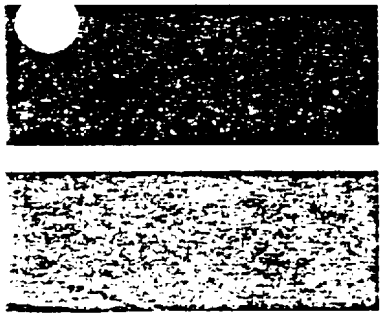
TIME OVERCURRENT RELAY



BE1-51

BE1-51-11-D
GD/S

Features

Configurations:

- Single Phase
- 2 Phase and Neutral
- 3 Phase
- 3 Phase and Neutral

– Available in single S1 case –

Setting Range:

- TIME OVERCURRENT 0.5 to 4 Amps (Low)
  1.5 to 12 Amps (High)

  – Continuous Adjustment over full range
  – Units with 1 or 3 sensing inputs include both ranges (0.5 to 12 Amps)

- INSTANTANEOUS OVERCURRENT

  – 1 IOC function available in all configurations
  – 2 IOC functions available with single phase

  – Continuous Adjustment - 1 to 40 times Time Overcurrent Setting (0.5 to 480 Amps)

Significant Advantages

- Relay may be coordinated when installed
- Switch selectable characteristics curve
- Low sensing burden
- Instantaneous Reset
- Compact Packaging
- Quick delivery

Time Characteristics

- All configurations may be ordered with any of 21 standard characteristic shapes

or

- May be ordered with a 16 position Characteristic Selector Switch

- Switch selectable characteristics allow relay to be coordinated with protected circuit

Applications Summary

Timing Characteristic		Typical Protective Application	Special Characteristic
Number	Name		
B1	Short inverse	Generators, busses	Relatively short time, desirable where preserving system stability is a critical factor.
B2, E2	Long inverse	Motors	Provides protection for starting surges and overloads of short duration.
B3	Definite time	General use	Fixed time delay according to dial setting. Useful in sequential tripping schemes.
B4	Moderately Inverse	Transmission and feeder lines. Useful in both phase and ground fault applications	Accommodates moderate load changes, as may occur on parallel lines where one line may occasionally have to carry both loads.
B5, E4, E5 B6, E6 B7, E7	Inverse Very inverse Extremely inverse	Feeder lines, or backup protection for other types of relays	Provides additional variations of the inverse characteristic, thereby allowing flexibility in meeting load variations, or in coordinating with other relays.
B8	I^2T	Motors	Prevents tripping from motor starting currents. Provides protection against light, medium and heavy overloads.
C1-C8	I^2T with limits		
	Extended timing range option		Provides a second set of the above listed curves with longer timing for increased flexibility.

Current Sensing External Connections

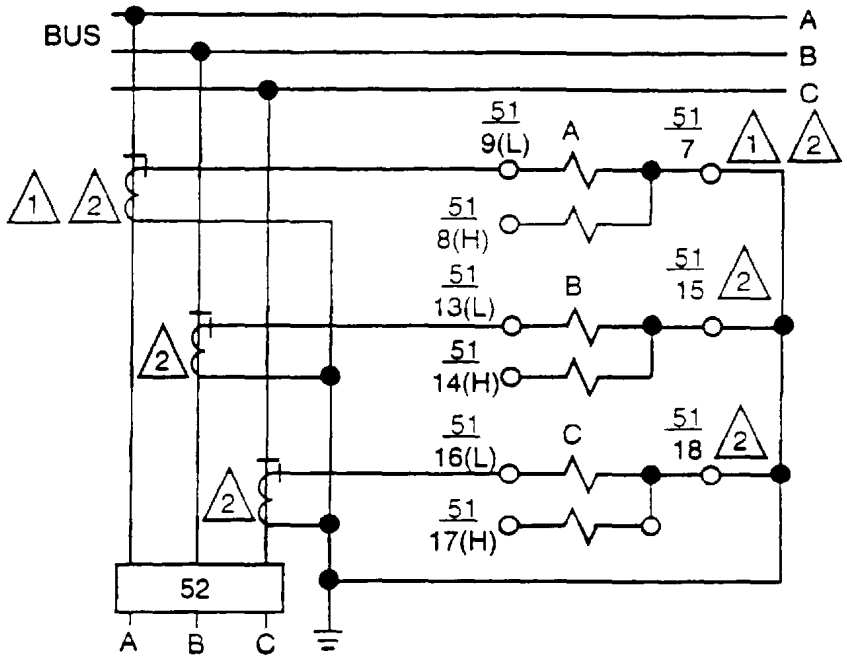
Single Phase, Two Phase and Neutral, and Three Phase - BE1-51

Legend:

51 = Overcurrent relay
52 = Power circuit breaker
(L) = Low sensing range (0.5 - 4.0A)
(H) = High sensing range (1.5 - 12A)

