs.

Tap Changer Cutout Contact Selector Plug (J2): (type 79M only)

The J2 selector link controls the "T" contact mode of operation. With the J2 selector plug in the "IN" position, the "T" contact will close on LOCKOUT. With the J2 plug in the "OUT" position, the "T" contact will remain open until RESET.

3. SETTINGS

Number of Reclosures: (Type 79M only)

This tap pin is used to select 1, 2, or 3 reclosing operations.

CAUTION: Increasing the setting of the Number of Reclosures is a command for additional automatic reclosures. Change this tap pin only when the relay is in the RESET condition, or if the breaker has been manually opened with its control switch.

Open Interval Time:

Type 79M: three dials are provided to individually set the open interval time between the occurrence of a circuit breaker trip and the reclosing operation. *The timing for each of these open intervals starts at zero seconds when its corresponding trip occurs.*

Type 79S: only one open interval dial is needed for the single-shot relay.

Note: for both the 79M and 79S, the FIRST open interval selector dial includes an Instantaneous position: to select "I" turn the dial fully counterclockwise until the switch clicks into place. The nominal open interval time for the "I" setting is 0.075 seconds.

Reset Time:

This dial is used to set the time required that the breaker remain closed to have a "successful" reclosure. *The timing for this function starts at zero seconds each time the breaker is closed.*

Number of Instantaneous Trips: (Type 79M only)

This tap pin is used to select the number of trip operations that can occur before the instantaneous cutout contacts ("I") open to block the instantaneous elements of the associated overcurrent relays.

4. INDICATORS

Reset Indicator: a green led is provided on the front panel to indicate reset.

Lockout Indicator: a red led is provided on the front panel to indicate lockout. Also, the lockout alarm contact (L) close to provide remote annunciation of lockout.

APPLICATION DATA

The ABB Circuit-Shield™ Type 79M Multi-shot Reclosing Relay is used to automatically reclose a circuit breaker one or more times after it has been tripped by its protective relay. The Type 79S provides only a single reclose attempt. These relays are used in schemes to protect lines which are subject to temporary faults such as those caused by lightning, or tree branches which burn free leaving the line clear.

The reclosing relay provides for the selection of the desired number of reclosures. The open interval times are independently adjustable for each reclosure. A successful reclosure is obtained if the breaker remains closed for the time set on the reset dial. *The reset timer starts at zero seconds each time the breaker is reclosed.* If after the preset number of reclosures the breaker trips again before reset is attained, the relay goes into the lockout state.

The Circuit-Shield™ Types 79M and 79S have a trip count circuit operated by a circuit breaker auxiliary contact (52/b) which closes when the breaker opens; and, a close count circuit operated by a circuit breaker auxiliary contact (52/a) which closes when the breaker closes. The trip count and close count circuits are interlocked so that a close must occur before a subsequent trip can be counted.

The reclosing relay uses magnetic-latching control relays to retain the reclosing program step in the event control power is interrupted. Thus, the relay's program resumes on the proper step upon restoration of control power.

Solid-state timing circuits are used to time the open interval times and the reset time.

The following contacts are provided by the relay:

CLOSE CONTACT (C): closes after the set open interval time to reclose the circuit breaker.

INSTANTANEOUS CUTOFF CONTACTS (I): opens on the selected trip count, to block the instantaneous elements of the associated overcurrent relays. Closes on reset. May be programmed to also close on lockout, by means of the selector plug J1 (see pg.3). On the Type 79S, the (I) contacts open on the first trip.

LOCKOUT INDICATION CONTACT (L): closes on lockout, opens on reset or when 52/b contact opens.

TAP CHANGER CUTOFF CONTACT (T): opens on the first trip count to block operation of a transformer on load tap changer. Closes on reset. May be programmed to also close on lockout, by means of selector plug J2 (see pg. 3). "T" contact is not provided on all units. Check the internal connection diagram for the particular unit.

The Types 79M and 79S reclosing relays are designed to operate from a regulated 24Vdc source. The Type 79PS power supply module is used to adapt the reclosing relay to the particular system control voltage. The module is designed for surface mounting on a vertical surface. The circuit breaker 52/a and 52/b contacts are wired to the 79PS module, which in turn provides the proper logic signals to the reclosing relay.

The typical external connection diagrams show two additional contacts wired to the 79PS module:

43 - recloser cutout switch: the reclosing relay will not operate to reclose the breaker when this switch is open.

101 - breaker control switch slip contact: this contact opens upon manual tripping of the breaker to block reclosing. The contact closes only upon manual closing of the breaker, thus restoring the reclosing function.

Additional "permissive" contacts may be placed in series with the 43 and 101 contacts if desired. For example, a contact from a sync check relay to allow reclosing, or a contact from a high-set instantaneous overcurrent relay which latches-on on high fault current to block reclosing.

