

INSTRUCTIONS

High-Dropout Current Relays

CIRCUIT SHIELD[®]

- TYPE 50B INSTANTANEOUS FAULT DETECTOR
- TYPE 50H INSTANTANEOUS OVERCURRENT
- TYPE 50D DEFINITE-TIME OVERCURRENT
- TYPE 37H INSTANTANEOUS UNDERCURRENT
- TYPE 37D DEFINITE-TIME UNDERCURRENT

Catalog Series 268 Standard Case
Catalog Series 468 Drawout Test Case



Type 50D

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INTRODUCTION

These instructions contain the information required to properly install, operate, and test the ABB Circuit-Shield™ Types 50B, 50D and 50H High-Dropout Overcurrent Relays, and Types 37D and 37H High-Dropout Undercurrent Relays, Catalog Series 268 and 468.

These relays are housed in a relay case suitable for conventional semi-flush panel mounting. All connections to the relay are made at terminals located on the rear of the case and clearly numbered.

Relays with catalog numbers starting with 468 are similar to relays of the 268 series, but offer totally drawout construction with integral test facilities. Current transformer shorting is accomplished by a direct-acting spring and blade assembly upon removal of the relay from its case. Units of the 268 series are of partial drawout construction, with the input transformers remaining in the case upon withdrawal of the lower electronic circuit board.

The pickup and time settings are located on the front panel behind a removable clear cover. Provisions for a meter seal are included. A target indicator is also mounted on the front panel. The target is reset by means of a pushbutton extending through the cover. Control voltage must be present to reset the target.

Earlier models of these relays, catalog series 238 are referenced on page 19 of this book.

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 before energizing. Be sure that the control voltage is applied in the correct polarity.
2. Apply only the rated control voltage marked on the front panel.

For relays with dual-rated control voltage, the control voltage selector plug located on the lower circuit board MUST be placed in the correct position for the system control voltage. For the Type 50B relay it will be necessary to separate the lower board from the upper to gain access to the selector plug.

3. These relays are shipped with a shorting link between terminals 9 and 10. This link must be in place for proper operation, unless the relay is being used in a "torque-control" application.

4. Relays with connection diagrams 16D468D, 16D468E, and 16D468F use an external resistor between terminals 15 and 16. This resistor must be in place for normal operation. These relays also have a movable link on the vertical rear circuit board to select the form of the contact between terminals 13 and 14. The position of this link should be inspected before placing the unit into service.

5. High voltage tests are not recommended. See section on testing for additional information.

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. Keep the relay clean and dry and use normal care in handling to avoid mechanical damage.

2. INSTALLATION

Mounting:

The outline dimensions and panel drilling and cutout information is given in Fig. 1.

Connections:

Internal connections and contact logic are shown on page 8. Typical connection diagrams are shown in the APPLICATION section. For the Type 50B and the three-phase Types 50D and 50H, ct polarities must be observed and connected as shown in the diagrams, in order for the relay to correctly measure the current on three-phase and phase-to-phase faults.

Special care should be taken to connect control power in the proper polarity.

For relays with dual rated control voltage, the control voltage selector plug located on the lower circuit board must be placed in the correct position for the system control voltage. This plug is accessible (left rear of lower circuit board) on the Types 50H, 50D, 37H, and 37D; however, for the Type 50B relay it will be necessary to separate the lower board from the upper to gain access. See procedure on page 16.

For relays with a 48/110vdc front panel rating, place the selector plug in the 125vdc position for a 110vdc system. For relays with a 120vac front panel rating, place the selector plug in the 48vdc position (the conversion from 120vac to 48vdc is accomplished on the upper board, using an isolation transformer, rectifier, and filter).

These relays have a metal front panel which is connected through printed circuit board runs to a rear terminal marked "G". In all applications this terminal should be wired to ground.

Relays with connection diagrams 16D468D, 16D468E, 16D468F (see pgs 5 & 8) include a movable link on the vertical rear circuit board (inside surface) which allows you to choose a normally-open (NO) or normally-closed (NC) contact for rear terminals 13-14. These relays also include an external resistor which is supplied mounted to the case and wired between terminals 15 and 16. This resistor must be connected for proper operation.

If the relay is to be "torque-controlled" by another relay, the shorting link between terminals 9 and 10 must be removed and these terminals connected to a suitable controlling relay, such as an ABB Type 32 directional relay. (Note: for the Type 37, the shorting link will usually be left on, since opening the connection between terminals 9 and 10 will look like an undercurrent condition and the relay will operate.)

3. SETTINGS

Pickup

The current pickup control is continuously adjustable from 1 to 10 times the current "rating" of the relay. The current rating is stamped on the lower left of the relay front panel. This "rating" is for the pickup dial only and should not be confused with the continuous current rating of the relay which is listed in the application data later in this instruction book.

For the Type 50B fault detector relay, two separate pickup adjustments are provided: one labelled PHASE, the other labelled GROUND. The "ratings" for each are marked on the front panel at the lower left.

Time Delay

The Types 50D and 37D relays include a timer to provide a definite-time delay. The dial for this timer is labelled in SECONDS and is continuously adjustable.

4. OPERATION INDICATORS

Target: A hand-reset target indicator is provided. The target is electronically actuated at the time that the relay trip contacts transfer. Control power must be present and the relay must be in the non-trip condition to reset the target.

Pickup LED: a yellow led indicator lights when the input current to the relay is above pickup (Types 50D, 50H), or below dropout (Types 37D, 37H).

APPLICATION DATA

These ABB Circuit-Shield™ high-dropout current relays have superior characteristics which make them suitable for many applications:

- * High dropout-to-pickup ratio (greater than 98%).
- * High continuous current rating - relay may be operated continuously above its setting.
- * Low burden.
- * Wide selection of current and timing ranges.
- * Easy to set, continuous pickup and timing adjustments.
- * Fast reset.
- * Single-phase, three-phase, and two-phase and ground models.

Types 50B and 50H: high-speed overcurrent relays with solid-state measuring circuitry and electromechanical contact output. Applications include supervision schemes requiring load or fault current detection, and breaker-failure schemes. See the instruction books for the companion timing relays Types 62B and 62T which can be used with the Type 50H or 50B to make up a breaker failure scheme. The Type 50B is a two-phase and ground relay, with separate pickup adjustments for phase and ground. The Type 50H is available in single-phase and three-phase models.

Type 50D: this relay has the same current measuring circuitry as the Type 50H, but also includes a solid-state timer to provide a definite-time delay characteristic. This relay finds application in phase and ground-fault protection, self-balancing machine differential protection, overload alarms and fan control.

In schemes where the relay trips the breaker, and where instantaneous operation is desired, the Type 50D with adjustable delay from 0.01 to 0.3 seconds is frequently preferred over the Type 50H. This minimum time-delay range gives the user flexibility in selecting just enough time delay to overcome any transient inrush current which might result in nuisance tripping while still maintaining high-speed operation.

Types 37D and 37H: these undercurrent relays are used in load loss schemes, such as in pump-motor protection. The Type 37H provides instantaneous operation and the Type 37D includes a timer to provide a definite-time characteristic. The Types 37D and 37H are available only as single-phase units.

"Torque-Control": torque-control is provided on all units as a standard feature. To control the relay, remove the external link between terminals 9 and 10, and connect the controlling contact. The relay is operable when the contact is closed. For units with time delay, the full time delay will occur upon contact closure, assuming an overcurrent condition exists. (Note: since Types 37D and 37H are undercurrent relays opening the connection between terminals 9 and 10 will cause the relay to operate.)