1 = 1 Phase sensing

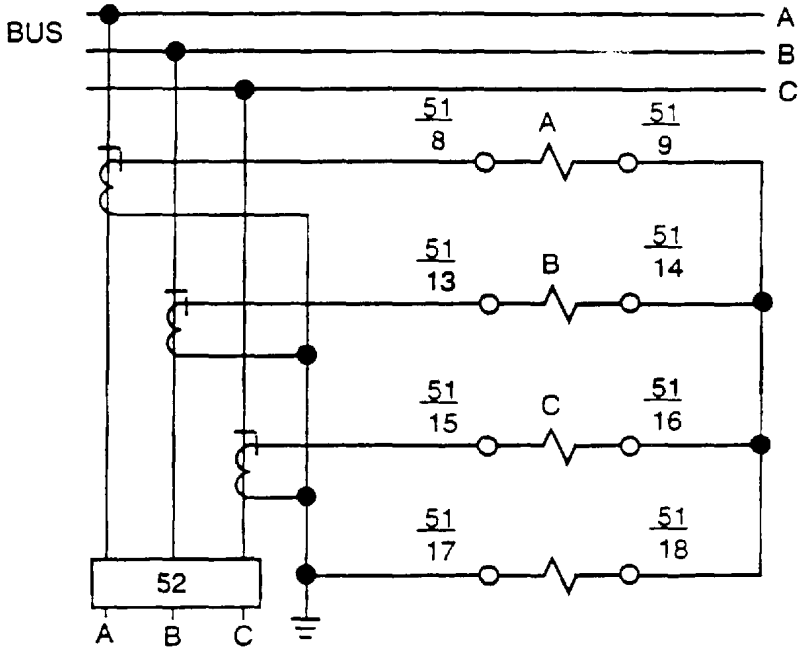
2 = 3 Phase sensing



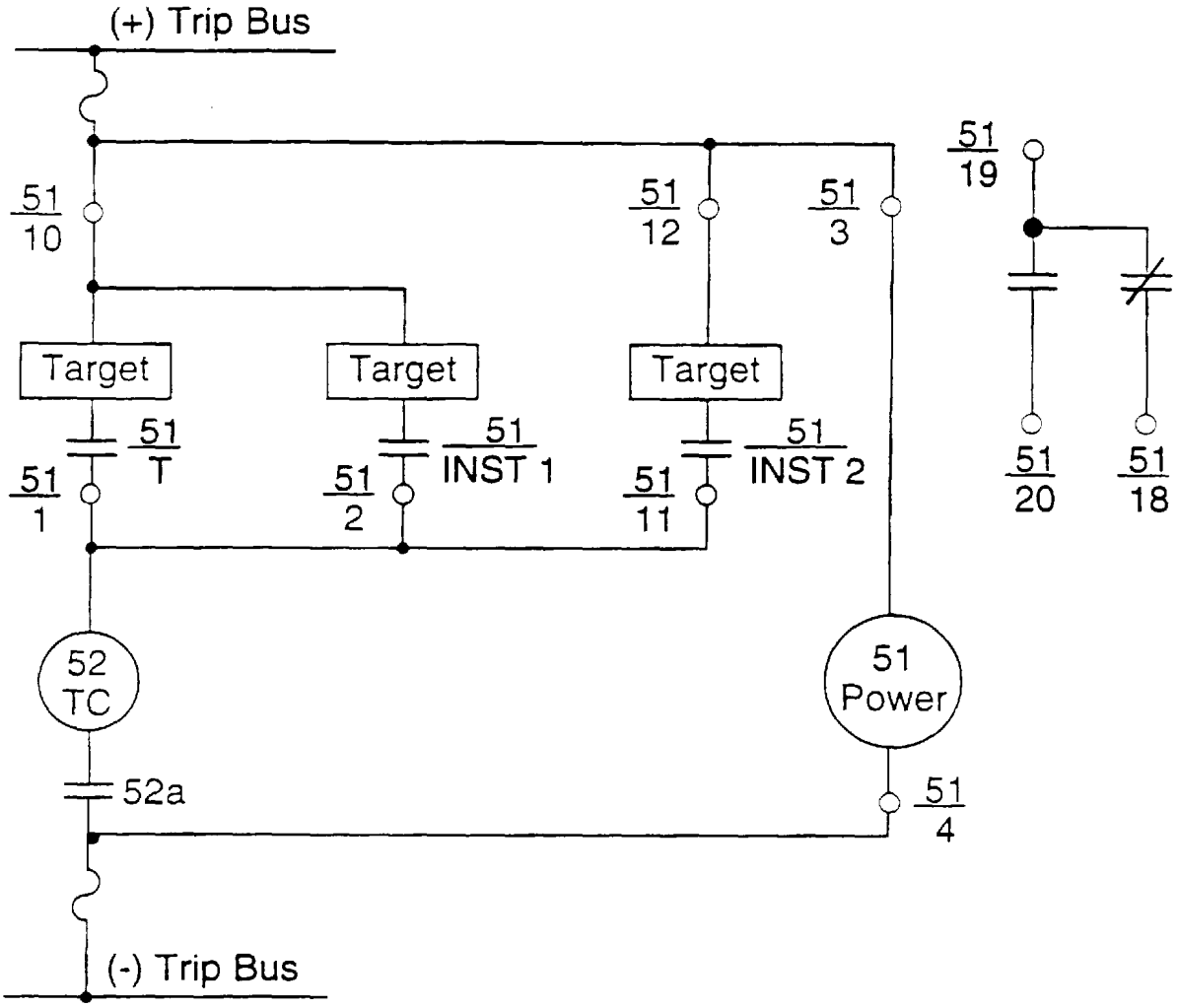
Three Phase With Neutral - BE1-51

Legend:

51 = Overcurrent relay
52 = Power circuit breaker



External Control Circuit Connections



Legend:

51	= Overcurrent relay	INST 2	= Instantaneous overcurrent # 2
52/TC	= Breaker trip coil	T	= Timed
52a	= Breaker auxiliary contacts	⌒	= Fuse
INST 1	= Instantaneous overcurrent # 1		

Functional Description

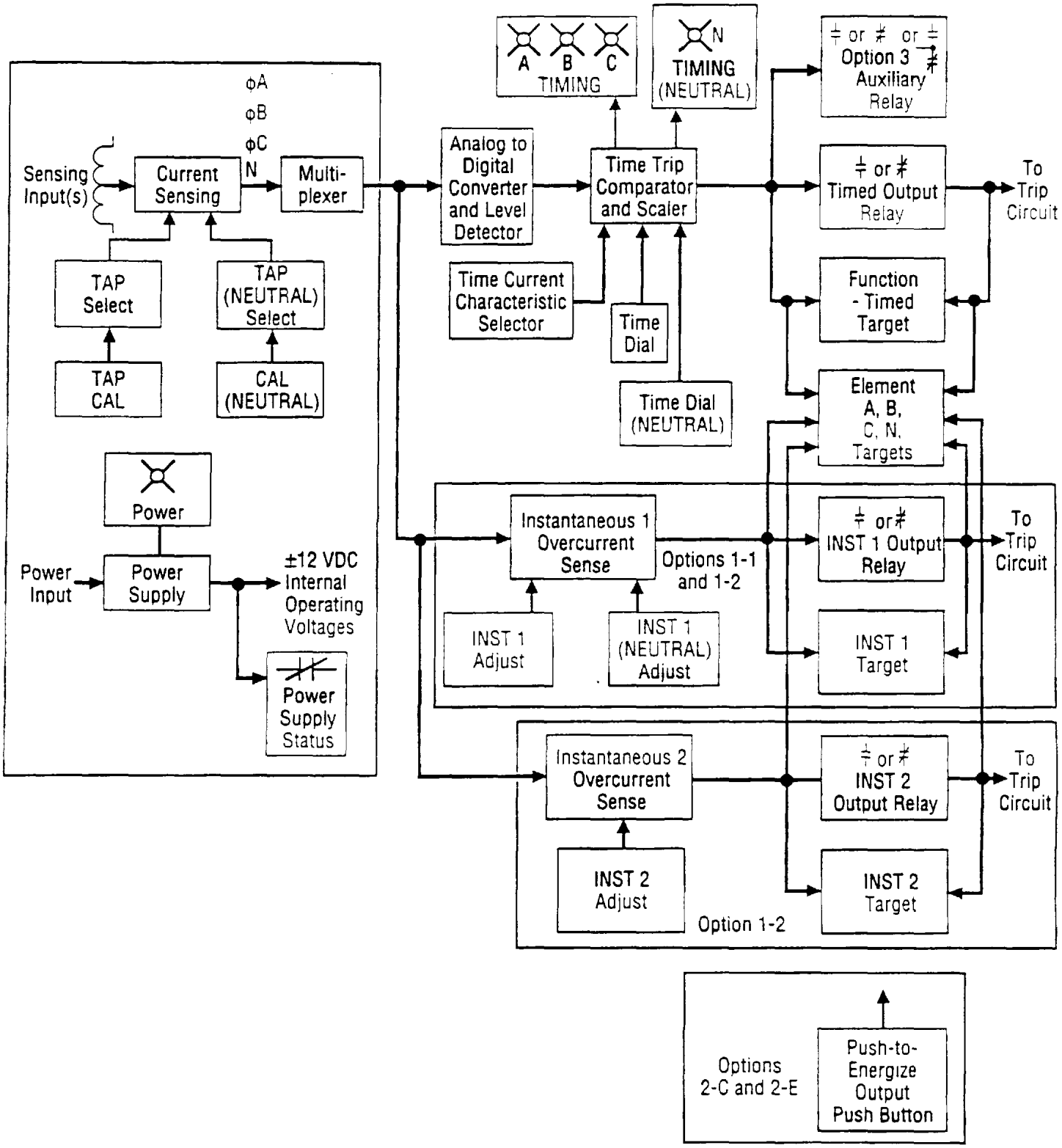
- Each input current is monitored independently, scaled and compared to the appropriate pickup setting.

- Timing is accomplished by the microprocessor in accordance with any of sixteen independent characteristics.

- Pickup setting is determined by a TAP switch and TAP CAL adjustment. This combination provides continuous adjustment capability over the full sensing range of the relay.