SPECIFICATIONS:

Output Circuit: Contact ratings at
 Closing 125 Vdc 30 amperes 240 Vac 30 amperes
 Continuous 5 amperes 5 amperes
 Break 0.3 ampere 2 amperes

Control Power: select Type 79PS power supply module to match system control volts;
 models available for:

<u>Rated Voltage</u>	<u>Operating Range</u>	<u>Nominal Drain at Standby</u>	<u>Nominal Drain at Lockout</u>
32 Vdc	22- 38v	0.07 A	0.21 A
48 Vdc	28- 60v	0.06	0.20 A
110 Vdc	60-125v	0.06	0.18 A
125 Vdc	70-140v	0.05	0.16 A
120 Vac	85-140v	0.05	0.16 A
240 Vac	170-280v	0.03	0.08 A

Operating Temperature: -20° to +70° C

Timing Tolerance: Open Interval Times and Reset Time @ 25° C:
 +/-10% or +/-1 second, whichever is greater.

Note: above tolerances based on printed dial markings.
 Since the dials are continuously adjustable, the times can be set by test, and will give very good repeatability.

Instantaneous (I) position of first open interval dial:
 0.05-0.10 seconds.

Dielectric Strength: 1500 vac, 50/60 Hz., 60 seconds, all circuits to ground.

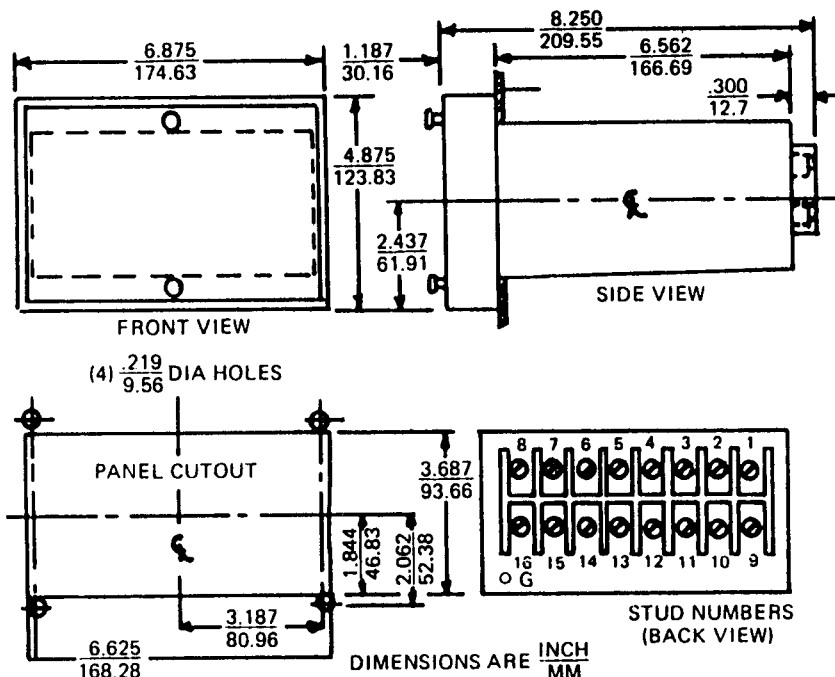


Figure 1A: Relay Outline and Panel Drilling
 Type 79M and Type 79S Reclosing Relays

CHARACTERISTICS OF COMMON UNITS

Type	Open Interval Times			Reset Time	Connection Diagram	Catalog Numbers	
	#1	#2	#3			Std Case	Test Case
79M	I-15	2-30	4-60	2-30	16D248B	248G3613	448G3613
	I-15	2-30	4-60	4-60	"	248G3813	448G3813
	I-60	2-60	2-60	4-120	"	248F3913	448F3913
	I-15	2-30	15-120	2-30	"	248H4613	448H4613
	I-15	2-30	15-120	4-120	"	248H4913	448H4913
79M	I-15	2-30	15-120	2-30	16D248E	---	448H4633
79S	I-15	--	--	2-30	16D248D	248S1911	448S1911
	I-60	--	--	4-120	"	248S3911	448S3911

Notes: Times in seconds. "I" = instantaneous timing (nominal 0.075 sec).

448 Series preferred for new installations due to improved test facilities.

A Type 79PS Power Supply Module is supplied with each reclosing relay. Select the power supply module catalog number based on the system control voltage:

DC Control Voltage	Catalog Number	AC Control Voltage	Catalog Number
32 Vdc	79PS032M	120 Vac	79PS120M
48 Vdc	79PS048M	240 Vac	79PS240M
110 Vdc	79PS110M		
125 Vdc	79PS125M		

Note:

For proper cooling power supply must be mounted on a vertical surface.