The torque-control feature allows the Types 50D and 50H relays to be used in directional-overcurrent schemes, with one of the ABB Types 32, -32Q, and -32D directional relays as the controlling element. See the instruction book for these relays for additional information.

Circuit-Description: refer to Circuit-Description CD 7.2.1.7-3 for details of the design of the relay's internal solid-state circuitry.

CHARACTERISTICS OF COMMON UNITS

Type 50B

Continuous Rating Phase	Pickup Range Phase	Continuous Rating Ground	Pickup Range Ground	Catalog Numbers Type 50B Two Phase & Ground
20A	2 - 20A	4A	0.2 - 2A	468D56x5
16A	0.8 - 8A	4A	0.2 - 2A	468D55x5

Types 50H, 37H

Continuous Rating	Pickup Range	Catalog Numbers		Catalog Numbers Type 37H Single-Phase
		Type 50H Single-Phase	Type 50H Three-Phase	
2A	0.1-1A	468S03x5	468T03x5	468U03x5
4A	0.2-2A	468S04x5	468T04x5	468U04x5
8A	0.4-4A	468S02x5	468T02x5	468U02x5
16A	0.8-8A	468S05x5	468T05x5	468U05x5
20A	2-20A	468S06x5	468T06x5	468U06x5
20A	8-80A	468S07x5	468T07x5	--
20A	20-200A	468S08x5	468T08x5	--

Types 50D, 37D

Continuous Rating	Pickup Range	Time Range	Catalog Numbers		Catalog Numbers Type 37D Single-Phase
			Type 50D Single-Phase	Type 50D Three-Phase	
2A	0.1-1A	0.01-0.3s	468S13x5	468T13x5	468U13x5
		0.1 - 3 s	468S23x5	468T23x5	468U23x5
		1 - 30 s	468S33x5	468T33x5	468U33x5
		10 - 300s	468S43x5	468T43x5	468U43x5
4A	0.2-2A	0.01-0.3s	468S14x5	468T14x5	468U14x5
		0.1 - 3 s	468S24x5	468T24x5	468U24x5
		1 - 30 s	468S34x5	468T34x5	468U34x5
		10 - 300s	468S44x5	468T44x5	468U44x5
8A	0.4-4A	0.01-0.3s	468S12x5	468T12x5	468U12x5
		0.1 - 3 s	468S22x5	468T22x5	468U22x5
		1 - 30 s	468S32x5	468T32x5	468U32x5
		10 - 300s	468S42x5	468T42x5	468U42x5
16A	0.8-8A	0.01-0.3s	468S15x5	468T15x5	468U15x5
		0.1 - 3 s	468S25x5	468T25x5	468U25x5
		1 - 30 s	468S35x5	468T35x5	468U35x5
		10 - 300s	468S45x5	468T45x5	468U45x5
20A	2-20A	0.01-0.3s	468S16x5	468T16x5	468U16x5
		0.1 - 3 s	468S26x5	468T26x5	468U26x5
		1 - 30 s	468S36x5	468T36x5	468U36x5
		10 - 300s	468S46x5	468T46x5	468U46x5

IMPORTANT: Each of the catalog numbers listed above contains an "x" for the control voltage designation. To complete the catalog number, you must replace the "x" with the proper digit from the chart below. Also, the internal connection diagram is related to the control voltage rating as shown.

Control Voltage Rating	Replace "x" with digit	Internal Connection Diagrams		
		50H, 50D	50B	37H, 37D
48/125 Vdc	7	16D468A	16D468B	16D468C
48/110 Vdc	0			
24/ 32 Vdc	9			
120 Vac	6			
250 Vdc	5	16D468D	16D468E	16D468F
220 Vdc	2			

Catalog Series 268:

Units of catalog series 268 have the same operating characteristics as units of the 468 series, and all catalog numbers translate directly. Units of the 268 series are of partial drawout construction, with the input transformer board remaining fixed in the case. External connections to the rear terminals are the same as for units with connection diagrams 16D468A, 16D468B, and 16D468C. Catalog 468 series should be selected for new designs due to the improved test features and total withdrawability.

Special Versions: special versions of certain of these relays are available to meet the requirements of unique applications:

- * **Hand-reset operation:** these are units which seal-in the output contacts upon operation, and require actuation of the front panel target reset button to reset the contacts and target. To specify this option change the last digit in the catalog number to a 1: 468xxxx1. With this option, only the output contacts between terminals 11-12-13 are provided: *do not use terminals 14-15-16.*
- * **Control power indicator:** to specify a green led control power indicator add the suffix "-L" to the catalog number. This led indicates internal power supply voltage is present.
- * **Type 50H with internally adjustable operating time:** this relay is available for applications where some delay is needed to overcome inrush conditions, such as in motor starting, but no front panel adjustment of the operating time is permitted. This relay is factory calibrated for a 0.03-0.05 second delay. Internal potentiometer R22 provides a range of adjustment of 0.01-0.3 seconds. To specify this unit add the suffix "-AT" to the catalog number of the Type 50H unit.
- * **Wide frequency range:** Types 50D and 50H units are available for operation over the frequency range of 10-75 Hz. These units are specified by changing the catalog number from 468T to 468Fxxxx for 3-phase units, and from 468S to 468Hxxxx for 1-phase units. The dropout (reset) time for these units is 110 milliseconds maximum. Pickup tolerance is +25%, -15% over the entire frequency range, with much of this variation for frequencies below 20 Hz. Repeatability at any given frequency will be better than +/-3%.
- * **25 Hz Rating:** single-phase Types 50D and 50H units have catalog number form 468Gxxxx. The dropout (reset) time is approximately 40-50 milliseconds.
- * **Adjustable dropout-to-pickup ratio:** Types 50D, 50H, 37D, and 37H units are available with an internal adjustment which provides a range of 70-88%. Add the suffix "-V" to the catalog number to specify these units.

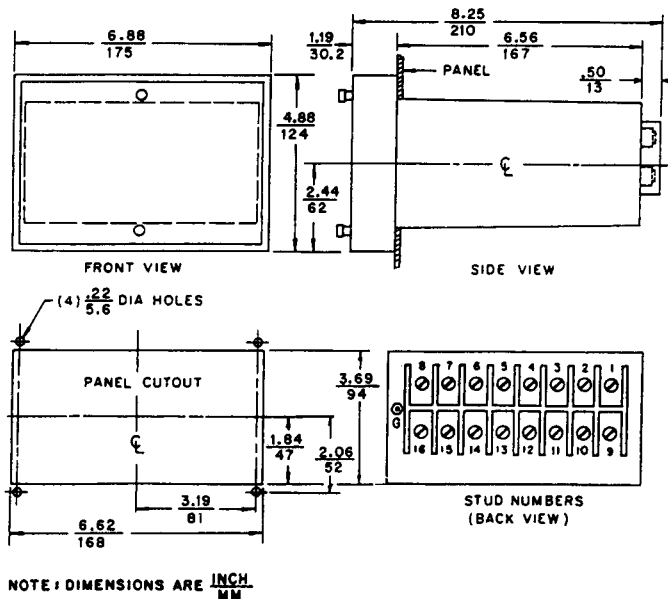


Figure 1: Relay Outline and Panel Drilling

Specifications

Input Circuits (50/60 Hz):

Relay Pickup Range	Continuous Rating	One Second Rating	Burden at Pickup	Burden at 5A
0.1-1A	2A	200A	0.58 ohms	0.30 ohms
0.2-2A	4A	200A	0.16	0.14
0.4-4A	8A	300A	0.045	0.045
0.8-8A	16A	300A	0.014	0.014
2-20A	20A	390A	0.006	0.006
8-80A	20A	390A	0.005	0.005
20-200A	20A	390A	0.004 (resistive, 1.0PF)	0.004

Dropout to Pickup Ratio: higher than 98% for standard units.