- Front panel LEDs provide visual indication of the operational status of the unit

Functional Block Diagram

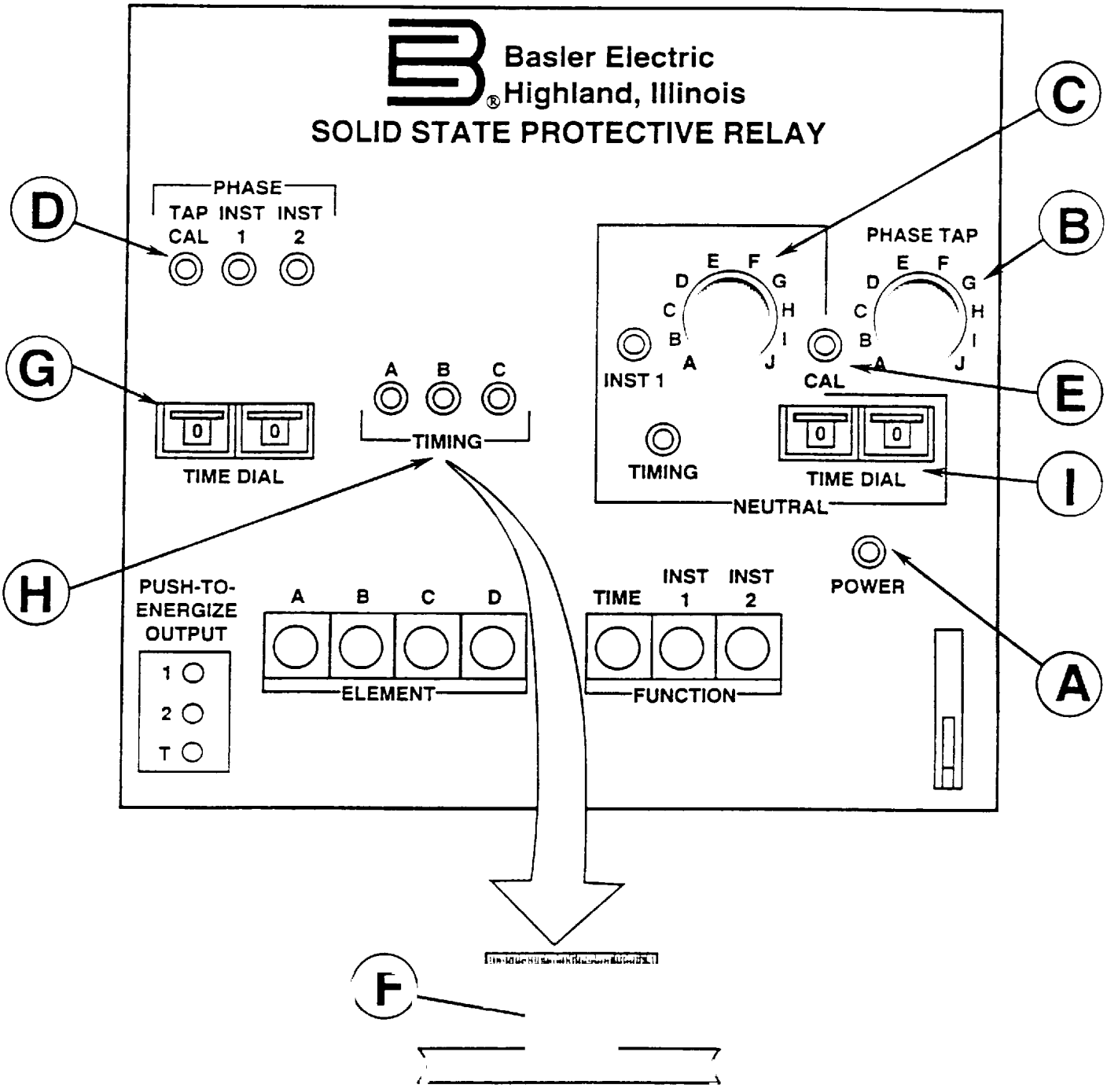


BE1-51

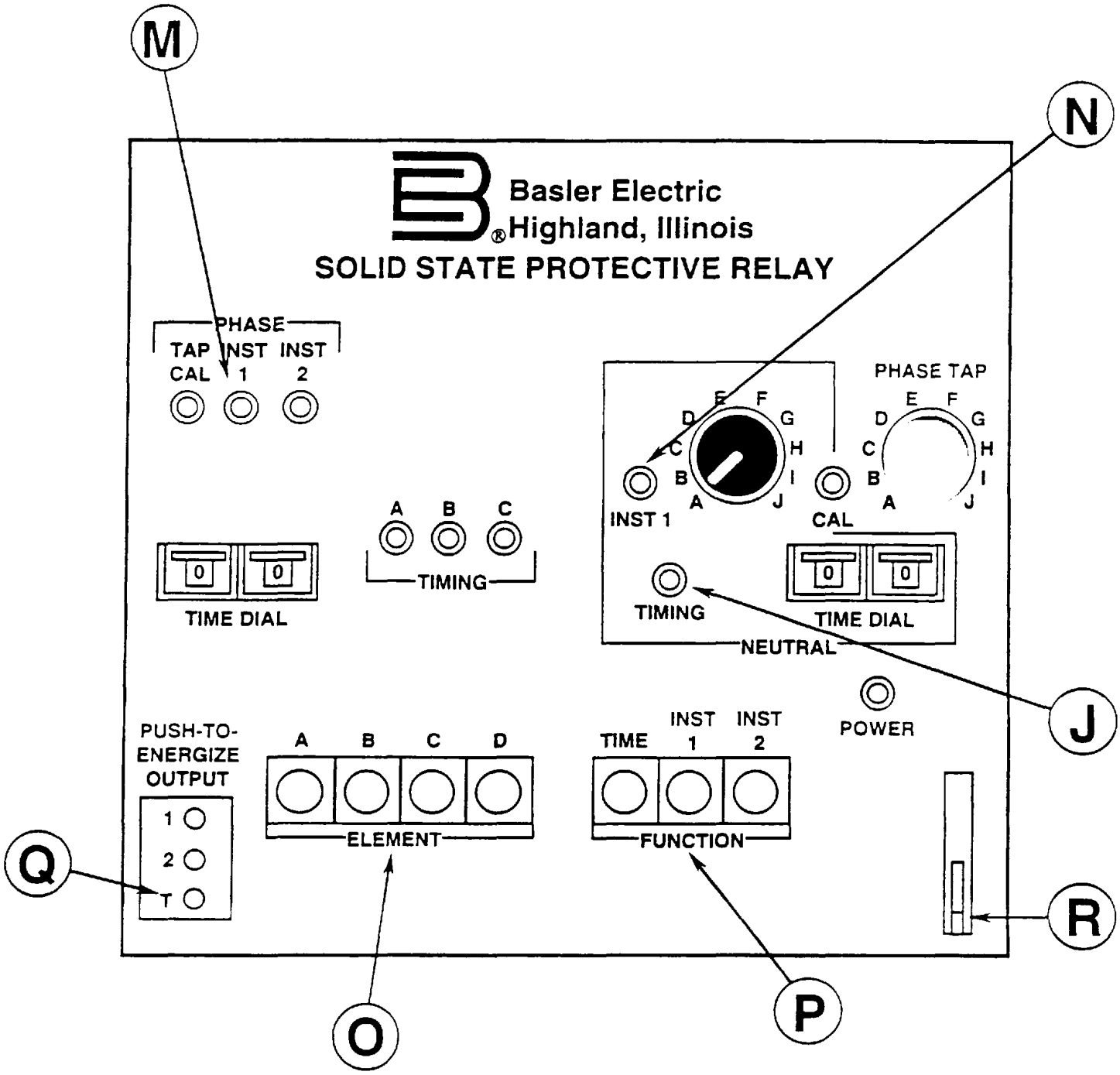
Controls and Indicators

Letter	Control or Indicator	Function or Indicator
A	Power Indicator	LED indicates the power supply is functioning.
B	TAP selector	Provides selection of the overcurrent pickup point in conjunction with the TAP CAL Control.
C	TAP NEUTRAL Selector	Provides selection of the NEUTRAL overcurrent pickup point in conjunction with the NEUTRAL CAL control.
D	TAP CAL Control	Provides adjustment of the phase overcurrent pickup point between the selected tap setting and the next lower tap setting.
E	CAL NEUTRAL control (Relays having three phase and N sensing only)	Provides adjustment of the NEUTRAL overcurrent pickup point between the selected tap setting and the next lower tap setting.
F	Time current characteristics curve selector (Z1 & Z2 Timing types only)	Provides selection of Time current characteristic curve.
G	TIME DIAL	Determines the time delay between sensing of the overcurrent condition and the closing of the output relay.
H	TIMING indicator	LEDs light when overcurrent pickup setting is reached and exceeded.
I	TIME DIAL NEUTRAL	Provides same function as TIME DIAL but for NEUTRAL element only.

BE1-51
Location of Controls and Indicators



BE1-51
Location of Controls and Indicators



Controls and Indicators (Cont)

Letter	Control or Indicator	Function or Indicator
J	TIMING indicator NEUTRAL	Provides same indication as TIMING indicator but for NEUTRAL element only.
M	INST 1 and 2 control (options 1-1 and 1-2 only)	Provides adjustment of the INST 1 trip setting over the range of 1 to 40 times the selected input sensing range for Phase Elements.**
N	INST 1 NEUTRAL (options 1-1 and 1-2 only)	Same function as INST 1 control, except it adjusts the INST 1 NEUTRAL trip setting.**
O	ELEMENT targets (A, B, C, N)	Appropriate target trips when output relay is energized by an overcurrent condition.
P	FUNCTION targets (TIME INST 1, INST 2)	Appropriate target trips when the corresponding output relay is energized.
Q	PUSH-TO-ENERGIZE OUTPUT pushbutton	Provides manual energizing of the output relay(s) for testing the external trip circuit.
R	Target reset lever	Provides manual reset for all targets (ELEMENT and FUNCTION).

Legend:

(**) This instantaneous overcurrent sensing circuit detects only levels at or above the level selected for the time overcurrent sensing circuit. Any change of the time overcurrent pickup setting will cause a directly proportional change increase of the instantaneous overcurrent levels.

SECTION 5

TESTS AND ADJUSTMENTS

GENERAL

Procedures in this section are for use in testing and adjusting a relay for the desired operation in a protective scheme. If a relay fails an operational test, or if an adjustment discloses a faulty relay, refer to Section 6.

REQUIRED TEST EQUIPMENT

Minimum test equipment required for relay testing and adjustment is listed below. Refer to Figures 5-1 through 5-4 for test setups.

a. Appropriate ac or dc power source for relay operation.
b. Appropriate ac source (50 or 60 Hz as appropriate) for voltage and current testing.
c. Dc external power source for output relay(s) test setup and timer input.
d. Relay test set capable of delivering 40 A. A higher capability is needed for instantaneous settings above 40 A.
e. Timer.
f. One shunt resistor for providing minimum target Load.

OPERATIONAL TEST

Preliminary Instructions

Perform the following steps before going on to any testing.

Step 1. Connect the relay test setup in accordance with Figures 5-1 through 5-4, depending upon the sensing input type for your relay (See Figure 1-1, Style Number Identification Chart).

(a) Sensing Input Type K (Single-Phase Sensing). Refer to Figure 5-1.

> **NOTE**
> For relays having the above sensing, only the front panel **LOW** range current sense terminal(s) should be connected for a complete check of the Relay.

Ensure that the timed output terminals 1 and 10 are connected.

(b) Sensing Input Type G (Three-Phase Sensing). Refer to Figure 5-2.

> **NOTE**
> For relays having the above sensing, only the front panel **LOW** range current sense terminal(s) should be connected for a complete check of the Relay.
>
> For all three-phase relays, the test signals must connect to both the current and voltage terminals for the same phase.

Ensure that the timed output terminals 1 and 10 are connected.

(c) Sensing Input Type H or V (Three-Phase with Neutral Sensing). Refer to Figure 5-3. Ensure that the timed output terminals 1 and 10 are connected. Also, verify that either A, B, or C current sense terminals are connected initially (N terminals will be connected later in the test).

(d) Sensing Input Type I or X (Two-Phase with Neutral Sensing). Refer to Figure 5-4. Ensure that the timed output terminals 1 and 10 are connected. Also, verify that either A, B, or C current sense terminals are connected initially (N terminals will be connected later in the test).

Step 2. Remove the relay front cover.

Step 3. Set the front panel **TIME DIAL** selector and, if present, the front panel **TIME DIAL (NEUTRAL)** selector to 99.

Step 4. Adjust the front panel **INST 1** and **INST 2** controls, if present, fully clockwise (CW).

Step 5. Adjust the front panel **TAP CAL** control, and if present, the front panel **TAP (NEUTRAL)** control fully CW.

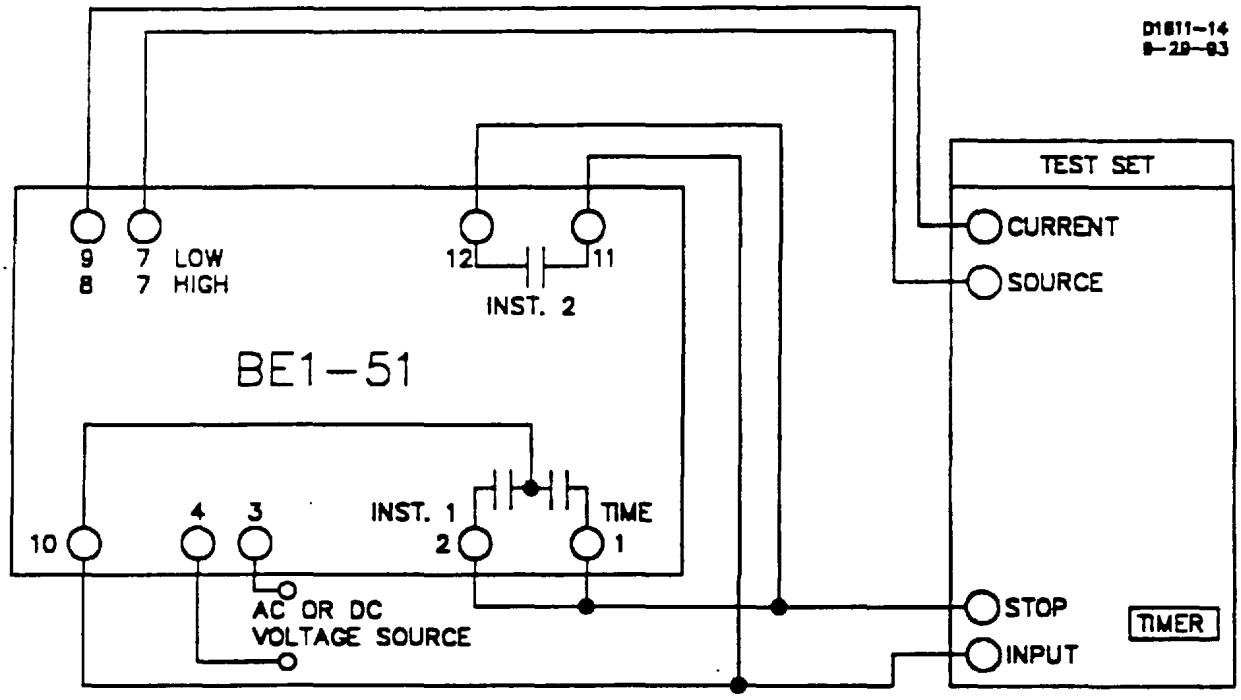


Figure 5-1. Test Setup for Sensing Input Type K (Single-Phase Sensing)

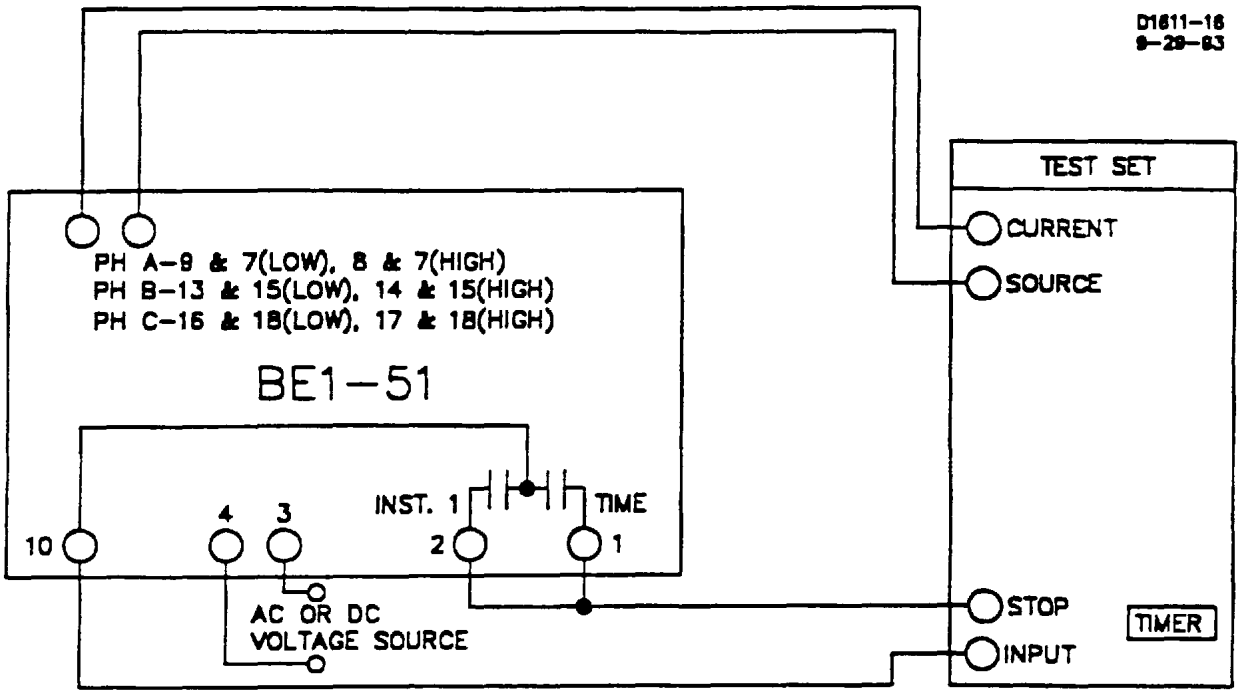


Figure 5-2. Test Setup for Sensing Input Type G (Three-Phase Sensing)

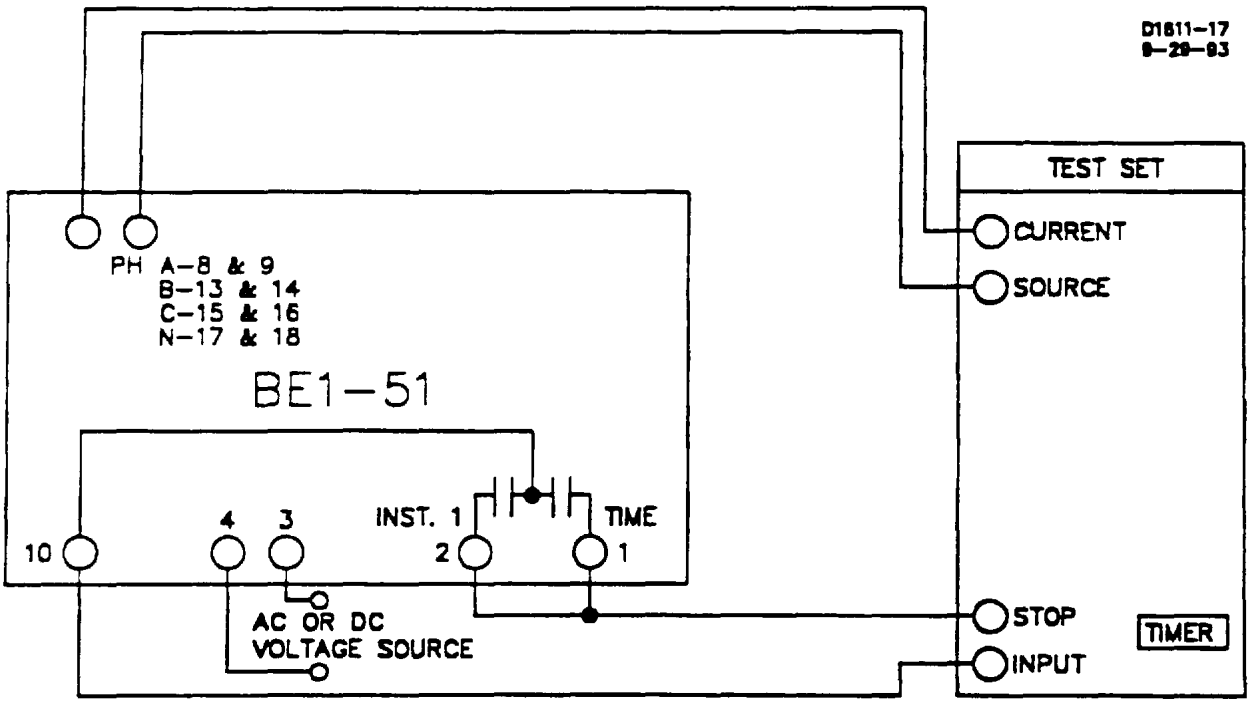


Figure 5-3. Test Setup for Sensing Input Type H or V (Three-Phase with Neutral Sensing)

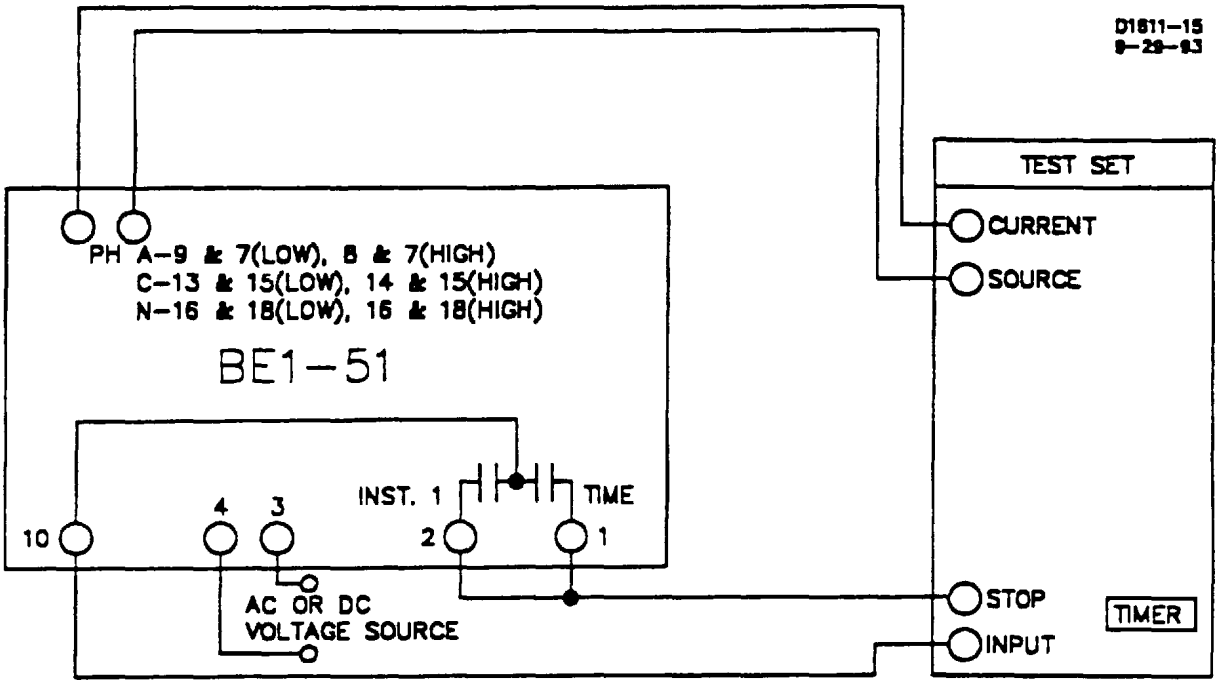


Figure 5-4. Test Setup for Sensing Input Type I or X (Two-Phase with Neutral Sensing)

Step 6. Ensure that the relay front panel **TARGETS**, if present, are reset.

Step 7. Apply 100% of nominal voltage based on the sensing input type for your relay.

Time Overcurrent Pickup Test

This test checks the minimum and maximum overcurrent pickup points of the time overcurrent element.

> **NOTE**
> During this test, disregard any indication on the test setup timer.

Step 1. Perform the Preliminary Instructions.

Step 2. Set the front panel **TAP** selector to **A**.

Step 3. Adjust the test set, for an overcurrent threshold having one of the following values:

a) 0.5 A for relays with Sensing Input Range 1, 2, or 4.
b) 1.5 A for relays with Sensing Input Range 3 or 5.

Step 4. Slowly adjust the front panel **TAP CAL** control CCW until the front panel **TIMING** Indicator illuminates.

RESULT: For the phase minimum overcurrent pickup point of 0.5 A (Step 3a., above) or 1.5 A (Step 3b., above) the front panel **TAP CAL** control should be near its maximum CCW limit.

Step 5. Adjust the front panel **TAP CAL** control fully CW to allow measurement of the actual overcurrent pickup point at the **A** setting of the front panel **TAP** selector. Note that the front panel **TIMING** indicator will extinguish. Do not disturb this setting.

Step 6. Slowly increase the current toward the value of the front panel **TAP** selector **A** setting until the front panel **TIMING** indicator illuminates. Do not disturb this setting.

Step 7. Record the current reading and remove input current.

RESULT: The recorded value should be within ±5% of the front panel **TAP** selector **A** setting for the phase minimum overcurrent pickup point for the time overcurrent.

Step 8. Set the front panel **TAP** selector to **J**.

Step 9. Slowly adjust the test set, increasing the overcurrent threshold toward the value of the front panel **TAP** selector **J** setting until the front panel **TIMING** indicator just illuminates. Do not disturb this setting.

Step 10. Record the current reading and remove input current.

RESULT: The recorded value should be within ±5% of the front panel **TAP** selector **J** setting for the phase maximum overcurrent pickup point for the time overcurrent element.

Step 11. Perform the following steps as appropriate for the correct sensing input types.

> **NOTE**
> Ensure that the voltage sense terminals and current sense terminals are connected to the same phase.

(a) *Sensing Input Type K (Single-Phase Sensing).* This concludes the time overcurrent test. Proceed to the timed output test.

(b) *Sensing Input Type I or X (Two-Phase and Neutral Sensing).* Remove the power and reconnect the input sensing to the remaining phases as shown in Figure 5-4, each time repeating Steps 1 through 10. For neutral testing continue with Step 12.

(c) *Sensing Input Type G (Three-Phase Sensing).* Remove the power and reconnect the input sensing to each of the remaining phases as shown in Figure 5-2, each time repeating Steps 1 through 10.

(d) *Sensing Input Types H or V (Three-Phase with Neutral Sensing).* Remove the power and reconnect the input sensing each of the remaining phases as shown in Figure 5-3, each time repeating Steps 1 through 10. For neutral testing continue with Step 12.

Step 12. Perform the preliminary instructions.

For the neutral sensing (terminals 17 and 18), connect the relay as shown in Figures 5-3 and 5-4, then perform the following steps (Steps 13 through 21).

Step 13. Set the front panel **TAP (NEUTRAL)** selector to **A**.

Step 14. Adjust the test set for an overcurrent threshold having one of the following values:

a) 0.5 A for relays with Sensing Input Range 2 or 3.
b) 1.5 A for relays with Sensing Input Range 4 or 5.

Timed Output Test

This test checks the accuracy of the time overcurrent characteristic delay.

> **NOTE**
> For Relays having three-phase sensing (Sensing Input Type G or V) only a single input phase needs to be connected, since this is sufficient for a complete test of the Time Delay. For Relays that include neutral sensing (Sensing Input Types H, I, V, and X) this test includes reconnecting the Test Output to the Neutral Sensing Terminals for testing the Timed Output during neutral sensing.

Step 1. Verify that the preliminary instructions have been performed.

Step 2. (Timing type Z1, Z2, or Z3 only.) Select the desired time current characteristic curve.

Step 3. Set the front panel **TAP** selector to **B**.

Step 4. Adjust the front panel **TIME DIAL** to **20**.

Step 5. Adjust the test set for an overcurrent threshold of precisely 5 times the front panel **TAP** selector **B** setting, as measured on the ammeter.

Step 6. Apply input current to the relay and initiate the test setup timer.

Step 7. Observe that the appropriate front panel **TIMING** indicator illuminates and when the time delay ends that the timed output relay is energized.

RESULTS:
(1) The appropriate front panel **TIMING** indicator extinguishes.
(2) The test setup timer stops. (Record count for use in Step 9.)
(3) If target type A or B is present:
  (a) The front panel **FUNCTION-TIME** target (if present) trips.
  (b) The appropriate front panel **ELEMENT** target **A**, **B**, or **C** (if present) trips.

Step 8. Remove input current and (if present) reset the relay front panel targets.

> **NOTE**
> Due to delays inherent in the test equipment, the time delay for the following test may appear to exceed these limits.

Step 9. On the appropriate time overcurrent curve chart (Figures 1-2 through 1-70), locate the line representing 5 times the tap value (from Step 5) where it intersects the particular curve representing the front panel **TIME DIAL** setting of 20 (from Step 4). The resulting time delay value in seconds should be within ±5% of the timer reading [from step 7(2)].

Step 10. Adjust the front panel **TIME DIAL** to **40**, **60**, and **99**, each time repeating Steps 6 through 9.

NOTE

For Relays having two-phase and neutral, three-phase, or three-phase-and-neutral sensing (Sensing Inputs Types G, H, I, V and X) it is not necessary to repeat this test for the remaining phases.

For Relays having two-phase-and-neutral, or three-phase-and-neutral sensing (Sensing Input Type H, I, V, and X) perform Steps 11 through 20.

For relays having single-phase or three-phase sensing (Sensing Input Types G and K) with instantaneous overcurrent option 1-1 or 1-2: Proceed to the instantaneous overcurrent test.

Step 11. Remove the power and reconnect the test output to the neutral current sensing input of the relay as shown in Figures 5-3 and 5-4 (terminals 17 and 18).

Step 12. Set the front panel **TAP (NEUTRAL)** selector to **B**.

Step 13. Rotate the front panel **CAL (NEUTRAL)** control fully CW.

Step 14. Rotate the front panel **TIME DIAL (NEUTRAL)** to **20**.

Step 15. Ensure that all relay targets have been reset.

Step 16. Adjust the test set for an overcurrent threshold of precisely 5 times the front panel **TAP (NEUTRAL)** selector **B** setting as measured by the ammeter.