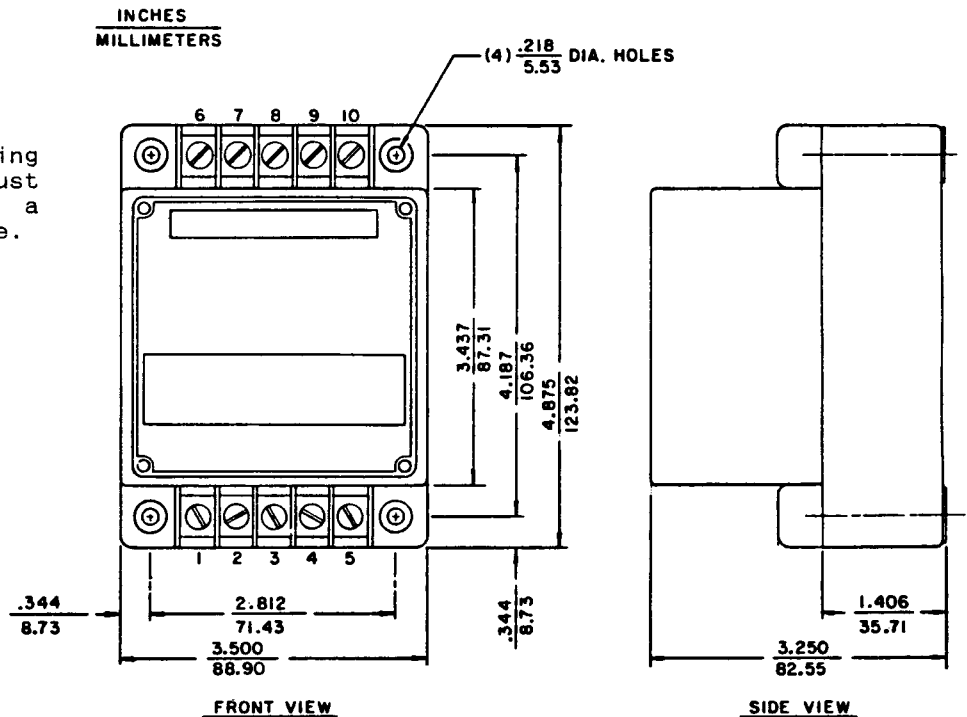
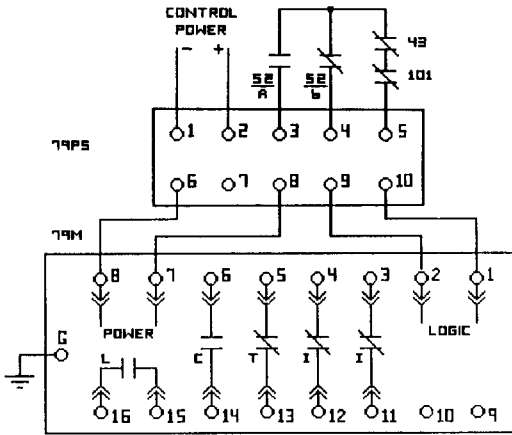


Figure 1B: Outline for Type 79PS Power Supply Module

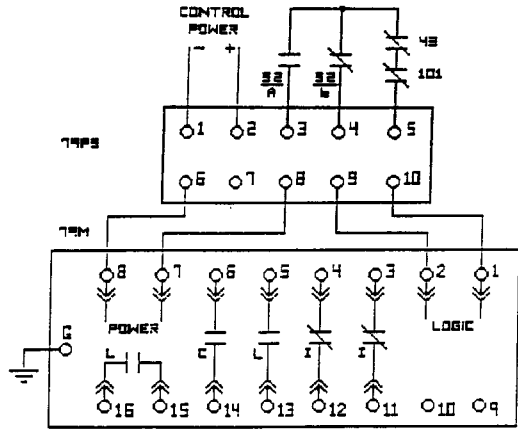
16D248B Type 79M

Std. Case and Test Case



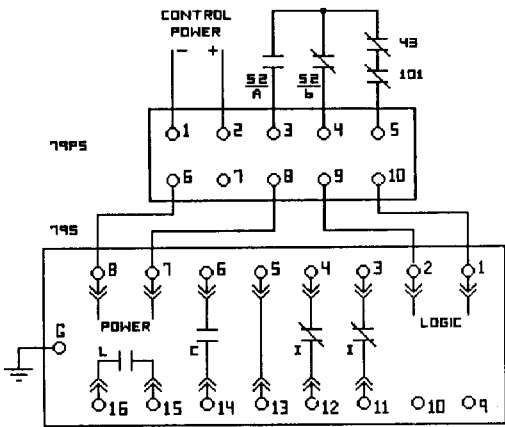
16D248E Type 79M

Std. Case and Test Case



16D248D Type 79S

Std. Case and Test Case



Legend:

- 43 - Recloser Cutout Switch
- 52/a - Circuit Breaker Aux. Contact, closed when c.b. is closed.
- 52/b - Circuit Breaker Aux. Contact, closed when c.b. is open.
- 101 - Control Switch Contact, closed only after Close.
- I - Instantaneous Cutout Contact
- C - Close Contact
- L - Lockout Alarm Contact
- T - Tap Changer Cutout Contact

Figure 2: Internal Connection Diagrams

Figure 2A:
Typical Circuit Breaker Control Switch
Contact Arrangement.

ABB Type C77, catalog C77-4000-1CC1-0002

Contact designated 101 in above diagrams
is terminals 9-13 on this switch.