Operating Time:

Types 50D, 37D: definite-time characteristic, available ranges per chart on page 5.

Types 50B, 50H: instantaneous operation, see Figure 7 (pg 12).

Type 37H: instantaneous operation, approximately 0.025 sec.

Reset Time: Types 50B, 50D, 50H: see Figure 8 (pg 12).

Types 37D, 37H: typically less than 0.02 sec.

Control Power:

Types 50D, 50H, 37D, 37H models:

24/ 32 vdc at 0.08A max drain
48/110 vdc at 0.05A max drain
48/125 vdc at 0.05A max drain
220 vdc at 0.05A max drain
250 vdc at 0.05A max drain
120 vac at 0.04A max drain

Type 50B models:

48/110 vdc at 0.04A max drain
48/125 vdc at 0.04A max drain
220 vdc at 0.04A max drain
250 vdc at 0.04A max drain

Control Voltage	
Nominal Rating	Operating Range
24 vdc	19- 29v
32 vdc	26- 38v
48 vdc	38- 58v
110 vdc	88-125v
125 vdc	100-142v
220 vdc	176-246v
250 vdc	200-280v
120 vac	96-132v

Output Contact Ratings:	@125vdc	@250vdc	@120vac	
	30A	30A	30A	tripping duty
	5A	5A	5A	continuous
	0.3A	0.1A	2A	break

Operating Temperature Range: -30 to +70° C.

Tolerances:

With respect to printed dial markings at 25° C:

Pickup: +/-10%.

Time Delay: +/-10% or +/-10ms. whichever is greater.

Since the front panel adjustments are continuous, after calibration to the desired operating values the repeatability will be excellent:

Repeatability at 25° C:

Pickup: +/-1%

Time Delay: +/-1.5% or +/-10ms., whichever is greater.

Repeatability over temperature range -20 to +55° C:

Pickup: +/-5%

Time Delay: +/-5% or +/-10ms., whichever is greater.

Dielectric Strength: 2000Vac, 50/60Hz. rms, 60 seconds, all circuits to ground.

Seismic: More than 6g ZPA, broadband multifrequency vibration per ANSI Q37.98.

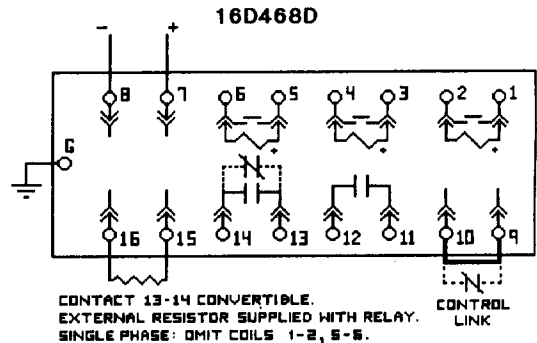
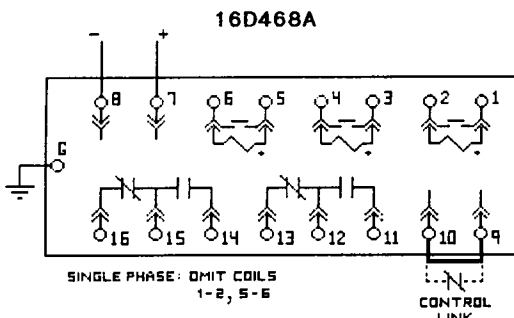
INTERNAL CONNECTIONS AND OUTPUT CONTACT LOGIC

The following table defines the output contact states in various conditions of the measured input current and the control power supply. AS SHOWN means the contacts are in the state shown on the internal connection diagram for that relay. TRANSFERRED means that the contacts are in the opposite state to that shown on the internal connection diagram.

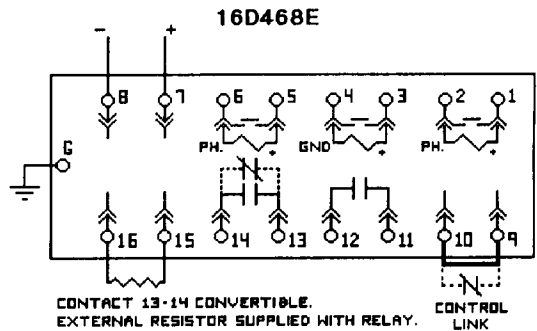
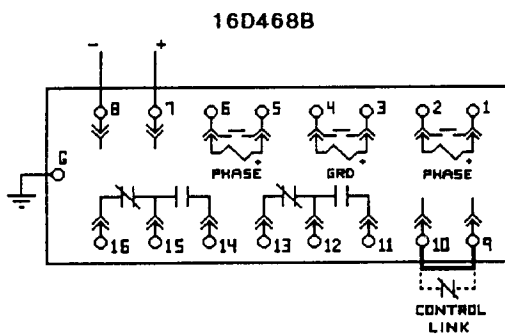
Condition	Relay Type	Output Contacts
No control voltage	All Types	As Shown
Normal control voltage Input current below setting	37D, 37H 50B, 50D, 50H	Transferred As Shown
Normal control voltage Input current above setting	37D, 37H 50B, 50D, 50H	As Shown Transferred

- Notes:**
- Control links must be in place for normal operation. Remove a link only when wiring an external contact to control the relay function.
 - For Types 50D, 50H - omit coils 1-2 and 5-6 for single phase units.
 - Units with an AC control power rating include an internal isolation transformer connected to terminals 7 and 8; polarity need not be observed.

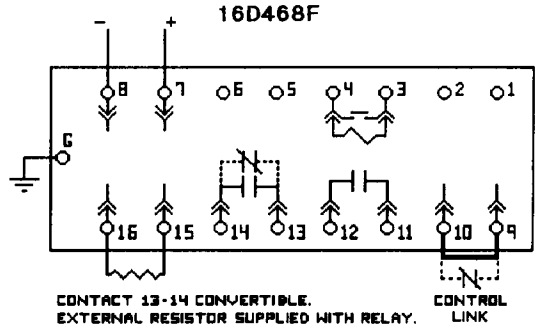
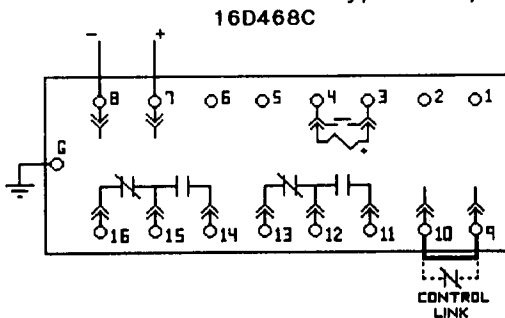
Types 50D, 50H Overcurrent Relays