Step 17. Apply input current to the relay and initiate the test setup timer.

RESULTS: Observe that the appropriate front panel **TIMING (NEUTRAL)** indicator illuminates.

Step 18. When the time delay ends, the timed output relay is energized.

RESULTS:
(1) The front panel **TIMING (NEUTRAL)** indicator extinguishes.
(2) The test setup timer stops. (Record count for use in Step 20.)
(3) If target Type A or B is present:
  (a) Front panel **FUNCTION-TIME** target (if present) trips.
  (b) Appropriate front panel **ELEMENT** target **A**, **B**, or **C** (if present) trips.

Step 19. Remove input current and (if present) reset the relay front panel targets.

Step 20. On the appropriate time overcurrent curve chart (Figures 1-2 through 1-70), locate the line representing 5 times the tap value (from Step 5) where it intersects the particular curve representing the front panel **TIME DIAL (NEUTRAL)** setting of 20 (from Step 14). The resulting time delay value in seconds should be within ±5% of the timer reading [from step 18(2)].

NOTE

Due to delays inherent in the test equipment, the time delay may appear to exceed these limits. This concludes the timed output test.

Relays having instantaneous overcurrent option 1-1 or 1-2 **only** proceed to the Instantaneous Overcurrent Test.

nstantaneous Overcurrent Pickup Test

This test checks the minimum overcurrent pickup points for Instantaneous 1 and (if present) nstantaneous 2 outputs.

> **NOTE**
> For relays having three-phase sensing (Sensing Input Type G or V), only a single input phase is connected since this is sufficient for a complete test of the instantaneous overcurrent sensing and output.
>
> For relays that include neutral sensing (Sensing Input Types H, I, V, and X), this test includes reconnecting the test output to the neutral sensing terminals for testing the instantaneous 1 output during neutral sensing.

Step 1. Perform the preliminary instructions.

Step 2. Reconnect the test setup to the INST 1 output terminals 2 and 10 as shown in Figures 5-1 through 5-4. Note that the timer may be removed from the test setup at this time.

Step 3. set the **TAP** selector to **A**.

Step 4. Turn the front panel **INST 1** control fully CCW to establish a pickup point of 1 times the **TAP** selector **A** setting.

Step 5. Slowly adjust the test set, increasing the overcurrent threshold toward the value of the front panel **TAP** selector **A** setting until the Instantaneous 1 output relay energizes). Do not disturb this setting.

RESULT: If the target Type A or B is present:

(a) The front panel **FUNCTION - INST 1** target (if present) will trip.
(b) The appropriate front panel **ELEMENT** target **A**, **B**, or **C** (if present) will trip.

Step 6. Remove input current. Record the test set current setting.

RESULT: The recorded value should be equal to or less than the front panel **TAP** selector **A** setting for the minimum overcurrent pickup point for the instantaneous 1 overcurrent element.

Step 7. Reset the relay front panel targets (if present).

Step 8. Turn the front panel **INST 1** control fully CW to establish a pickup point of 40 times the front panel **TAP** selector **A** setting.

Step 9. Adjust the test set to approximately 35 times the front panel **TAP** selector **A** setting.

Step 10. Slowly adjust the test set further toward an overcurrent threshold of 40 times the front panel **TAP** selector **A** setting until the instantaneous 1 output relay energizes. Do not disturb this setting.

RESULT: If target Type A or B is present:

(a) The front panel **FUNCTION - INST 1** target (if present) will trip.
(b) The appropriate front panel **ELEMENT** target **A**, **B**, or **C** (if present) will trip.

Step 11. Record the current reading. Remove input current (the front panel **TIMING** indicator should extinguish).

RESULT: The recorded value should be greater than 40 times the front panel **TAP** selector **A** setting for the maximum overcurrent pickup point for the instantaneous 1 overcurrent element.

> **NOTE**
> For relays having neutral sensing (Sensing Input Types H, I, V, and X) perform Step 12. For relays with option 1-2 (inst 2 elements), perform Step 13. Otherwise, the test ends here.

Step 12. For the neutral sensing, connect the relay as shown in Figures 5-3 and 5-4, then repeat Steps 2 through 11, substituting the following:

(a) The front panel **TAP (NEUTRAL)** selector instead of the front panel **TAP** selector (Step 3).
(b) The front panel **INST 1 (NEUTRAL)** control instead of the front panel **INST 1** control (Step 4).

Step 13. Reconnect the test setup to the inst 2 output terminals (11 and 12) as shown in Figure 5-1, then repeat Steps 4 through 11, substituting the following:

(a) Front panel **INST 2** control instead of the front panel **INST 1** control (Step 3).
(b) Front panel **FUNCTION - INST 2** target instead of the front panel **INST 1** target (Step 4).
(c) Instantaneous 2 output relay instead of the instantaneous 1 output relay (Step 2).

> **NOTE**
> This concludes the instantaneous overcurrent sensing and output test.

ADJUSTMENT OF CONTROLS FOR RELAY OPERATION

The following procedures set up the relay for use in a protective scheme. The procedures are arranged in a logical sequence that prevents upsetting previous control settings. For relays not having certain options, skip the corresponding adjustment paragraph. These paragraphs are identified by their headings.

TAP and TAP (NEUTRAL) Selector Setting

> **NOTE**
> Selection of one of the specific overcurrent pickup points provided by the front panel **TAP** Selector (and with the front panel **TAP CAL** control fully CW) will permit a pickup point within ±5% of the selector value without having to connect the relay to a test setup to verify the setting. If present, the front panel **TAP (NEUTRAL)** selector and the front panel **CAL (NEUTRAL)** control provide this function for the neutral overcurrent pickup point.
>
> However, if the desired pickup point falls between these front panel **TAP** selector settings, or if the instantaneous overcurrent option 1-1 or 1-2 is present, the relay should be connected to a test setup for a precise setting, then the following steps should be performed.

tep 1. Connect the test setup to the relay according to the sensing input type present in the relay as follows:

(a) *Sensing Input Type K:* Refer to Figure 5-1. Because the relay front panel **TIMING** indicator provides the needed pickup indication, do not connect the test setup to the output terminals. The current sense terminals for the desired range (HIGH or LOW), however, should be connected to the relay.

(b) *Sensing Input Types I or X:* Refer to Figure 5-4. Because the relay front panel **TIMING** indicator provides the needed pickup indication, do not connect the test setup to the output terminals. The front panel **TAP** selector is ganged and the adjustment of one input phase automatically aligns the other, thus, only one set of current sense terminals need be connected. For adjustment of the front panel **TAP (NEUTRAL)** selector, the relay is re-connected for neutral sensing by this procedure.

(c) *Sensing Input Types G:* Refer to Figure 5-2. Because the relay front panel **TIMING** indicator provides the needed pickup indication, do not connect the test setup to the output terminals. The desired range terminals (HIGH or LOW), however, should be connected to the relay. The front panel **TAP** selector is ganged and the adjustment of one input phase automatically aligns the others, thus, only one set of current sense terminals need be connected.

(d) *Sensing Input Types H or V:* Refer to Figure 5-3. Because the relay front panel **TIMING** indicator provides the needed pickup indication, do not connect the test setup to the output terminals. The front panel **TAP** selector is ganged and the adjustment of one input phase automatically aligns the others, thus, only one set of current sense terminals need be connected. For adjustment of the front panel **TAP (NEUTRAL)** selector, the relay is re-connected for neutral sensing by this procedure.

NOTE

For three-phase relays, ensure that the test signals are connected to both the current and voltage terminals for the same phase.

:p 2. Remove the relay front cover.

p 3. *Sensing Input Types G, I, K, or X.* Verify that the front panel **TAP RANGE** plate is installed so the correct range (HIGH or LOW) is visible.

p 4. Adjust the test voltage to 100 percent of nominal voltage for your relay and the test current to the desired time overcurrent pickup point for the relay.

p 5. Set the front panel **TAP** selector to the closest setting above the desired pickup point.

p 6. Adjust the front panel **TAP CAL** control fully CW.

p 7. Apply current to the relay.

p 8. Slowly adjust the front panel **TAP CAL** control CCW until the front panel **TIMING** indicator just illuminates which indicates the desired time overcurrent pickup point for phase sensing. For relays with two-phase-and-neutral, three-phase, or three-phase-and-neutral sensing, this pickup point will be the same for all the phases.

ɔ 9. Remove input current.

NOTE

For relays with two-phase-and-neutral or three-phase-and-neutral sensing (Sensing input types I or V), perform Steps 10 through 15. Otherwise, the time overcurrent pickup point calibration ends here (unless instantaneous 1 or 2 overcurrent calibration is to be performed later in these procedures).

Step 10. Reconnect the test set output to the neutral sense terminals. See Figures 5-3 or 5-4.

Step 11. Adjust the current to the desired time overcurrent pickup point for the relay.

Step 12. Set the front panel **TAP (NEUTRAL)** selector to the closest setting above the desired pickup point.

Step 13. Rotate the front panel **CAL (NEUTRAL)** control fully CW.

Step 14. Slowly adjust the front panel **CAL (NEUTRAL)** control CCW until the front panel **TIMING (NEUTRAL)** indicator just illuminates to establish the desired time overcurrent pickup point for neutral sensing.

Step 15. Remove input current.

NOTE

Pickup point calibration ends here.

Time Overcurrent Curve Selection (Timing Type Z1, Z2, and Z3 Only)

Step 1. Remove the relay case front cover to gain access to the logic board time overcurrent characteristic curve selector.

Step 2. Remove the phillips-head screws from both side of the unit and remove the front panel. See Figure 2-1 for the location of the logic board and curve selector.

Step 3. Select the desired curve. See Table 2-3 for the desired curve and selector position.

Step 4. Re-install the front panel and the front cover.

Time Delay Selection

NOTE

If Timing Type Z1, Z2, or Z3 is installed, refer to time overcurrent curve selection to obtain the desired set of time overcurrent curves (see Figures 1-2 through 1-70). Then proceed to Step 1, following.

If Timing Type Z1, Z2, or Z3 is not installed, determine the timing type from the model and style number for a specific relay. Then select the appropriate timing curve (see Figures 1-2 through 1-70). Proceed to the following, Step 1.

Step 1. Referring to the appropriate time overcurrent characteristic curve, select the desired time delay on the front panel **TIME DIAL** for the anticipated input overcurrent difference (multiples-of-pickup current) from the selected time overcurrent pickup point as follows:

(Selected Pickup Point) - (Anticipated Input Overcurrent) = Overcurrent Difference from Pickup

Step 2. Set the front panel **TIME DIAL** as follows:

a. On the appropriate curve, plot upward from the ***multiples-of-pickup-current*** value until the horizontal line opposite the desired time delay (***time-in-seconds***) is reached. The setting curve nearest the plot point should then be entered on the front panel **TIME DIAL**.

b. Using Figure 1-6 as an example, if the overcurrent is expected to be 4 times the pickup point value and time delay of 4 seconds is desired, plot upward from the point 4 on the ***multiples-of-pickup-current*** axis until the point 4 from the ***time-in-seconds*** axis is crossed. The curve for a setting of **52** crosses the plot point and should be entered on the front panel **TIME DIAL**.

c. For a lesser overcurrent difference from the pickup point, the time delay will be greater, so that for a multiple of 3 times the pickup current, the time delay for the previous front panel setting of **52** will be 5.8 seconds.

Neutral Time Delay Selection

Step 1. Use the same characteristic curve used in the previous paragraph (*Time Delay Selection*). However, the ***multiples-of-pickup current***, ***time-in-seconds***, and the resulting front panel **NEUTRAL TIME DIAL** setting can differ.

Step 2. Set the front panel **NEUTRAL TIME DELAY** as follows:

a. On the appropriate curve, plot upward from the ***multiples-of-pickup-current*** value until the horizontal line opposite the desired time delay (***time-in-seconds***) is reached. The setting curve nearest the plot point should then be entered on the front panel **NEUTRAL TIME DELAY**.

b. Using Figure 1-6 as an example, if the overcurrent is expected to be 4 times the pickup point value and time delay of 4 seconds is desired, plot upward from the point 4 on the ***multiples-of-pickup-current*** axis until the point 4 from the ***time-in-seconds*** axis is crossed. The curve for a setting of **52** crosses the plot point and should be entered on the front panel **NEUTRAL TIME DIAL**.

c. For a lesser overcurrent difference from the pickup point, the time delay will be greater, so that for a multiple of 3 times the pickup current, the time delay for the previous front panel setting of **52** will be 5.8 seconds.

INST 1 Control Setting

> **NOTE**
> Because the lower limit for this pickup is determined by the front panel **TAP** selector setting and the front panel **TAP (CAL)** control position, ensure that these adjustments have been performed as in the paragraph **TAP AND TAP (NEUTRAL) Selector Setting** (page 5-10).

Step 1. Verify that the test setup is as described in TAP and TAP (NEUTRAL) Selector Setting, Steps 1 through 6.

Step 2. Connect the test setup to the instantaneous 1 element output terminals (2 and 10) as shown in Figures 5-1 through 5-4. The timer should not be connected.

CAUTION

Steps 3 through 8 provide the application of overcurrent for short periods of time to allow adjustment while avoiding overheating of the input sensing transformers. To avoid damaging the relay, do not attempt to apply a constant high level of input current for adjustment of the front panel **INST 1**, **INST 1 (NEUTRAL)**, or **INST 2** controls.

Step 3. Set the front panel **INST 1** control to a position approximating the desired instantaneous 1 overcurrent pickup point for the relay.

Step 4. Apply current to the relay.

Step 5. Rapidly increase the overcurrent input to the relay until the instantaneous output relay just energizes. Note the overcurrent threshold reading on the ammeter.

Step 6. Remove input current.

Step 7. Reset the **INST TARGET** (if present).

Step 8. If the overcurrent threshold reading from Step 5 was too high or low, adjust the front panel **INST 1** control CCW to lower (or CW to raise) the instantaneous 1 overcurrent pickup point. Repeat Steps 4 through 8. If the overcurrent threshold reading from Step 5 was **NOT** too high or low, proceed to Step 9.

NOTE

For relays with two-phase-and-neutral or three-phase-and-neutral sensing (Sensing input types I or X), perform Steps 9 through 14.

Step 9. Reconnect the output to the neutral current sense terminals. See Figures 5-3 or 5-4.

Step 10. Set the front panel **INST 1 (NEUTRAL)** control to a position approximating the desired neutral instantaneous 1 overcurrent pickup point for the relay.

Step 11 Apply current to the relay.

Step 12 Rapidly increase the overcurrent input to the relay until the instantaneous output relay just energizes. Note the test set overcurrent threshold reading on the ammeter.

Step 13. Remove the input current.

Step 14. Reset the **INST TARGET** (if present).

Step 15. If the overcurrent threshold reading from Step 13 was too high or low, adjust the front panel **INST 1 (NEUTRAL)** control CCW to lower (or CW to raise) the Neutral Instantaneous 1 Overcurrent Pickup Point. Repeat Steps 9 through 14. If **NOT**, proceed to the next test.

INST 2 Control Setting

For this adjustment, repeat INST 1 control setting, but substitute instantaneous 2 output terminals (11 and 12) and the front panel **INST 2** controls Because neutral sensing does not apply to this pickup point, ignore Steps 9 through 15.