PLAN VIEW HANDLE END		CS POSITIONS FRONT VIEW			
SPRING RETURN		NO	TRIP-T	NORM-C	CLOSE
4	3	1-2			X
8	7	3-4	X		
12	11	5-6	X		X
16	15	7-8			X
		9-10	X	X	
		11-12			
		13-14		X	X
		15-16		X	X

CONTROL SWITCH

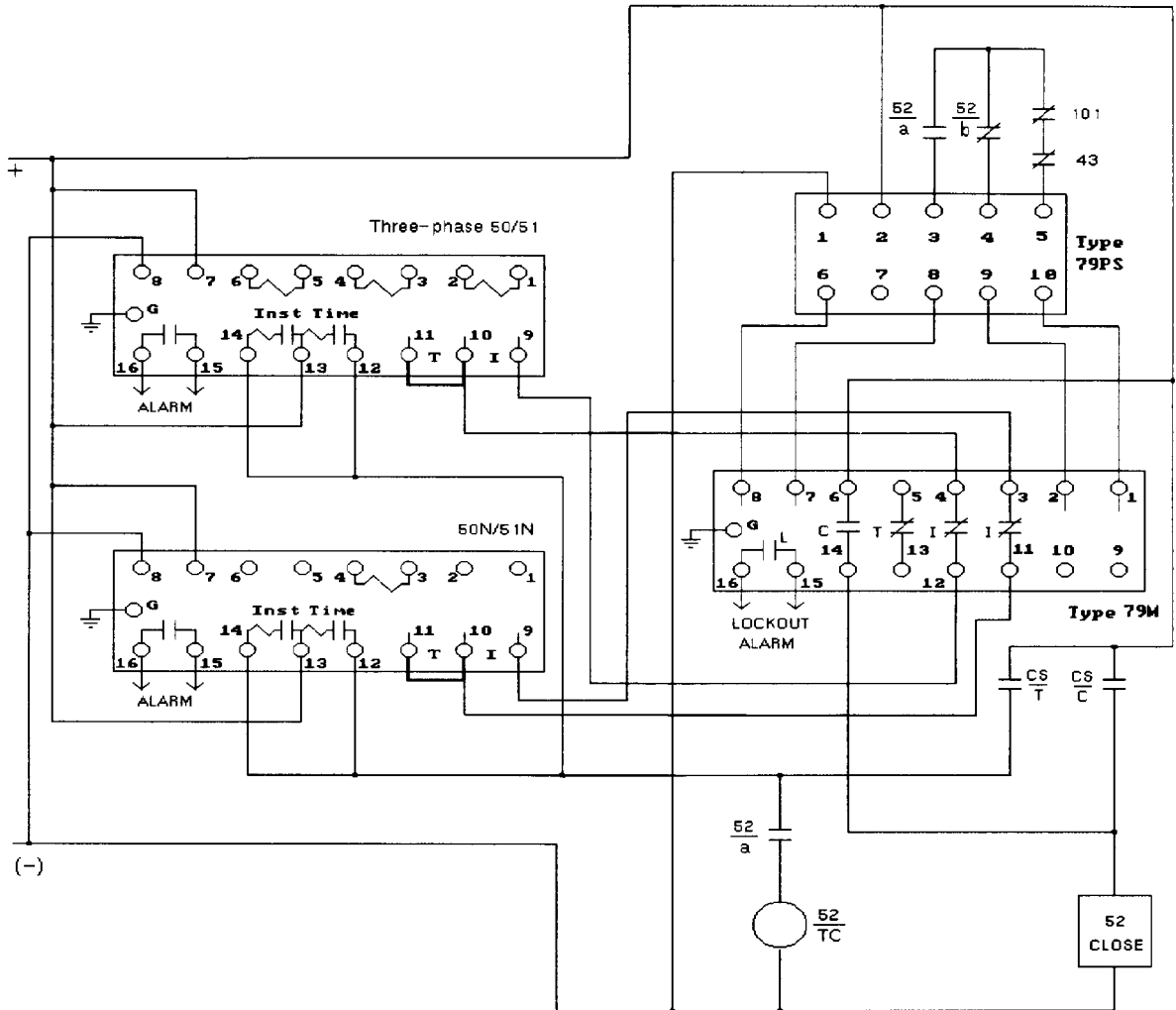


Figure 3A: Typical Basic Control Connections

ABB Circuit-Shield™ Type 51 Overcurrent Relays (Catalog Series 443)
Used with Type 79M Reclosing Relay

Note: Instantaneous Cutout Contacts of Type 79M Relay Wired to Torque-Control Feature of the Type 51 to control the operation of the instantaneous overcurrent elements.

LEGEND:

- CS/C = Breaker Control Switch (Close)
- CS/T = Breaker Control Switch (Trip)
- 101 = Control Switch Slip Contact, closed only after close.
- 43 = Reclosing Cutout Switch

- 52/TC = Circuit Breaker Trip Coil
- 52/a = Circuit Breaker Auxiliary switch, closed when c.b. is closed.
- 52/b = Circuit Breaker Auxiliary switch, closed when c.b. is open.