Type 50B Overcurrent Relay



Types 37D, 37H Undercurrent Relays



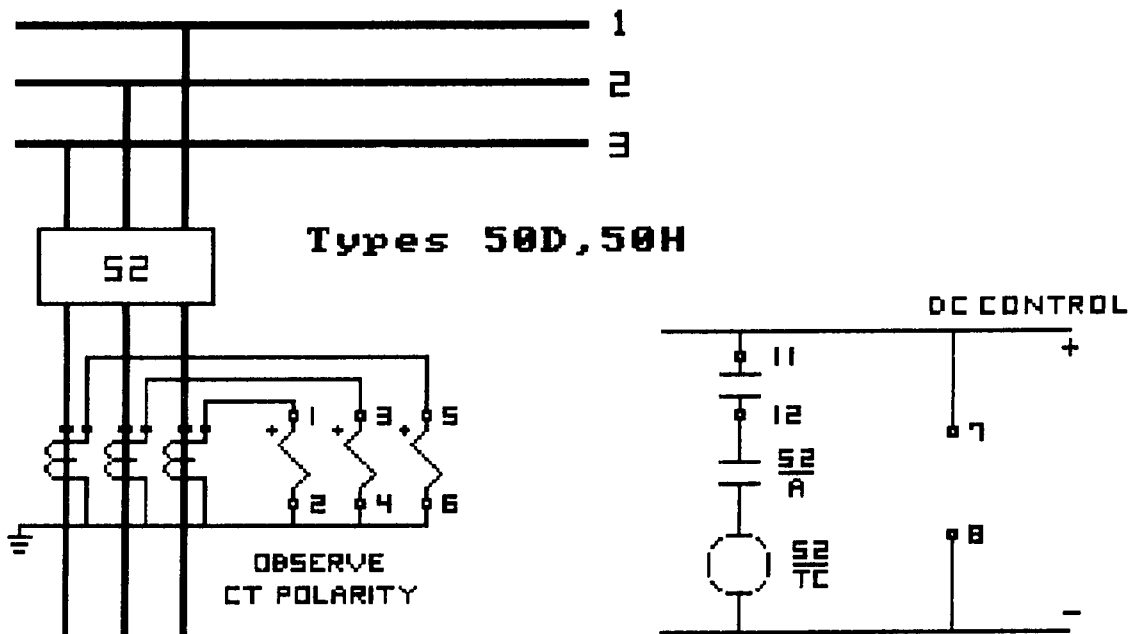


Figure 2: Typical External Connections
Three-phase Types 50D, 50H Phase Fault Protection

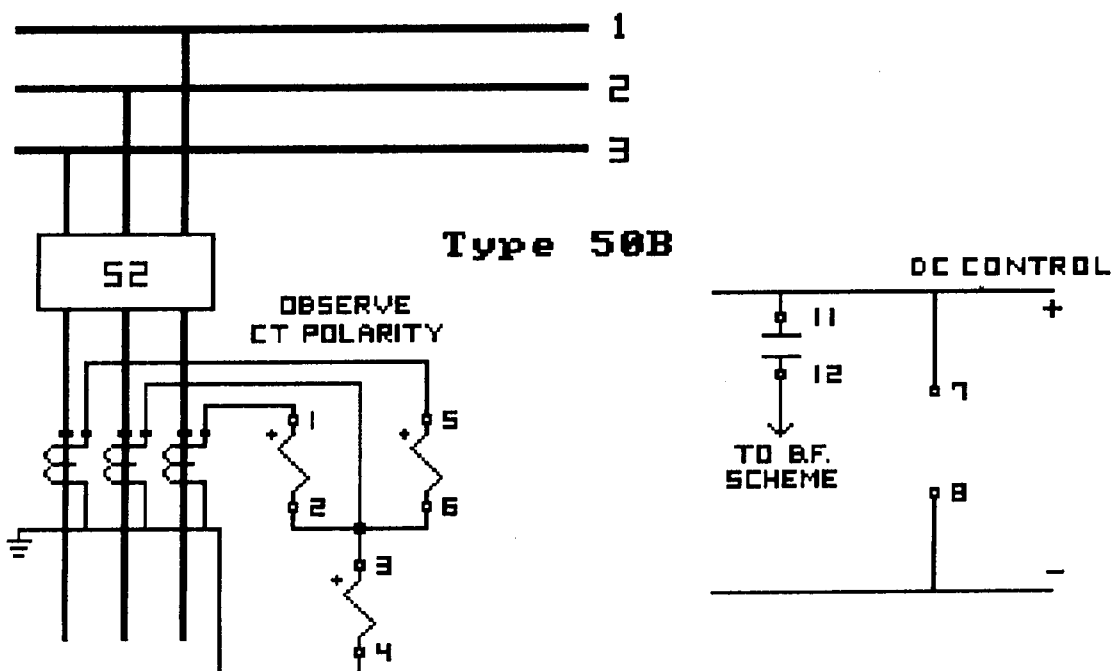


Figure 3: Typical External Connections
Type 50B for use in Breaker-Failure Scheme

Note: for complete breaker failure schemes refer to ABB Circuit-Shield Timing Relays, Types 62B and 62T (Instruction Books IB 7.7.1.7-5 and IB 7.7.1.7-6).

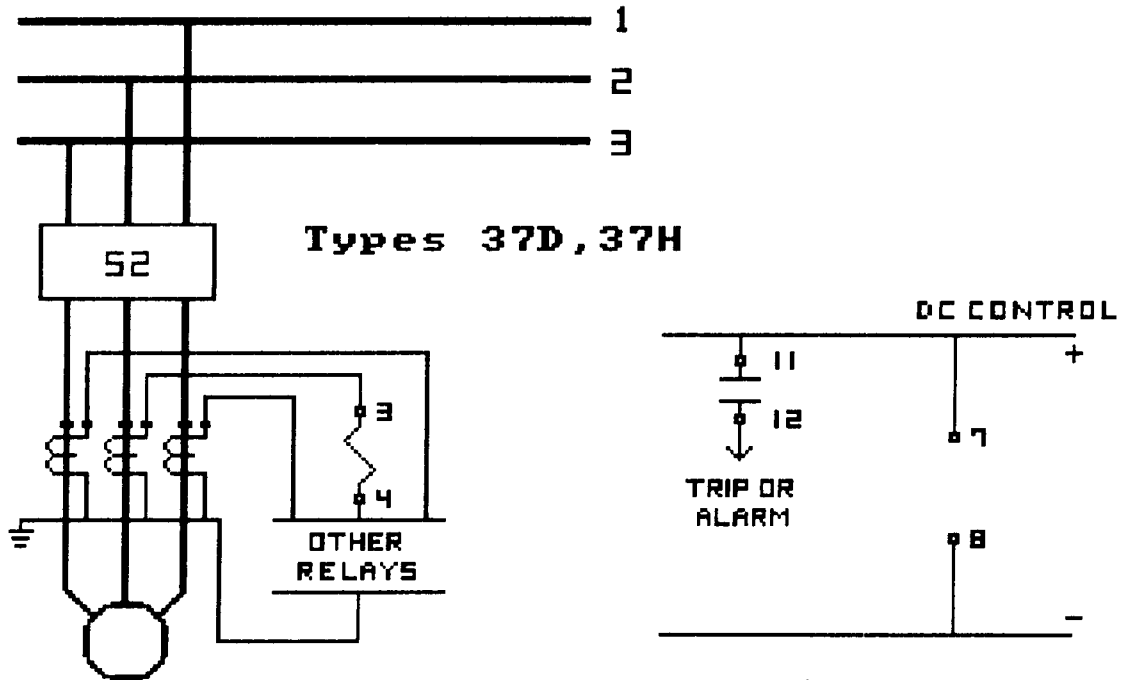


Figure 4: Typical External Connections
Types 37D, 37H Undercurrent Protection

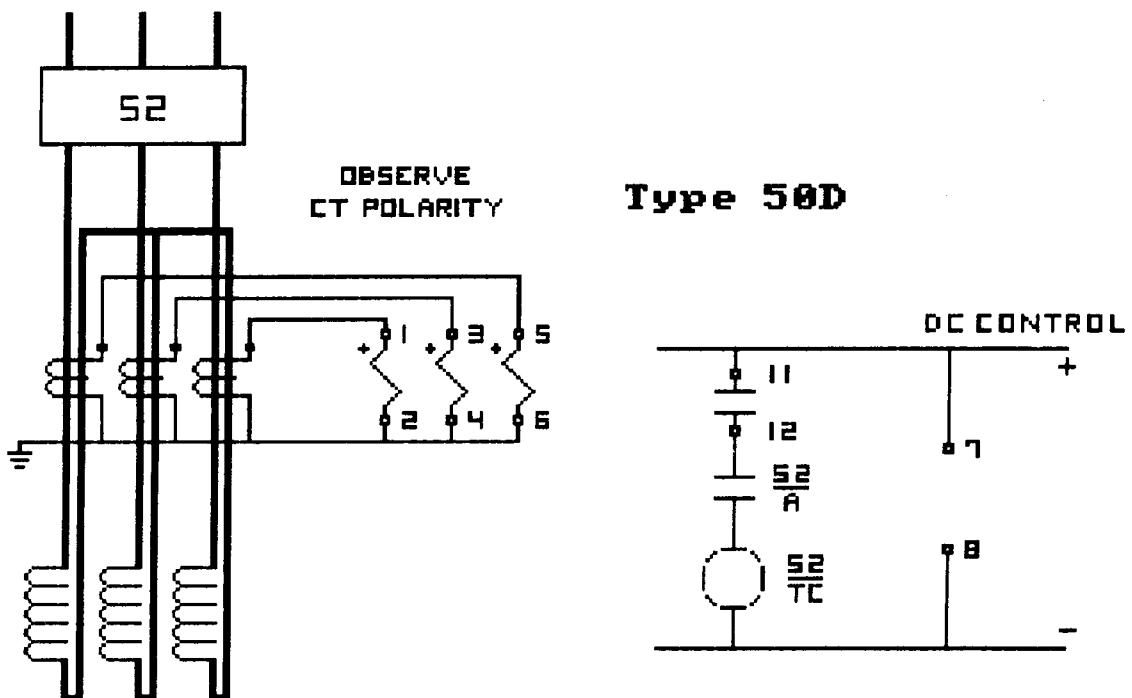


Figure 5: Typical External Connections - 87M Function
Three-Phase Type 50D in a Self-Balancing Machine Differential Scheme

Note: in this scheme the window ct's usually have a 50:5 ratio. The Type 50D relay usually selected is catalog 468T14x5 with a pickup range of 0.2-2A and a time-delay range of 0.01-0.3 seconds. With the 50:5 ratio ct's, this gives a primary side sensitivity of 2-20 amperes. The typical time delay setting used would be 0.03-0.05s.

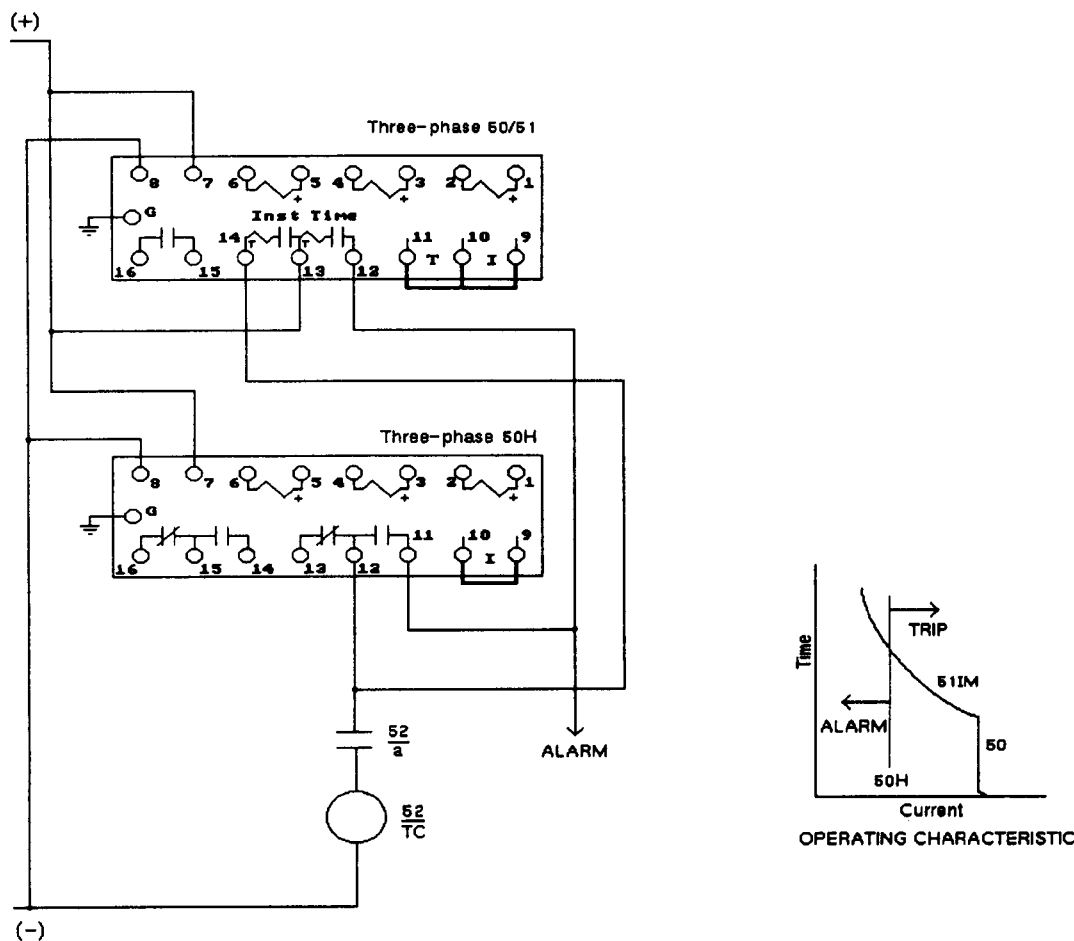


Figure 6: Control Circuit Connections - Motor Protection Scheme
Three-phase Overload and Fault Protection with Overload Alarm
ABB Circuit-Shield™ Types 51IM and 50H

This scheme provides a solid-state equivalent to the electromechanical relays Types IAC66K, IFC66K, and COM-5. The Circuit-Shield Type 51IM (catalog series 443) provides the (50) function for phase-fault protection, and the (51) long-time inverse characteristic curve for overload and locked-rotor protection. The Type 50H relay provides the high-dropout element. For overload currents below the 50H's threshold, an alarm is sent. For overload and locked-rotor currents above the 50H threshold, the 51IM will trip if the overload persists. The basic composite time-current characteristic is shown.

The relays typically chosen for this application are: Type 50H catalog 468T06x5, with pickup range 2-20 amps, and Type 51IM, catalog 443T85x1, long-time inverse, tap range 2.5-5 amps, with instantaneous 2-20x tap; (or catalog 443T85x2, same except with inverse instantaneous 4-16x tap, which provides slightly more delay near inst. pickup to override inrush on starting).