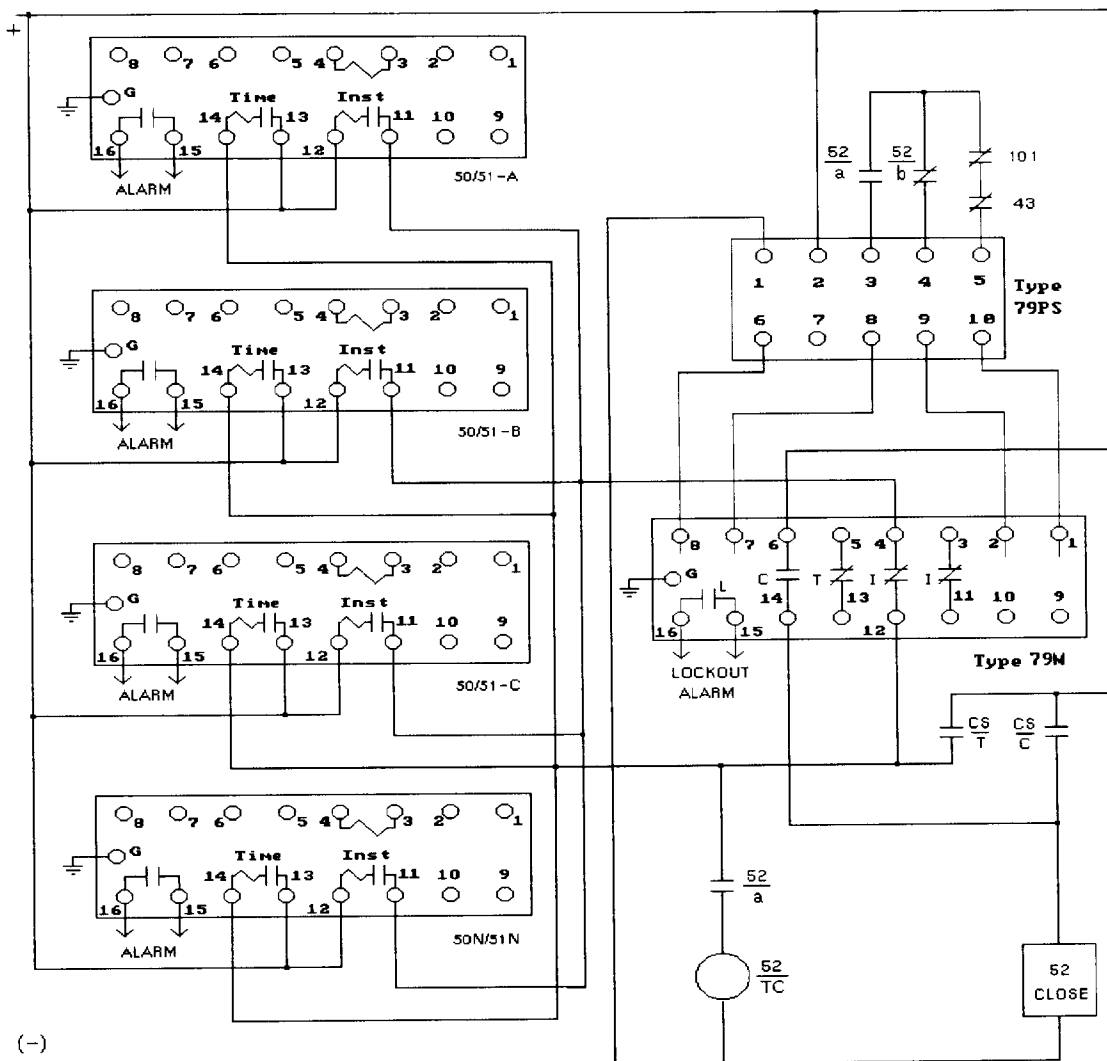


Figure 3B: Typical Basic Control Connections

**ABB Circuit-Shield™ Type Micro-51 Overcurrent Relays (Catalog Series 446)
Used with Type 79M Reclosing Relay**

Note: Instantaneous Cutout Contacts of Type 79M Relay Wired in Series with Inst. Output Contacts of Type 51 to control the operation of the instantaneous overcurrent elements.

LEGEND:

- | | |
|---|--|
| CS/C = Breaker Control Switch (Close) | 52/TC = Circuit Breaker Trip Coil |
| CS/T = Breaker Control Switch (Trip) | 52/a = Circuit Breaker Auxiliary switch, closed when c.b. is closed. |
| 101 = Control Switch Slip Contact, closed only after close. | 52/b = Circuit Breaker Auxiliary switch, closed when c.b. is open. |
| 43 = Reclosing Cutout Switch | |

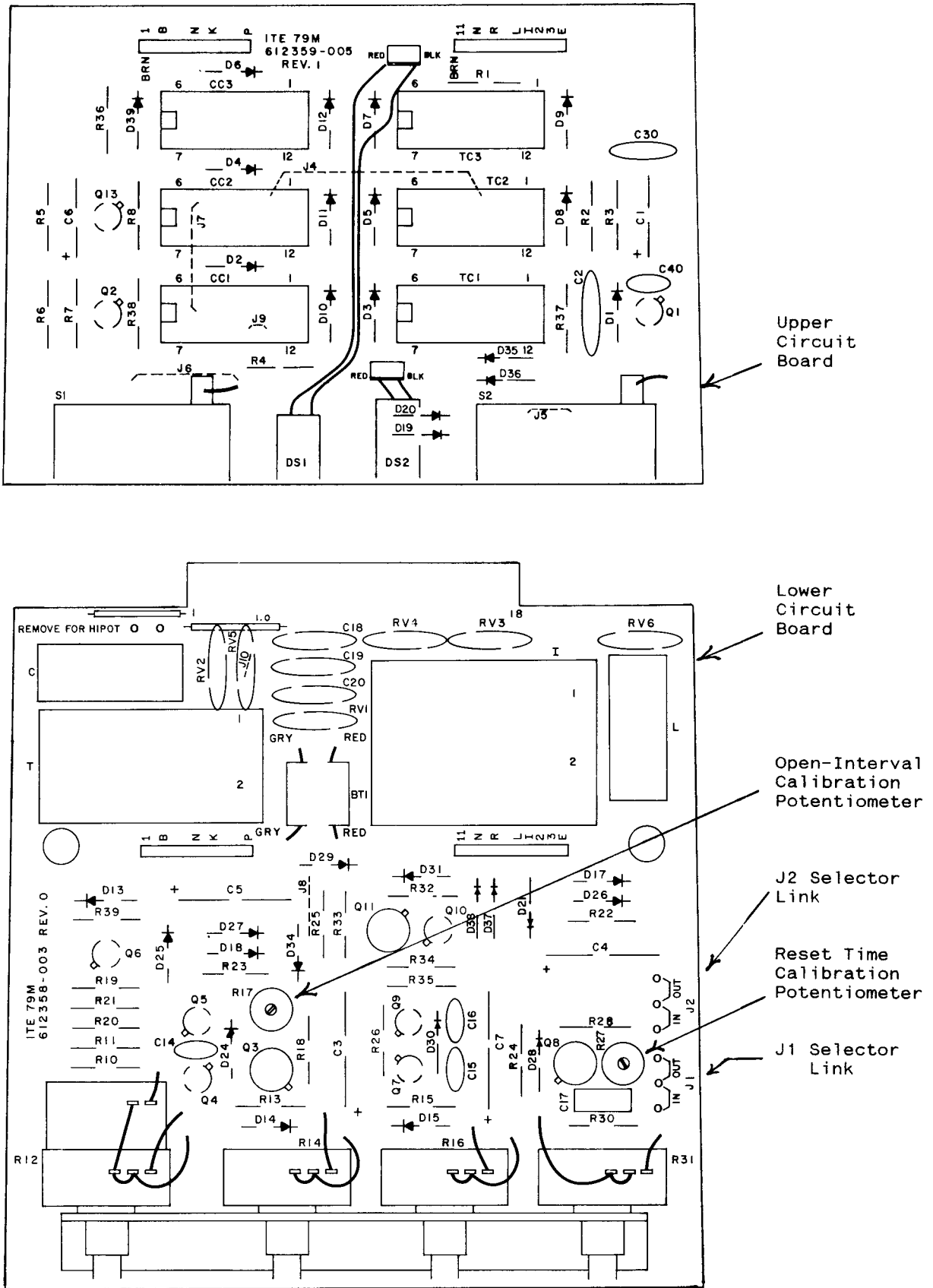


Figure 4: Typical Circuit Board Layouts

TESTING**1. MAINTENANCE AND RENEWAL PARTS**

No routine maintenance is required on the Type 79 relays. Follow test instructions to verify that the relay is in proper working order. We recommend that an inoperative relay be returned to the factory for repair; however, a schematic diagram and circuit description will be provided on request. Renewal parts will be quoted by the factory on request.

See Paragraph 4 for basic information on units of catalog series 208, and certain 248 units which are no longer in production.

CAUTION: since troubleshooting entails working with energized equipment, caution should be taken to avoid personal shock. Only competent technicians familiar with good safety practices should service these devices.

Drawout Element - Catalog Series 248

Drawout circuit boards of the same catalog number are interchangeable. A unit is identified by the catalog number stamped on the front panel and a serial number stamped on the bottom side of the drawout circuit board.

The board is removed by using the metal pull knobs on the front panel. Removing the unit with the circuit in service will open up the instantaneous cutout and tap changer cutout contact circuits.

An 18 point extender board, catalog 200X0018, is available for use in troubleshooting and calibrating the relay.

Drawout Element - Catalog Series 448

Metal handles provide leverage to withdraw the relay assembly from the case. Removing the unit in an application that uses the normally-closed Instantaneous cutout contacts will defeat the instantaneous elements. The same applies to the Tap-Changer cutout contacts. The assembly is identified by the catalog number stamped on the front panel of the unit and by a serial number stamped on the bottom of the board.

Test connections are readily made to the drawout relay unit by using standard banana plug leads at the rear vertical circuit board. This rear board is marked for easier identification of the connection points.

Test Plug:

A test plug assembly, catalog number 400X0002 is available for use with the 448 series unit. This device plugs into the relay case on the switchboard and allows access to all external circuits wired to the case. See Instruction Book IB 7.7.1.7-8 for details of this device.

2. HIGH POTENTIAL TESTS

High potential tests are not recommended. A hi-pot test was performed at the factory before shipping. If a control wiring insulation test is required, partially withdraw the relay unit from the case sufficient to break the rear connections before applying the test voltage.

On 448 and 248 series units, a link on the left rear of the lower circuit board is removed temporarily when high potential tests are conducted at the factory. After testing, the link is restored to its position to connect certain surge suppression components to ground for normal operation. The link is labelled "remove for hipot".

3. ACCEPTANCE TESTS

Inspection: withdraw the relay from its case and inspect that the connectors at each end of the (2) ribbon cables are seated in their connectors. Inspect the selector links J1 and J2 for proper placement.

The operation of the reclosing relay can be checked by simulating breaker operation. A typical test circuit is shown in Figure 5. Manually operate the toggle switch labelled S1 to simulate breaker tripping and closing. The relay may be stepped through to lockout, or allowed to reset, as desired by the tester. In Figure 5, S1 is shown in the "breaker closed" position.

Relay Settings for the following tests: 3 reclosures, 1 instantaneous trip, J1 and J2 links on "OUT".

(For the Type 79S, set the desired open interval and reset times. The following test sequence is written for the Type 79M. For the 79S, lockout will be obtained after the second trip operation.)

Open Interval Times:

To measure the open-interval times with an external timer, connect the timer START terminals to a second pole on switch S1 so that the timer starts when S1 closes on terminal 4, and the STOP input to the relay's close (C) contact. During the test sequence, note the RESET indicator on the front panel of the 79 relay to be sure that the relay has not had time to reset.

- 1) With the relay in the reset condition, reset the external timer.
- 2) Toggle S1 to simulate a breaker trip (close on terminal 4), starting the external timer. The 79 relay will issue a closing signal after the first open interval time, stopping the external timer. Record the time.
- 3) Reset the external timer. Toggle S1 to simulate a breaker close, and again to simulate the breaker opening. The 79 relay will issue a closing signal after the second open interval, stopping the external timer. Record the time.
- 4) Reset the external timer. Toggle S1 to simulate a breaker close, and again to simulate the breaker opening. The 79 relay will issue a closing signal after the third open interval, stopping the external timer. Record the time.
- 5) Toggle S1 to simulate a breaker close, and again to simulate a trip. The 79M relay lockout indicator should light, and the lockout alarm contact (L) should close.

Reset Time:

With the relay in lockout from the above test, reconnect the external timer to start when the S1 simulation switch closes on terminal 3 (breaker closes), and to stop when contacts T or I close.

- 1) Toggle S1 to simulate breaker closing starting the external timer. The timer should stop when the 79 relay resets. Record the reset time.

Reminder: for the ABB Circuit-Shield Type 79 relays, the reset timer starts at zero seconds each time the breaker closes. If the breaker remains closed for the reset time set on the dial, the reclosure is successful and the 79 resets.

Operation of the "I" and "T" Contacts:

With the 79 relay in the reset condition, toggle S1 to simulate a breaker trip. Contacts "I" and "T" should open immediately. With links J1 and J2 in the out positions, these contacts will not close until the reset condition, as shown by the green indicating light on the front panel.

Operation of the "I" and "T" contacts can also be checked for the "IN" positions of the selector links. Step the relay through to Lockout. The "I" and "T" contacts should close at Lockout, as indicated by the red indicating light.

Calibration of Reset and Open Interval Times:

In general, since the front panel dials are continuously adjustable, proper relay operating and reset times should be set by these dials, using the tests given above to confirm the values. In the event that recalibration of the dials becomes necessary, see the circuit board layout on page 10 for the location of the internal calibration potentiometers. Note that R17 affects all three open interval times on the Type 79M.

Type 79PS Power Supply Module:

The power supply module converts the system control voltage to a regulated 24vdc to power the 79 relay (79PS module terminals 8(+) and 6(-), 79 relay terminals 7(+) and 8(-)). The normal range of this voltage is 21-26 volts dc.

The 79PS also supplies logic signals to the 79 relay indicating the breaker position. These signals are 0vdc or +24vdc with respect to 79 relay terminal #8.

Legend:

- S1: Breaker Simulator Toggle Switch
- C = close contact
- I = instantaneous cutout
- L = lockout alarm
- T = tap changer cutout

Relay shown is Type 79M per diagram 16D248B.

Modify connections as needed for particular relay being tested. See diagrams on page 7.

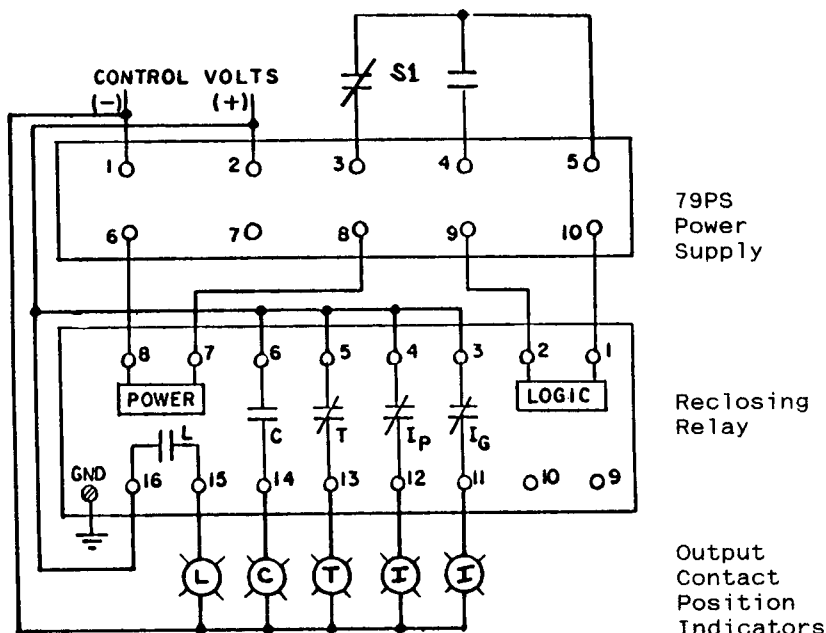
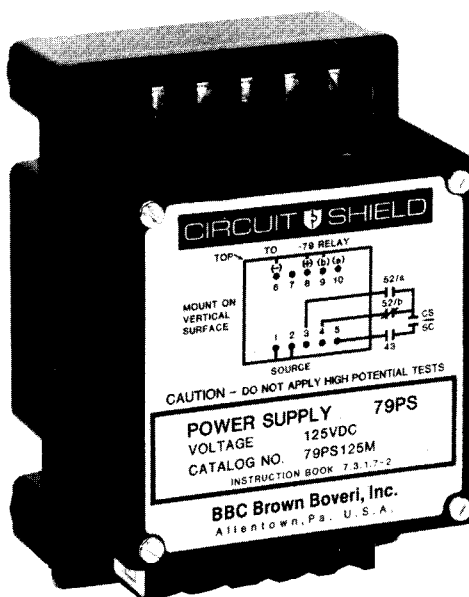


Figure 5: Typical Test Connections



4. OBSOLETE RELAYS:

Important: when replacing older versions of the Types 79M which did not include the reset indicator light, the Type 79PS power supply module should also be replaced with a new unit due to the increased current drain of the new relay.

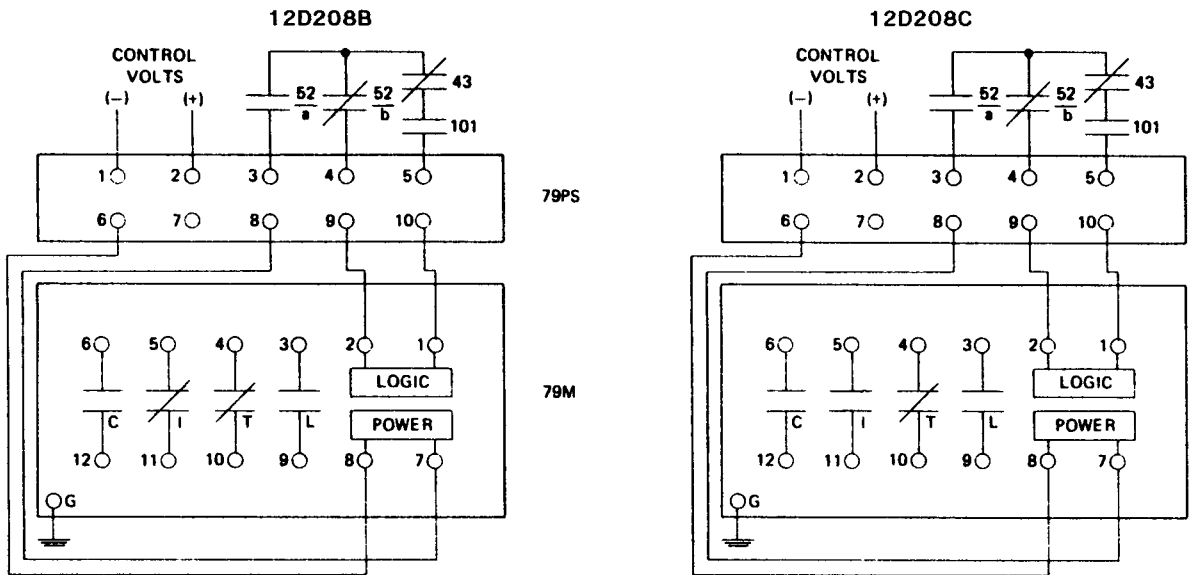
Case assemblies for newer units will mount in the same panel cutout as the older units. Refer to internal connection diagrams for the units in question for required wiring changes.

Catalog Series 208:

Type 79M Relays of the 208 catalog series are obsolete, and have been replaced by the later series covered in this instruction book. The following is a guide to the connections and characteristics of the earlier units in the event a unit must be replaced.

Catalog Number	Open Interval Times			Reset Time	Connection Diagram	Recommended Replacement
	#1	#2	#3			
208A3601	I-15	2-30	4-60	2-30	12D208B	448G3613
208A3604	I-15	2-30	4-60	2-30	12D208C	--

Connection Diagrams for 208 Series (obsolete - for reference only)



Early Models of Type 79M Catalog Series 248:

Earlier models of the Type 79M of the catalog form 248x3x03, where "x" is any digit or character, are similar to the models covered in this instruction book; except they did not include the reset indicating light, and they do not have the J1 and J2 movable links.

As shipped from the factory, the unit was wired so the Instantaneous cutout contacts open when the proper number of trip operations occur, per the tap setting on the front panel of the relay; and close when the relay resets, or goes to lockout. To modify the operation so that the instantaneous contacts remain open on lockout, you must clip off the wire jumper on the circuit board that is in parallel with diode D37 (this jumper labelled J1 on some units).

NORM Button:

Earlier models of the Types 79M and 79S have a front panel pushbutton labelled "NORM". When depressed and held for a period greater than the reset time programmed on the RESET dial, this function will reset the relay.

Obsolete Model Type 79S Catalog Number 248B1906:

Catalog Number	Open Interval Times #1 #2 #3	Reset Time	Connection Diagram	Recommended Replacement
248B1906	I-15 -- --	2-30	16D248C	448S1911

Connection Diagram for 248B1906 (obsolete - for reference only)