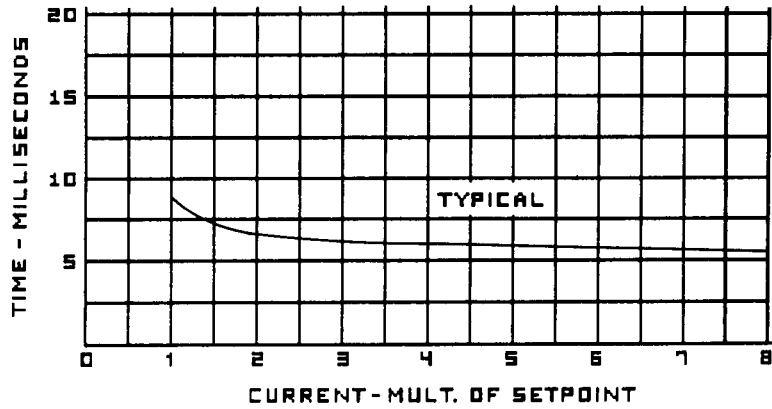


Figure 7: Typical Operating Time for Types 50B and 50H
Typical Reset Time for Types 37D and 37H

Notes:

1. Curve shown is typical for a unit rated for 125vdc, at nominal control voltage, and with the current source switched on and timing begun at its current zero.

Add 3 milliseconds to curve for a 24vdc, 48vdc, or 120vac rated unit.
2. Add 2 milliseconds to curve for a 125vdc or 32vdc rated unit operated with minimum control voltage (-20%).

Add 8 milliseconds to curve for a 24vdc, 48vdc, or 120vac rated unit operated with minimum control voltage (-20%).

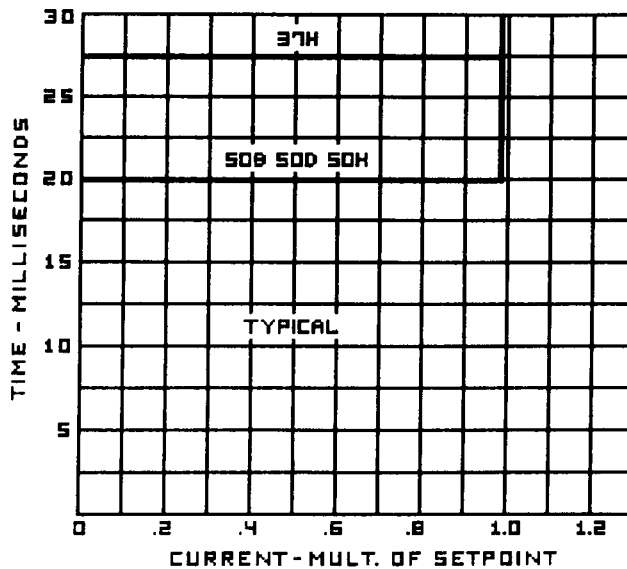


Figure 8: Typical Reset Time for Types 50B, 50D, and 50H
Typical Operating Time for Type 37H

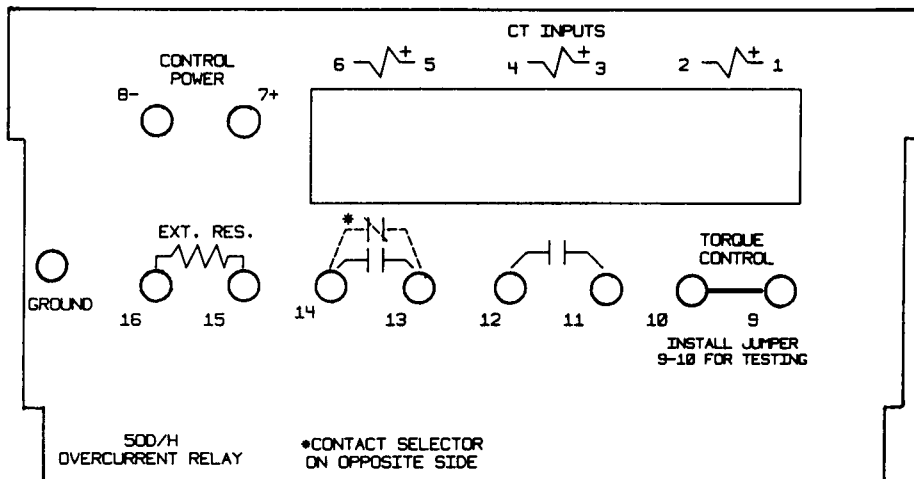


Figure 9: Backplane Layout for Types 50D and 50H Units with Convertible Contacts, Terminals 13-14

Note: selector link is on inside surface of this rear vertical circuit board.

Arrangement is similar for Types 37D, 37H, and 50B

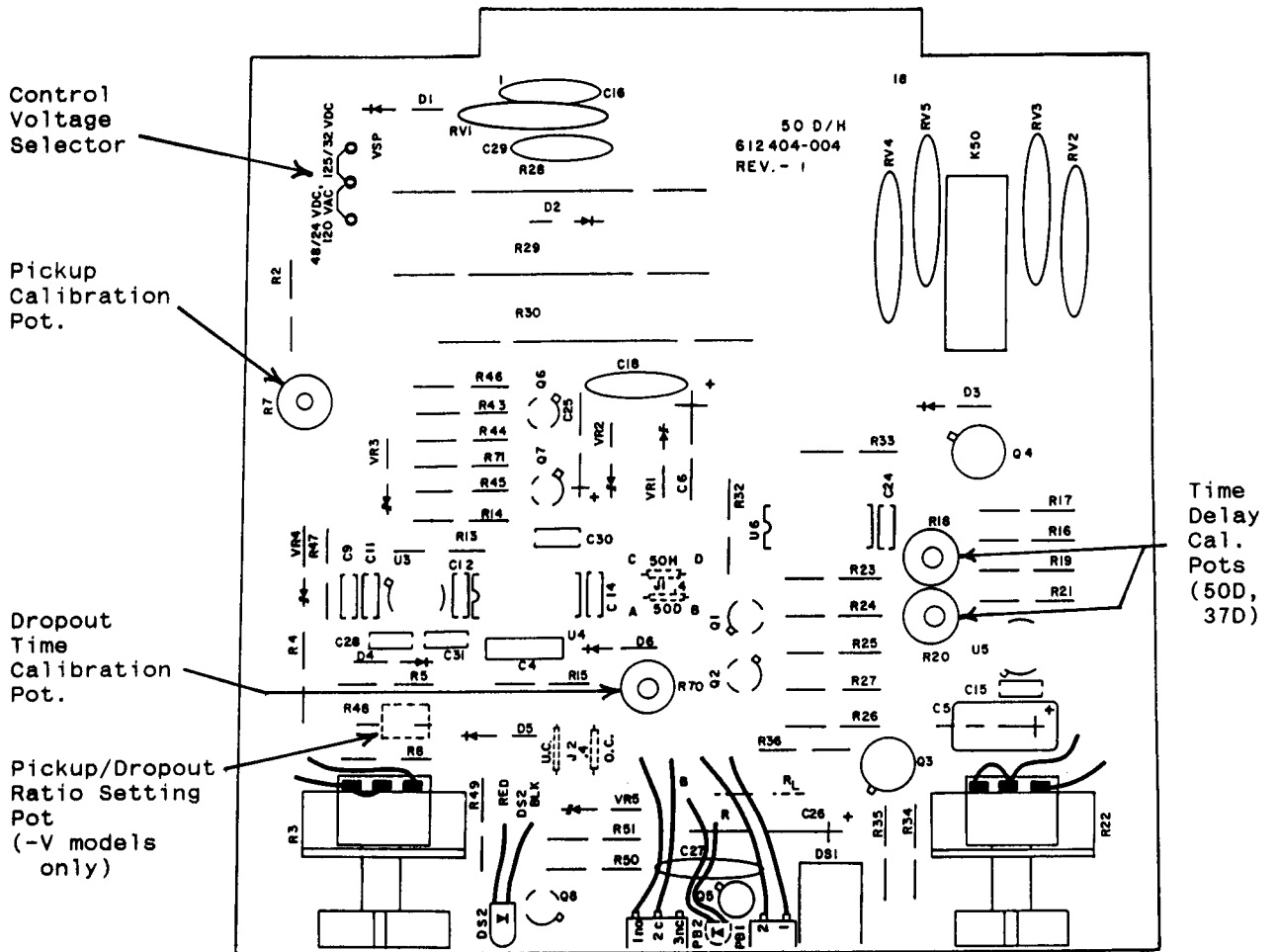


Figure 10: Typical Lower Circuit Board Layout - Types 50D, 50H, 37D, 37H

- Notes:
1. Internal calibration potentiometers shown for reference. These pots are set and sealed at the factory. Usually it should not be necessary to disturb these settings. Refer to test procedures starting on page 16.
 2. For Type 37H, R70 sets operating time. Do not disturb factory setting.

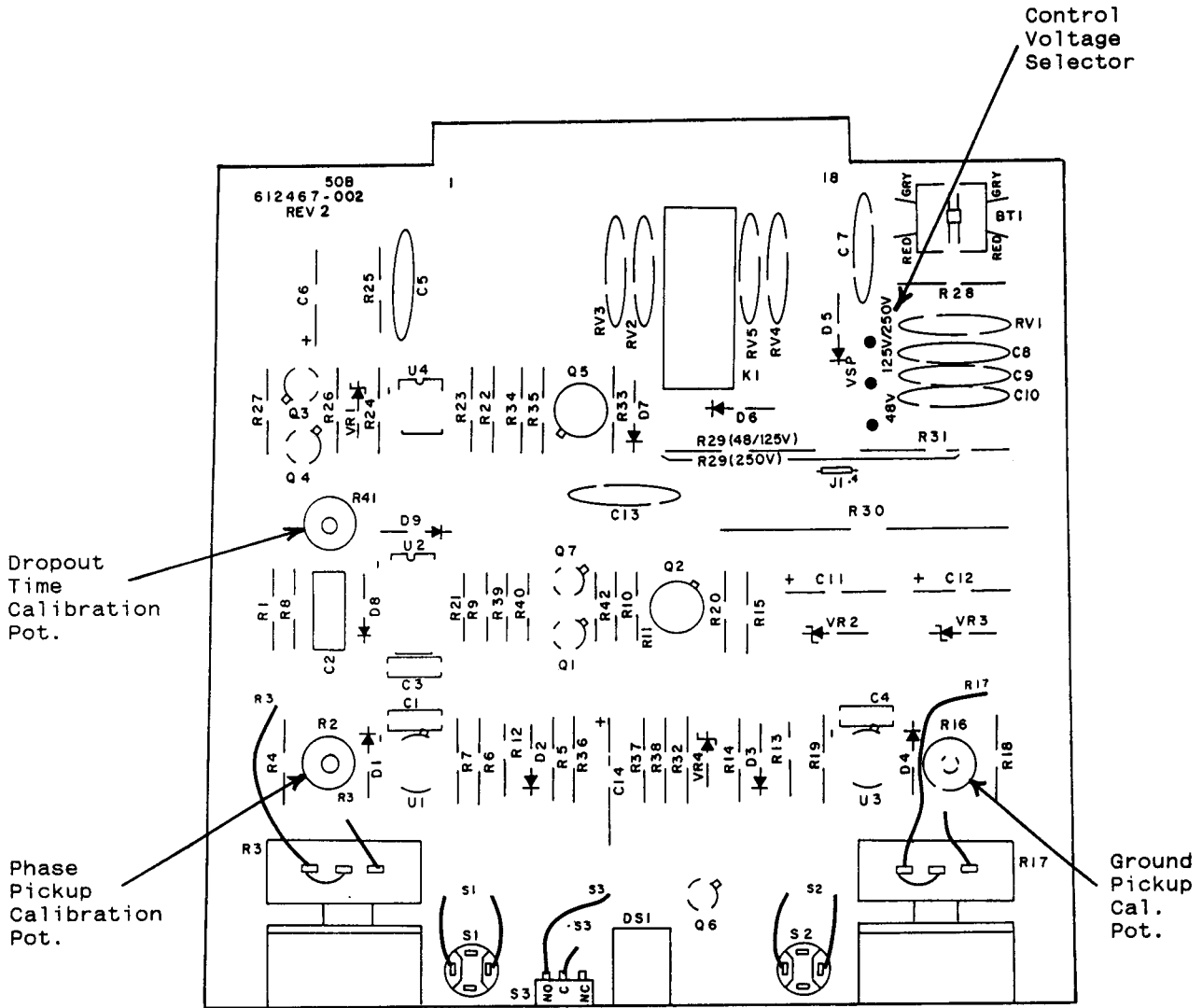


Figure 11: Typical Lower Circuit Board Layout - Type 50B

Note: Internal calibration potentiometers shown for reference. These pots are set and sealed at the factory. Usually it should not be necessary to disturb these settings. Refer to test procedures starting on page 16.

TESTING

1. MAINTENANCE AND RENEWAL PARTS

No routine maintenance is required on these ABB Circuit-Shield™ solid-state 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 and circuit description is available on request. Renewal parts will be quoted on request to the factory.

268 Series Units:

Drawout circuit boards of the same catalog number are interchangeable. A unit is identified by the catalog number stamped on the front panel and by a serial number stamped on the bottom side of the drawout circuit board. The board is removed using the metal pull knobs on the front panel. Removing the board does not open circuit the ct's; however, there is a risk of a nuisance operation, depending on the relay model, its settings, and which output contact is being used.

An 18 point extender board, cat. 200X0018, is available for use in troubleshooting.

Drawout circuit boards of the 268 series are NOT interchangeable with the older 238 series units. For information on the 238 series see page 19.

468 Series Units:

Metal handles provide leverage to withdraw the relay assembly from the case. Removing the unit in an application that uses the normally closed contacts will cause a trip. The assembly is identified by a catalog number stamped on the front panel of the relay and a serial number stamped on the bottom of the circuit board.

Test connections are readily made to the drawout relay unit by means of standard banana plugs. Current connections are made to the vertical posts at the blade assemblies. Control power and output connections are made at the rear vertical circuit board. This rear board is marked for easier identification of the connection points.

Since these relays include the "torque-control" feature, a jumper will be required from terminals 9 to 10 in order to make the drawout unit operable during testing.

IMPORTANT: in order to test the drawout unit of relays that have external resistors per diagrams 16D468D, 16D468E, and 16D468F on page 8, a suitable resistor must be temporarily connected between terminals 15 and 16 on the rear vertical circuit board. The value of this resistor depends on the control voltage rating of the relay. A 25 watt resistor is suitable for testing. The resistor values are: for Type 50B rated 250vdc -10000 ohms. For Types 50D, 50H, 37D, 37H rated 220vdc or 250vdc - 10000 ohms.

Disassembly: Should separation of the upper and lower circuit boards be necessary, remove the (2) screws holding the handle assemblies in place. Some units may also require the removal of (2) screws from the underside of the unit near the rear vertical circuit board. The lower circuit board may then be withdrawn forward from the printed circuit connector. An 18 point extender board, catalog 200X0018 is available if access to the lower circuit board is required during testing or troubleshooting.

Test Plug Assembly: a test plug assembly, catalog 400X0001 is available for use with the 468 series units. This device plugs into the relay case on the switchboard and allows access to all the external circuits wired to the case. See Instruction Book IB 7.7.1.7-8 for details on the use 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, withdraw the drawout element from the case before applying the test voltage.

3. BUILT-IN TEST FUNCTION

A built-in test function is provided for convenience in running a trip test on the relay and associated trip circuits.

CAUTION: tests should be made with the main circuit de-energized. If tests must be made on an energized circuit, take all necessary precautions.

The test button is labelled TRIP. For the Types 50B, 50D, 50H an overcurrent condition is simulated when the button is depressed. The relay will time out and trip if the button is held continuously for the duration of the time delay setting. For the Types 37D and 37H an undercurrent condition is simulated. Again the test button must be held for the time delay period to obtain an operation.

4. ACCEPTANCE TESTS

Test Connections:

A typical test circuit is shown in Figure 12. Apply proper control voltage per the nameplate rating of the relay (also check internal control voltage selector link position on units with dual rating).

Single-phase relays: apply test current to terminals 3 and 4.

Three-phase relays: a phase-to-phase current connection is recommended to insure that the polarity of the internal transformers is correct. (Incorrect polarity will result in pickup at significantly lower current than expected.) To make a complete check, test pickup with connections as shown in Figure 12; then, move the test source leads from terminal 5 to terminal 3 and from 6 to 4, and repeat the test.

Type 50B two phase and ground relay: test the phase inputs with the connections as shown in Fig. 12. For the ground input connect the test source to terminals 3 and 4.

Pickup Tests:

Adjust pickup dial to desired setting. If no setting has been specified, use 1x. Increase test current until the pickup led lights (Types 50D, 50H) or when the output contacts transfer (Type 50B). Pickup current should be within +/-10% of the dial setting. For Types 37D and 37H, start with a current above the set point, and reduce the current until the led lights.

If the final settings for the application are known, the pickup dial can be re-adjusted to obtain the precise operating point desired.

Note: In general it should not be necessary to use the internal potentiometers to recalibrate the front panel pickup dials; however, their locations are shown on the circuit board layouts in Figures 10 and 11 for reference.

Timing Tests (Types 50D and 37D):

Set the time delay dial to the desired setting. If no setting has been specified use the maximum delay setting. Set the test current source to 2 times the pickup setting. Reset the relay's target.

For the Type 50D, apply the test current: the pickup led should light. The relay should time out and transfer its output contacts to stop the test-set timer. The relay's target should set to orange. The operating time should be within +/-10% of the setting.

For the Type 37D, set up the test set to measure the time after the interruption of the current. Apply the current. Reset the relay's target. Interrupt the test current. The front panel led should light and the relay should time out and transfer its output contacts to stop the external timer. The relay's target should set to orange. The operating time should be within +/-10% of the setting.

Special Note for relays with the 0.01-0.3 sec. timing range: when used at the lower portion of the dial, the point-on-wave where switching of the test current source occurred can have a noticeable effect. The tolerance here is (Type 50D: +/-10% or +/-10ms. whichever is greater) or (Type 37D: +/-10% or +/-25ms whichever is greater). The test-set timer must be capable of accurately measuring these short times.

Timing Tests (Types 37H, 50B, 50H):

Since these are very fast relays (see Figure 7), point-on-wave switching effects and inherent limitations of the test equipment can make accurate measurements difficult; therefore, timing tests are not recommended as part of routine acceptance testing for these units.

Units with "-AT" Catalog Suffix:

These Type 50H instantaneous units have been modified to provide an internally adjustable operating delay just sufficient to overcome inrush conditions such as in motor starting applications. The factory calibration is 0.03-0.05 second delay. Internal calibration potentiometer R22 is used to set this delay. If you must verify the operating time, your test equipment must be capable of accurately measuring short times. Point-on-wave switching effects of the current source can have a noticeable effect on such timing tests.

Dropout Time Calibration (Types 50B, 50D, 50H):

In general, the factory setting of the internal calibration pot should not be field adjusted.

Total dropout or reset time of the relay is the sum of the measuring circuit delays and the dropout time of the mechanical output relay. Dropout of the measuring circuit is set by the pulse-stretcher circuit. Some adjustment of the pulse stretcher is provided by an internal pot: R70 for Types 50D, 50H and R41 for Type 50B. Total dropout or reset time is factory set for a nominal 20 milliseconds for standard units. This is an appropriate setting for most applications. Caution: it is possible but usually undesirable to reduce the pulse-stretcher time to the point where output relay chatter occurs. High accuracy test equipment or a storage oscilloscope should be used if any adjustment is made.

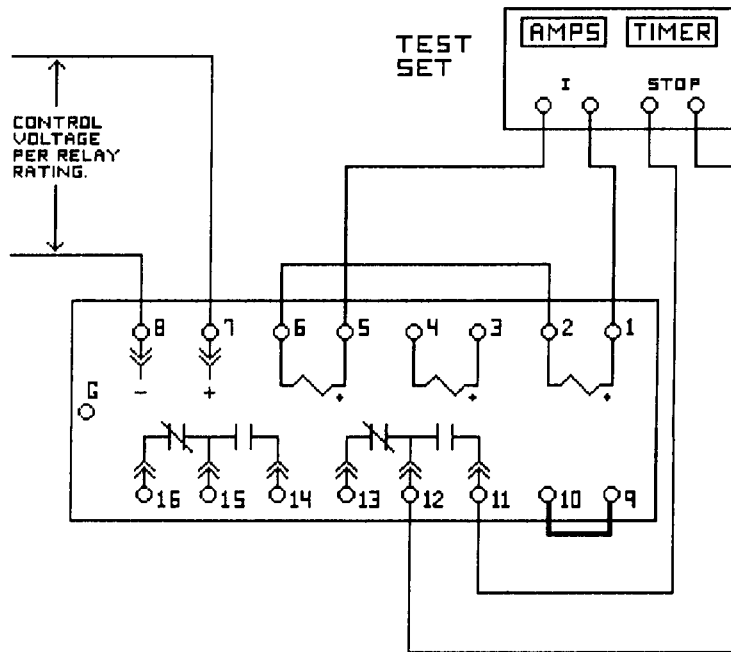


Figure 12: Typical Acceptance Test Circuit

Units with "-V" Catalog Suffix:

These units have been modified to provide an adjustable differential between the operate and reset thresholds. The usable adjustment range is $0.70 < R > 0.88$ where "R" is defined for the Types 37D and 37H as: (operate current / reset current); and for the Types 50D and 50H "R" is: (reset current / operate current).

The setting is made by test, using the internal multiturn calibration potentiometer R48. Refer to the circuit board layout in Figure 10 for the location of this adjustment. The use of an extender board will aid in this procedure.

Important: although the adjustment pot has additional range, settings below 70% should not be used.

OBSOLETE UNITS:

Units of catalog series 238 are similar in basic function to units of catalog series 268 and 468. Catalog numbers of standard units translate directly from the 238 series to the 268 and 468 series.

238 series units do not include a pickup led and have a hipot rating of 1500vac.

238 series and earlier versions of 268/468 series units did not include a dropout time calibration pot. Dropout times may be somewhat longer for these earlier versions.

Drawout circuit boards of the 238 and 268 series are not interchangeable. If a 238 series unit must be replaced we recommend using a 468 series unit. The entire case assembly must be changed-out; the case assembly has the same dimensions and panel cutout for all three catalog series.

Internal connections for the 238 and 268 series are given below for reference. Comparing with the 468 series shown on page 8, the terminal connections are the similar for all units except those rated for use with 220 or 250vdc control voltage.

Internal Connections 238/268 Series Units For Reference Only:

