GE Power Management

DIAC Type 66K

DIGITAL OVERCURRENT RELAY

Instruction Manual

DIAC 66K Revision: SPDV130.A03

Manual P/N: GEK-106261C

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ISO9000 REGISTERED

Manufactured under an
ISO9002 Registered system.

These instructions do not purport to cover all details or variations in equipment nor provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purpose, the matter should be referred to the General Electric Company.

To the extent required the products described herein meet applicable ANSI, IEEE, and NEMA standards; but no such assurance is given with respect to local codes and ordinances because they vary greatly.

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Figure 1–1: FRONT VIEW OF THE DIAC TYPE 66K RELAY

The DIAC Type 66K Digital Overcurrent Relay includes the following features:

- Digital single Phase overcurrent protection
- General purpose feeder protection
- 50 / 51 applications & Motor Protection
- Self powered
- 9 Selectable curves †
- Reset curve enable/disable
- Low Burden
- Fully Retrofittable
- Functional separate TOC/IOC, TOC alarm & Standard (EM) IOC operations.
- Wide settings range
- Drawout case construction

† The 66LT curve is used by this relay.

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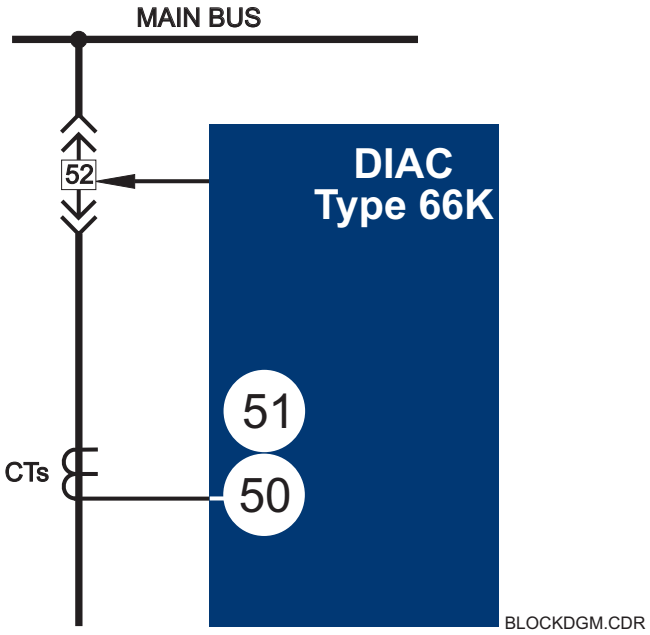

Figure 1–2: FUNCTIONAL BLOCK DIAGRAM

1.2 ORDER CODES

Table 1–1: ORDER CODES FOR THE DIAC TYPE 66K RELAY

	DIAC	*	*	*	
Base Unit	DIAC	|	|	|	Base Unit – Digital Overcurrent Component Relay, "S1 Case"
Configuration		B	|	|	One TOC/IOC target & seal-in; 1 TOC alarm output (max. current to 1 A); 1 standard hi-set IOC EM dual range target relay (2 to 16 A); time dial 0.1 to 9.9 sec., 50 & 60 Hz with instantaneous or timed reset plus IOC delay. Duplicates the IAC 66K function.
		C	|	|	Same as 'B' except one 1 standard hi-set dual range target relay unit (10 to 80 A)
		D	|	|	Same as 'B' except one 1 standard hi-set dual range target relay unit (20 to 160 A)
Current Rating			1	|	1 Amp Nominal Current
			5	|	5 Amp Nominal Current
Revision Level				B	Revision Level

2.1 GENERAL

The DIAC is a self-powered, single-phase, digital overcurrent relay. This digital overcurrent relay is sometimes referred to as the 'Type 66K relay', as it was designed to replace the IAC66K Motor Protection relay. The Type 66K relays are single-phase, current operated AC devices designed for motor protection. They utilize 16 selectable time-current characteristics (shown on pages 2–3 to 2–18).

Each relay consists of a time overcurrent unit, a dual-rated target seal-in unit, and a hinge-type instantaneous overcurrent unit. The available ranges in amperes of these units, as well as information on their continuous rating, contact rating, and top ratings are given in Section 2.3: RATINGS.

The DIAC 66K is packaged in a GE S1 style case. See Figure 5–4: DIAC PANEL MOUNTING AND DRILLING on page 5–5 section for mounting dimensions. The internal connections are shown in Figure 5–1: DIAC TYPE 66K INTERNAL/EXTERNAL CONNECTIONS on page 5–2. The DIAC 66K uses waveform sampling of the current input together with appropriate algorithms to provide time overcurrent (TOC) and instantaneous overcurrent (IOC) functions.

2.2 APPLICATION

The DIAC Type 66K is especially suited for motor protection. The relay contains an electronic (IOC) high dropout instantaneous unit to discriminate between motor-running overload and locked-rotor current. This is accomplished by setting pickup of the high dropout unit (50/B) between motor full-load current and locked-rotor current as illustrated in Figure 5–5: MOTOR PROTECTION CHARACTERISTIC CURVE on page 5–6, with the normal (EM) dropout instantaneous unit (50/A) set above locked-rotor current. The TOC reset characteristics can emulate those of an induction disk or set for fast reset with no intentional delay. The time overcurrent unit must coordinate with the motor thermal limit. Typical settings to accomplish this are listed in the table below:

Table 2–1: DIAC 66K SETTING RANGE

UNIT / FUNCTION		PICKUP SETTING (multiples of nominal current 1A/5A)
Time Overcurrent Unit	51	1.5 to 40
Normal Dropout Instantaneous Overcurrent Unit	50/A	8 to 15
High Dropout Instantaneous Overcurrent Unit	50/B	1.1 to 10

The user must determine the specific settings which will provide the required protection for his machine, and select a relay model having the operating ranges needed to obtain these settings.

With settings as illustrated in Figure 5–5: MOTOR PROTECTION CHARACTERISTIC CURVE on page 5–6 and external connections shown in Figure 5–3: TYPICAL EXTERNAL CONNNECTIONS FOR MOTOR PROTECTION on page 5–4, the operation of the DIAC66K relay will be as follows:

- For motor overloads, the time overcurrent unit (51) will time out, picking up an external auxiliary 51X, which sounds an alarm (Stud # 2).
- For the locked-rotor condition, the high-dropout unit (50/B) will pick up instantaneously and the TOC (51) will pick up with a time delay consistent with the motor thermal limit. When both units have operated, the breaker will be tripped (Stud 10).
- For a fault, the (EM) normal dropout instantaneous unit (50/A) will pick up instantaneously and trip the breaker (Stud 3).

NOTE: The relay can also be used by setting the Instantaneous HDO setting switch to the lowest setting, not including 0. This will allow the Instantaneous HDO unit to pickup at 0.1 A or 0.5 A, thus enabling TOC to operate independently using stud 10. Use stud 3 as the Standard High Set IOC.

Table 2–2: RATINGS OF TARGET AND SEAL-IN COIL

CURRENT OPERATED	UNITS	DUAL-RATED AMP	
		0.2 AMP TAP	2.0 AMP TAP
Carry 30 amps for	(seconds)	0.05	2.2
Carry 10 amps for	(seconds)	0.45	2.0
Carry continuously	(amperes)	0.37	2.3
Minimum operating	(amperes)	0.2	2.0
Minimum dropout	(amperes)	0.05	0.5
DC resistance	(ohms)	8.3	0.24
60 hertz impedance	(ohms)	50	0.65
50 hertz impedance	(ohms)	42	0.54

2.4 TOC FUNCTIONS

The TOC function operates on an 'RMS' current calculated from the sampled values. The IOC function operates on the sampled values, and the algorithm virtually eliminates the decaying DC offset component to achieve low transient overreach of less than 7%.

The relays contain two independent settings: one for TOC and one for IOC. These two settings control the TOC/Instantaneous function of Stud 10. The TOC/Instantaneous units operate in series with each other as in the Application Diagram shown in Figure 5–3: TYPICAL EXTERNAL CONNNECTIONS FOR MOTOR PROTECTION on page 5–4.

The TOC function provides 16 selectable time current curves:

- **IAC51**
- **IAC53**
- **55-SHORT TIME**
- **57-MEDIUM TIME**
- **66-LONG TIME (DIAC Type 66K)**
- **75-SHORT TIME**
- **IAC77**
- **95-SHORT TIME**
- **IEC Inverse**
- **IEC Very Inverse**
- **IEC Extremely Inverse**
- **IEEE Inverse**
- **IEEE Very Inverse**
- **IEEE Extremely Inverse**
- **Definite Time**
- **I^2T**

The IAC51, IAC53, and IAC77 curves match the time current curve of the respective IAC model. This includes the 0.5 through 9.9 time dial setting for the 1 and 5 A units. Numbered curves 55, 57, 66, 75, and 95 match the shape of the respective IAC model; however, the time dial positions are not one-to-one equivalents. The IEC, IEEE, and I^2t curves are based on the equations listed with the corresponding curves on pages 2–11 to 2–18.

The I^2t curve has a K value equal to the time dial times 250. The minimum value of K is 25 (0.1×250) and the maximum value is 2475 (9.9×250).

NOTE: IEC equations are defined by IEC 255-4 and IEEE equations are defined by IEEE PC37.112

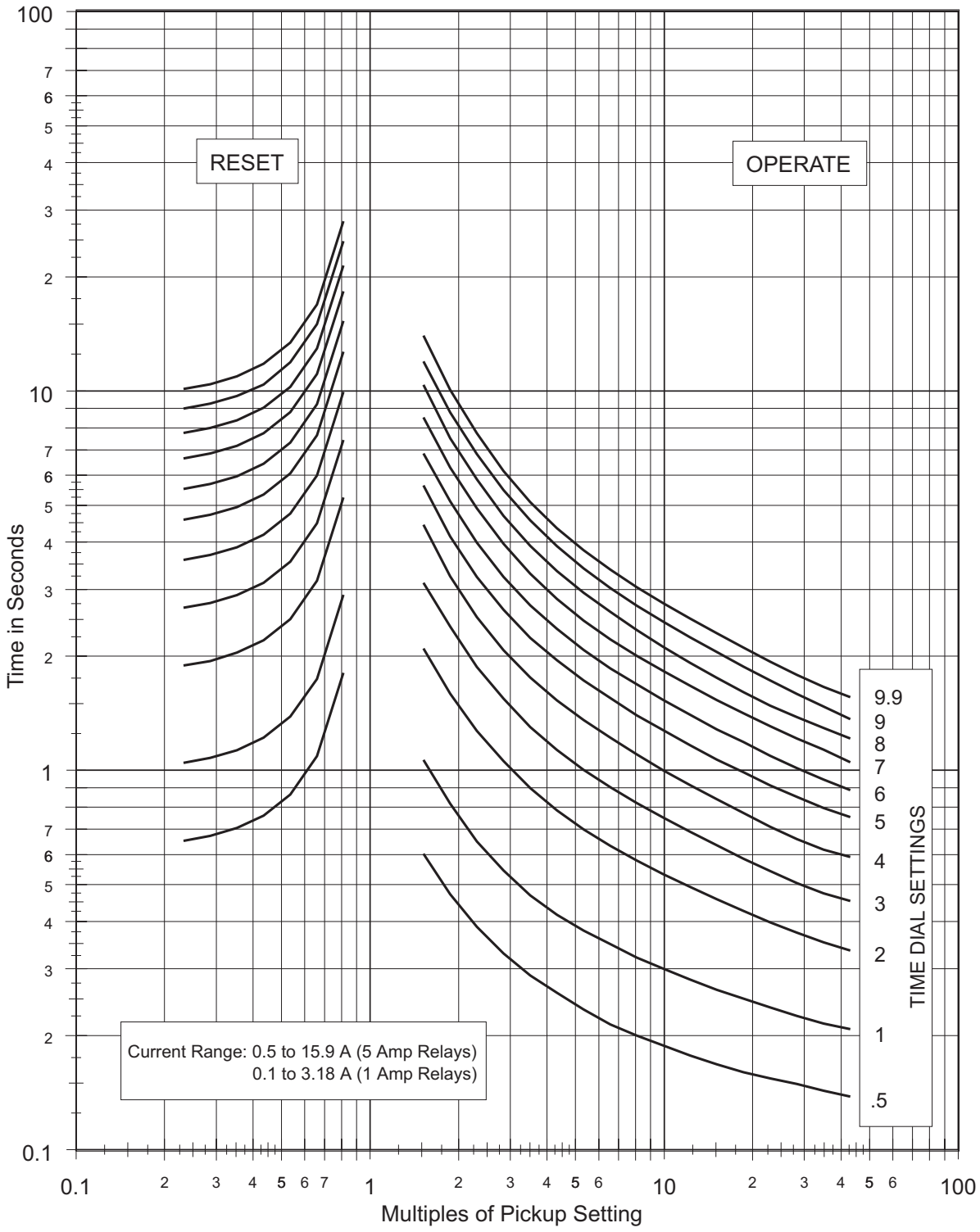

Figure 2–1: IAC51 TOC CURVE

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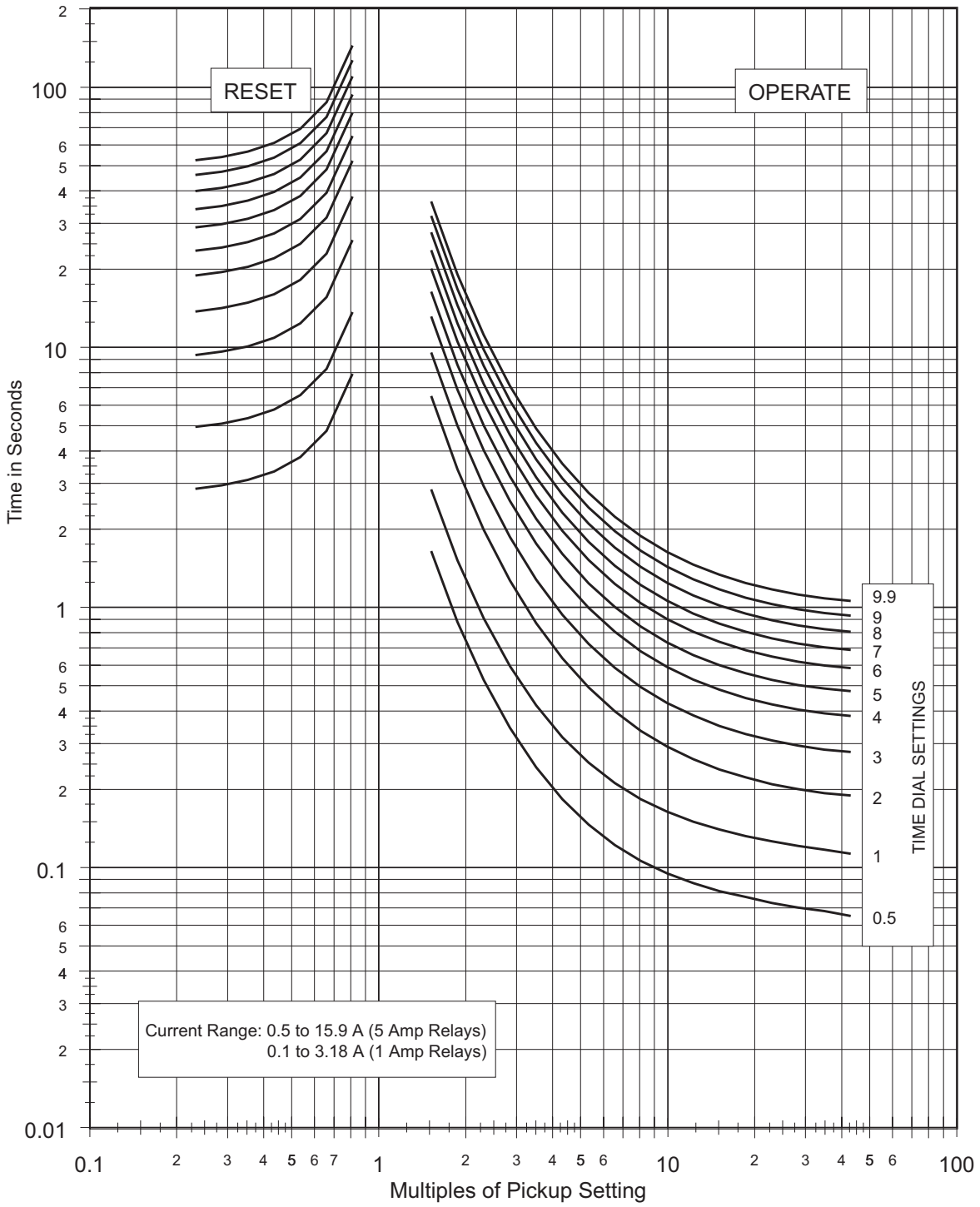

Figure 2–2: IAC53 TOC CURVES

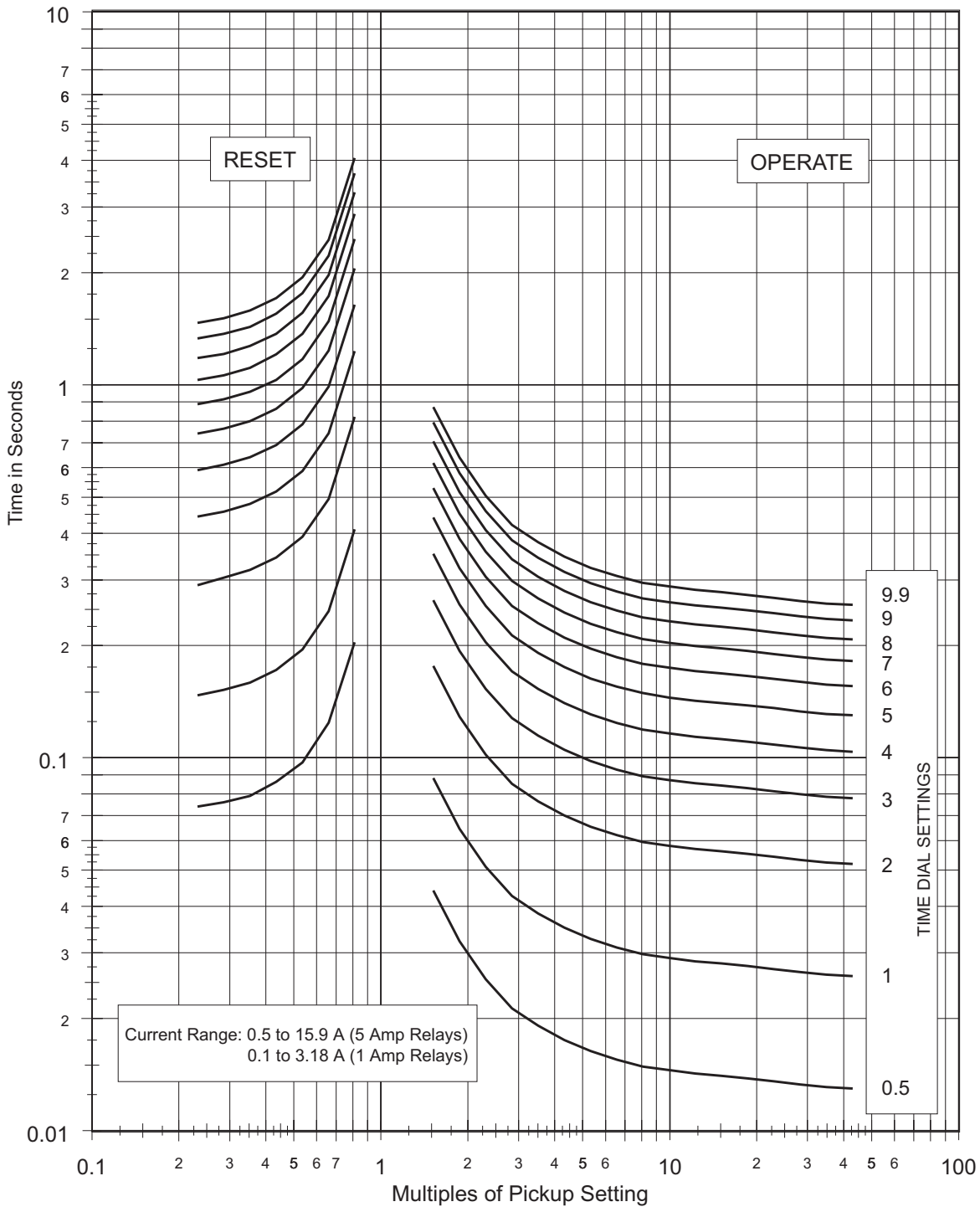

Figure 2–3: 55 SHORT TIME TOC CURVES

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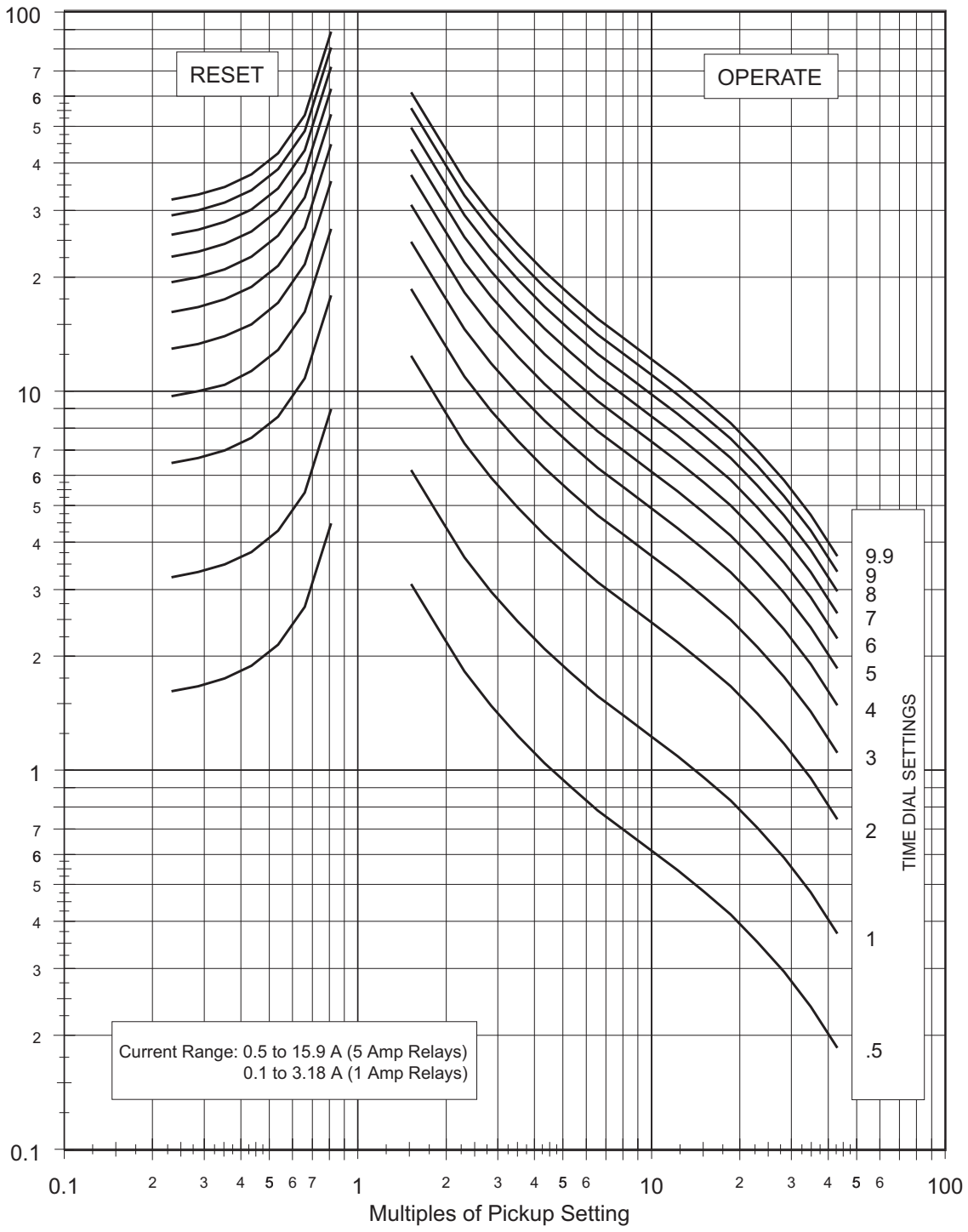

Figure 2–4: 57 MEDIUM TIME TOC CURVES

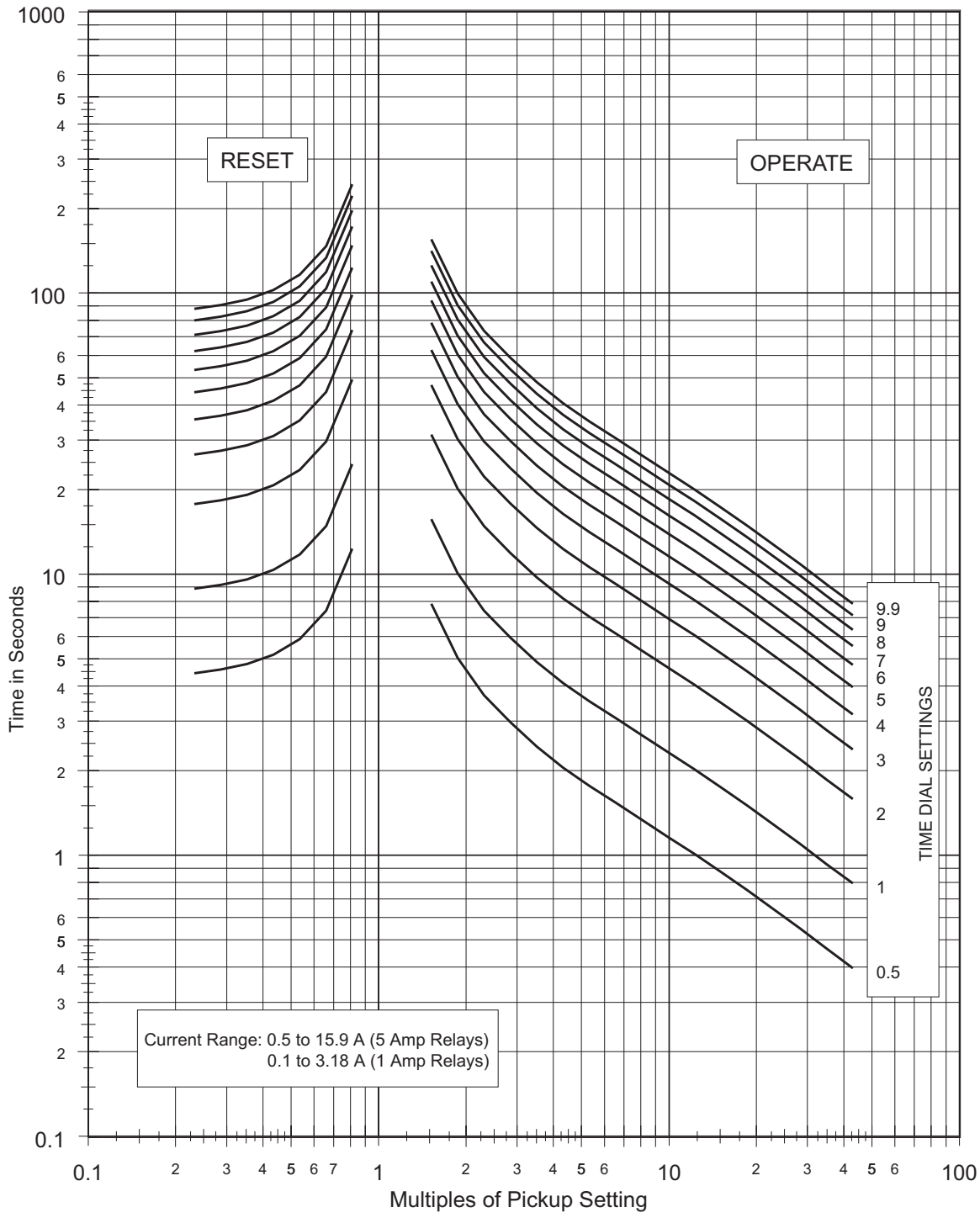

Figure 2–5: 66 LONG TIME TOC CURVES

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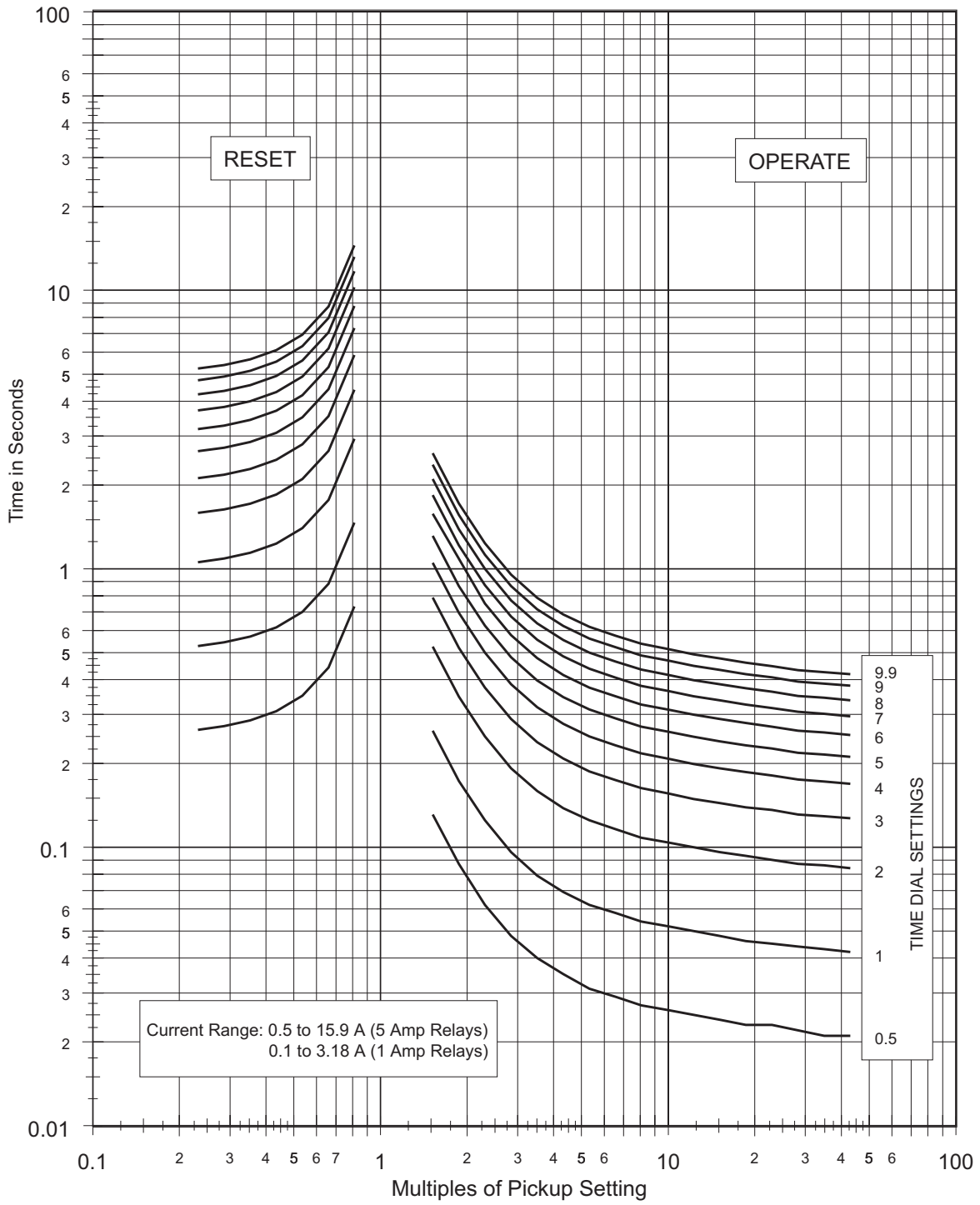

Figure 2–6: 75 SHORT TIME TOC CURVES

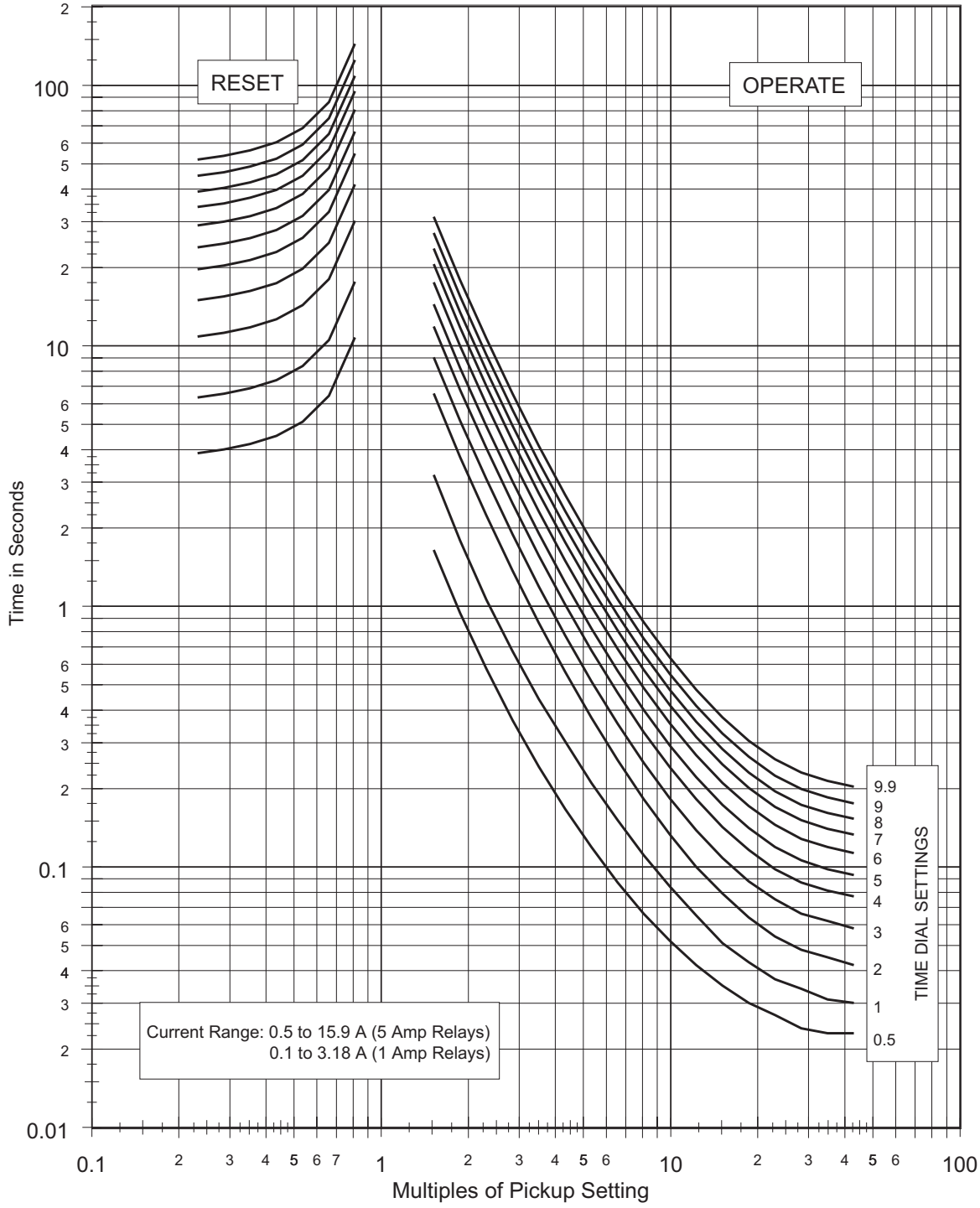

Figure 2–7: IAC77 TOC CURVES

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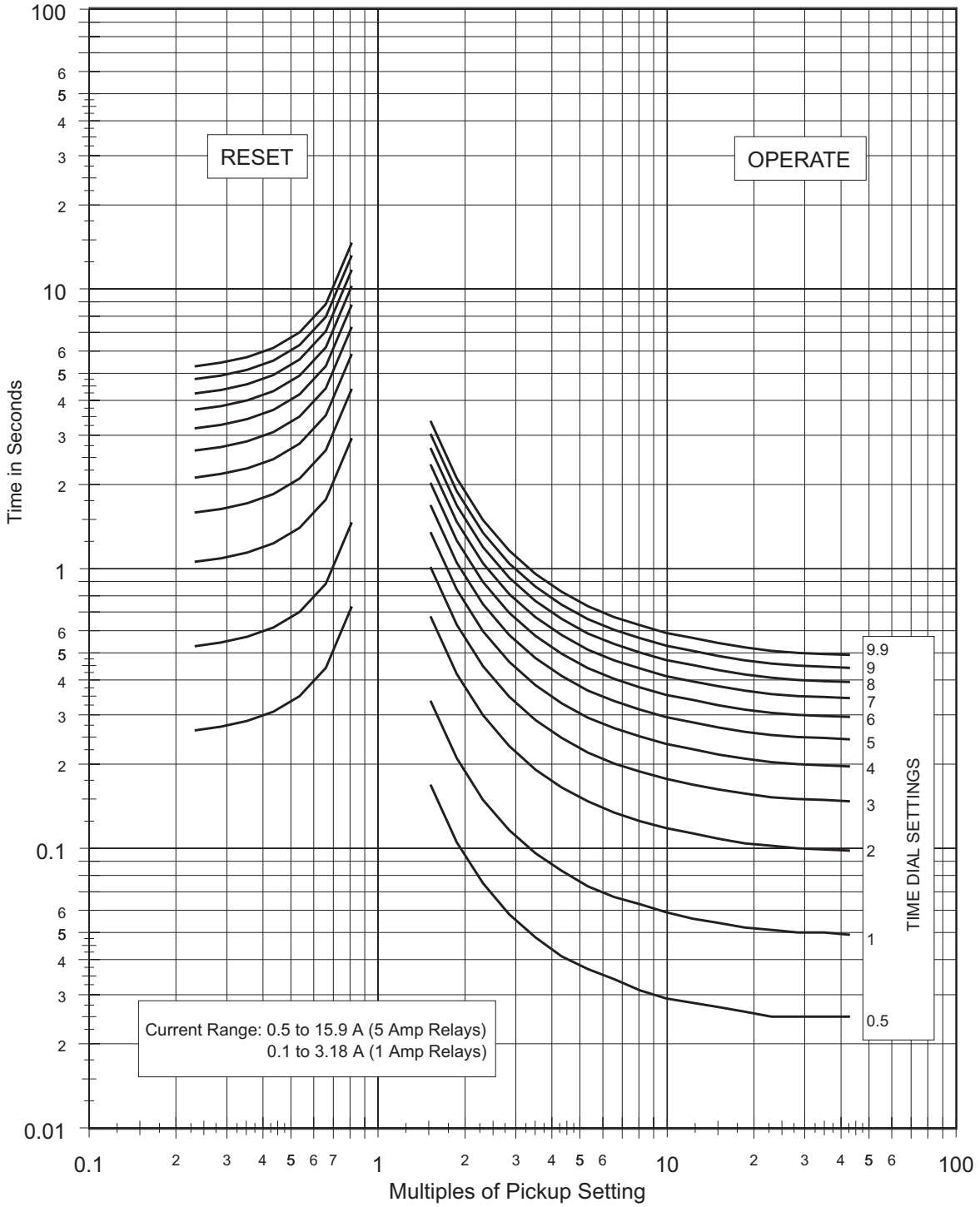
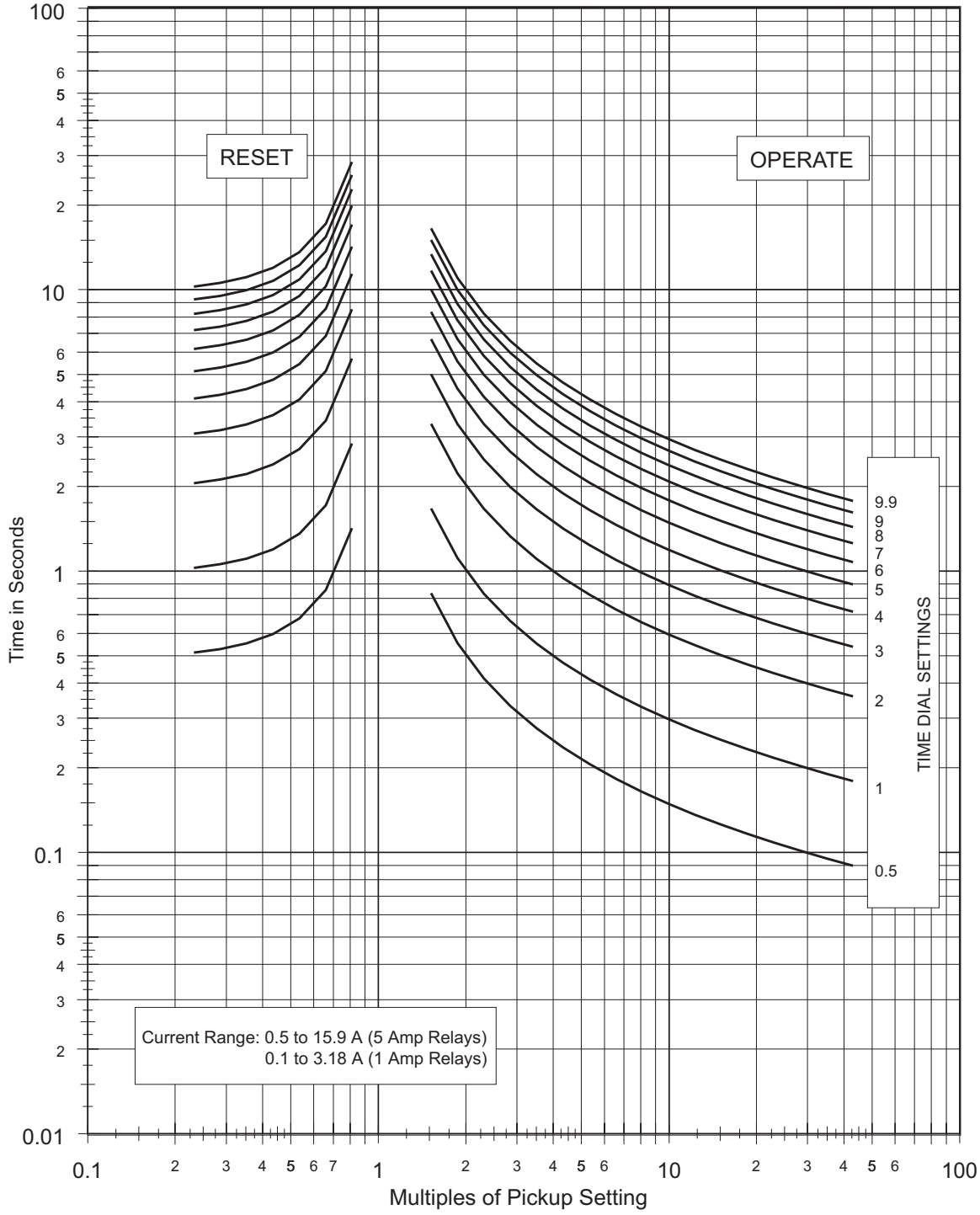


Figure 2–8: 95 SHORT TIME TOC CURVES



RESET TIME: $t = TD \cdot \left(\frac{0.97}{M^2 - 1}\right)$; PICKUP TIME: $t = TD \cdot \left(\frac{0.014}{M^{0.02} - 1}\right)$

Figure 2–9: IEC INVERSE TOC CURVES

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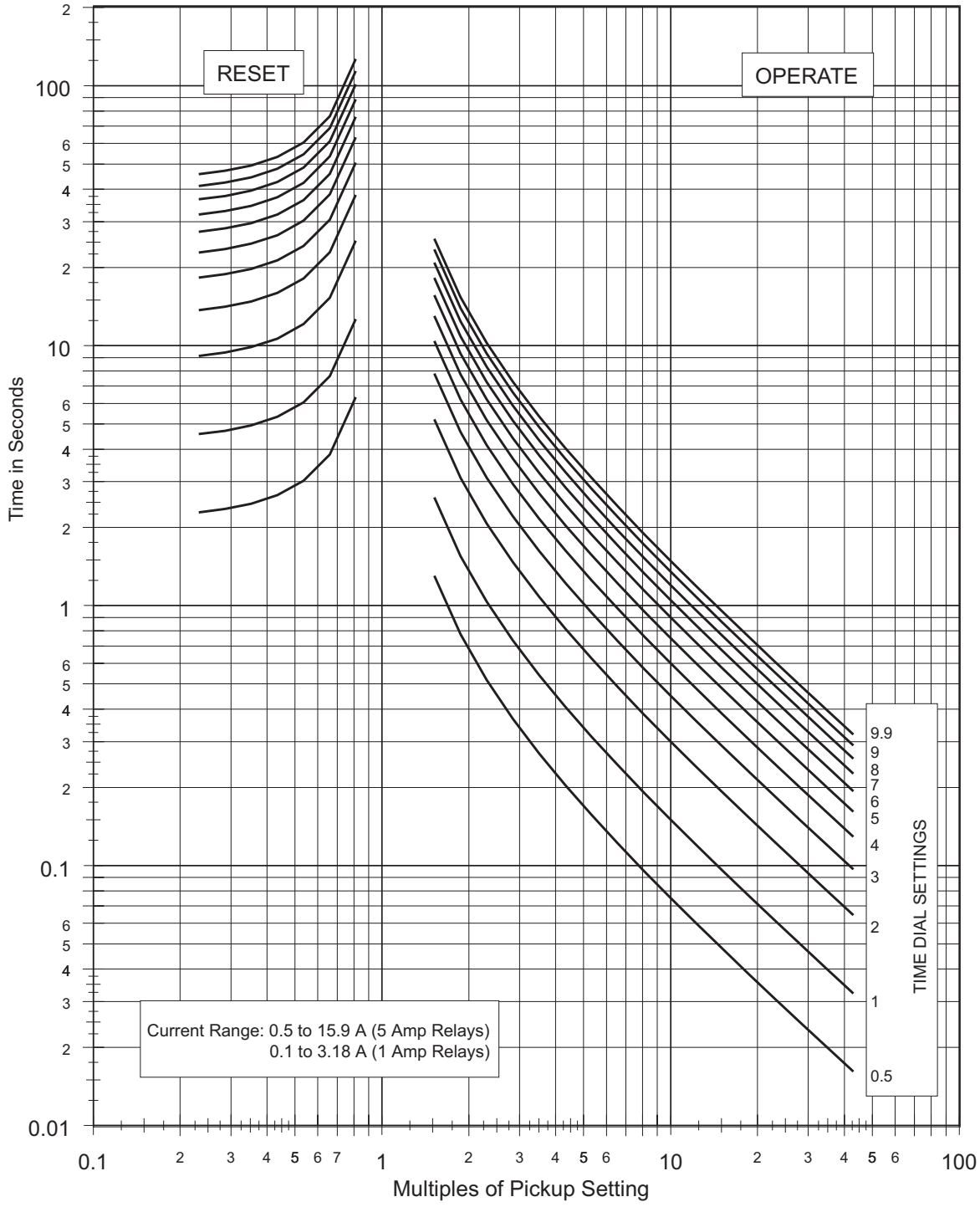
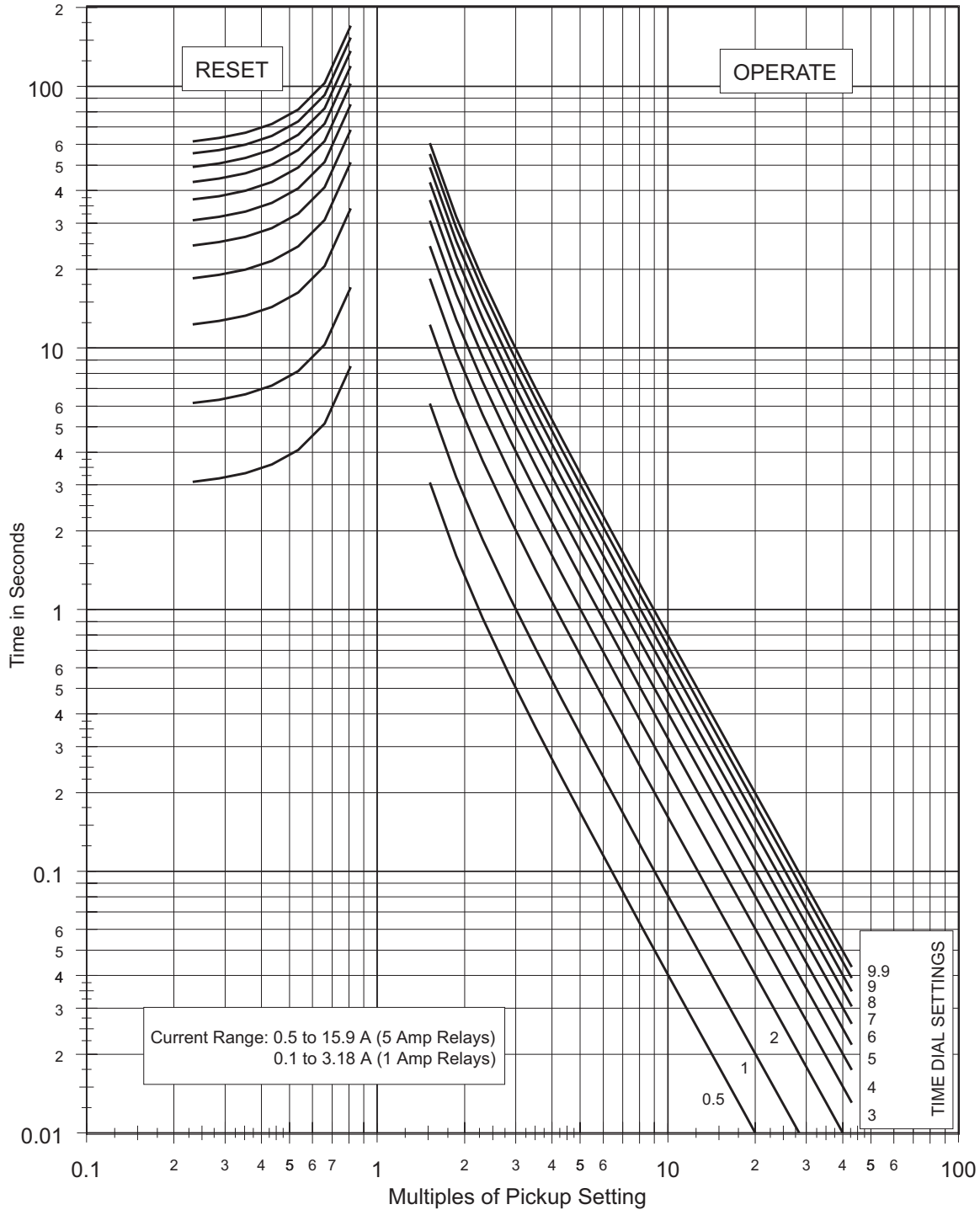


RESET TIME: $t = TD \cdot \left(\frac{4.32}{M^2 - 1}\right)$; PICKUP TIME: $t = TD \cdot \left(\frac{1.35}{M - 1}\right)$

Figure 2–10: IEC VERY INVERSE TOC CURVES



$$\text{RESET TIME: } t = TD \cdot \left(\frac{5.82}{M^2 - 1}\right); \quad \text{PICKUP TIME: } t = TD \cdot \left(\frac{8.0}{M^2 - 1}\right)$$

Figure 2–11: IEC EXTREMELY INVERSE TOC CURVES

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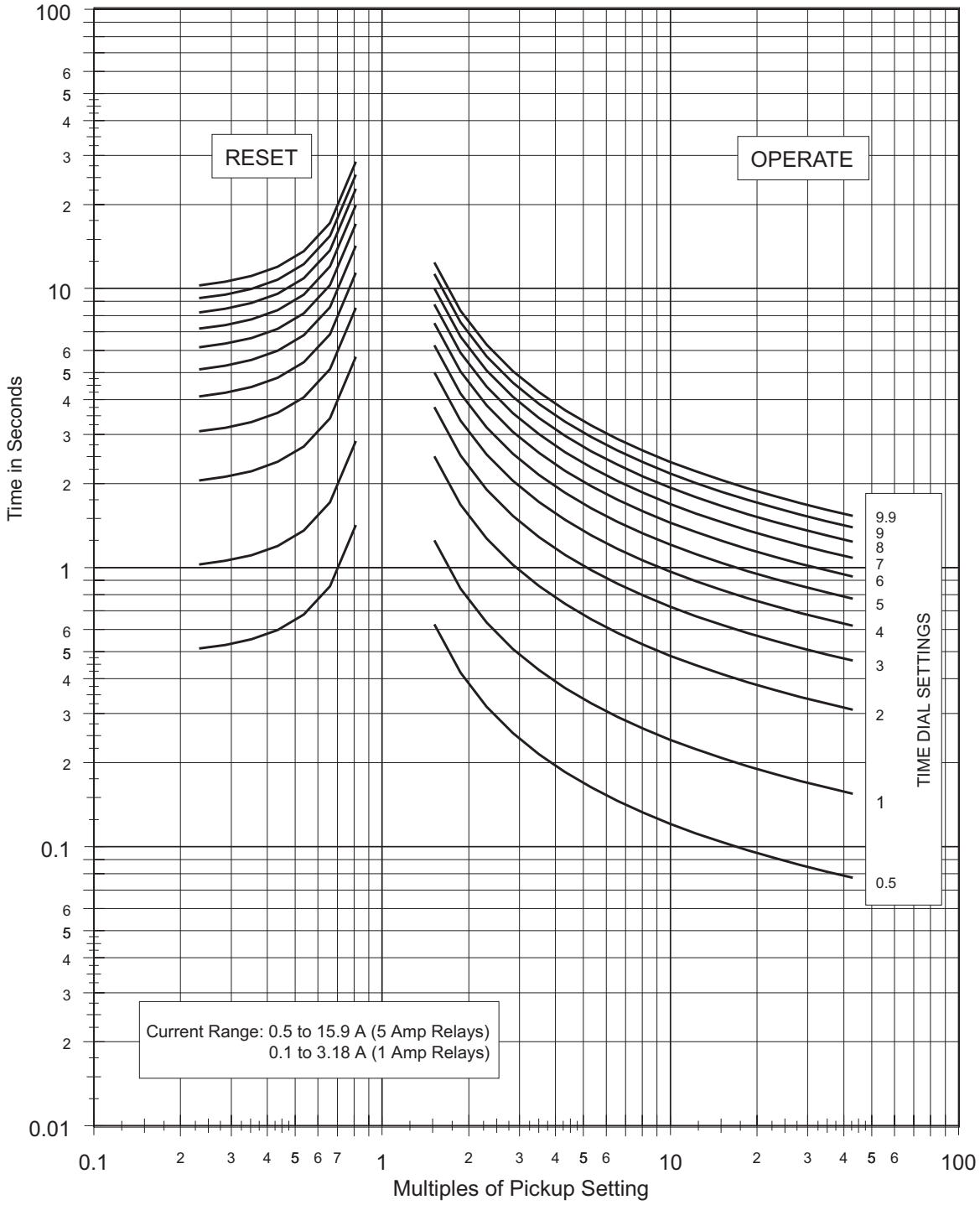
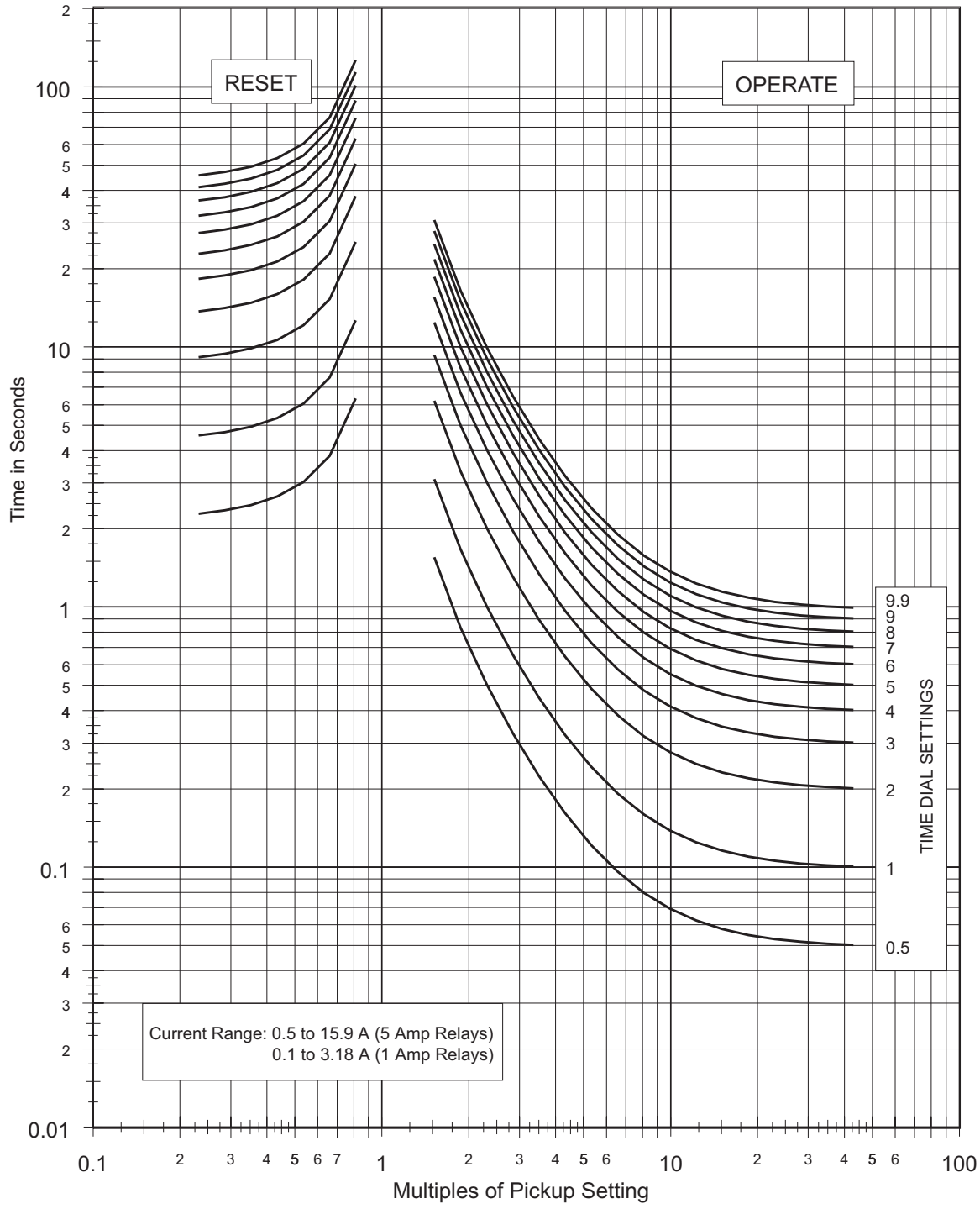


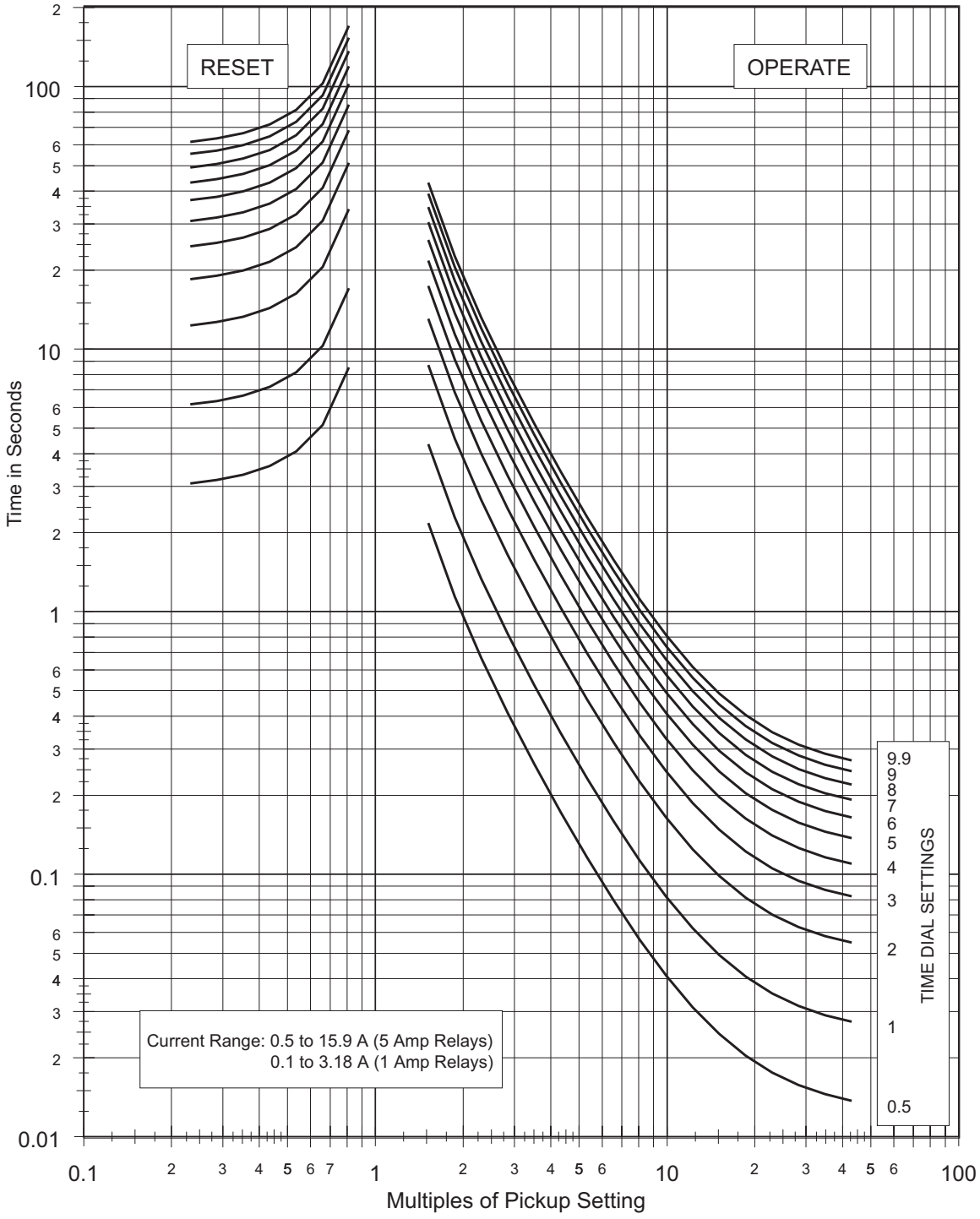
RESET TIME: $t = TD \cdot \left(\frac{0.97}{M^2 - 1}\right)$; PICKUP TIME: $t = TD \cdot \left(\frac{0.013}{M^{0.02} - 1} + 0.0228\right)$

Figure 2–12: IEEE INVERSE TOC CURVES



$$\text{RESET TIME: } t = TD \cdot \left(\frac{4.32}{M^2 - 1}\right); \quad \text{PICKUP TIME: } t = TD \cdot \left(\frac{3.922}{M^2 - 1} + 0.0982\right)$$

Figure 2–13: IEEE VERY INVERSE TOC CURVES



RESET TIME: $t = TD \cdot \left(\frac{5.82}{M^2 - 1}\right)$; PICKUP TIME: $t = TD \cdot \left(\frac{5.64}{M^2 - 1} + 0.02434\right)$

Figure 2–14: IEEE EXTREMELY INVERSE TOC CURVES

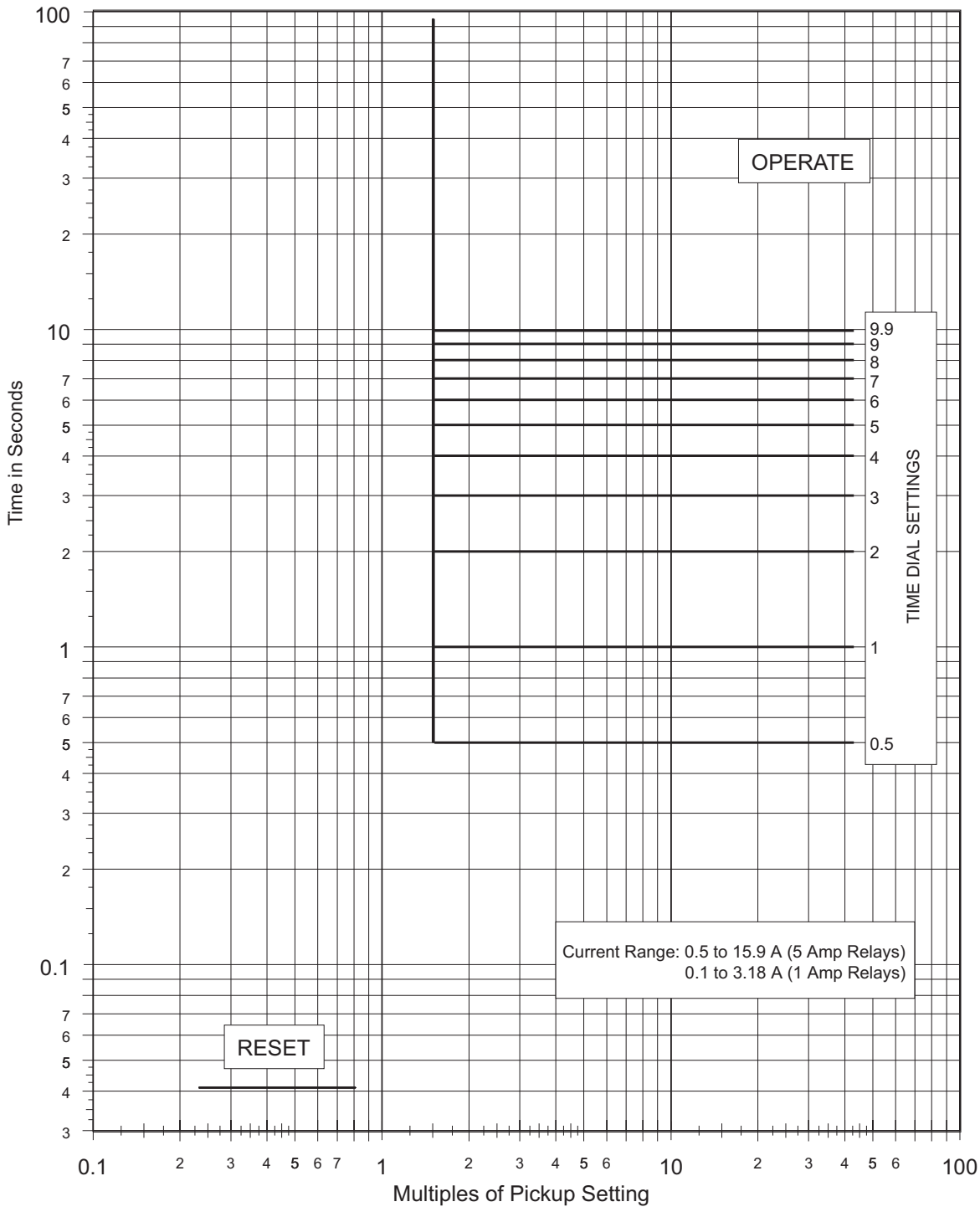


Figure 2–15: DEFINITE TIME

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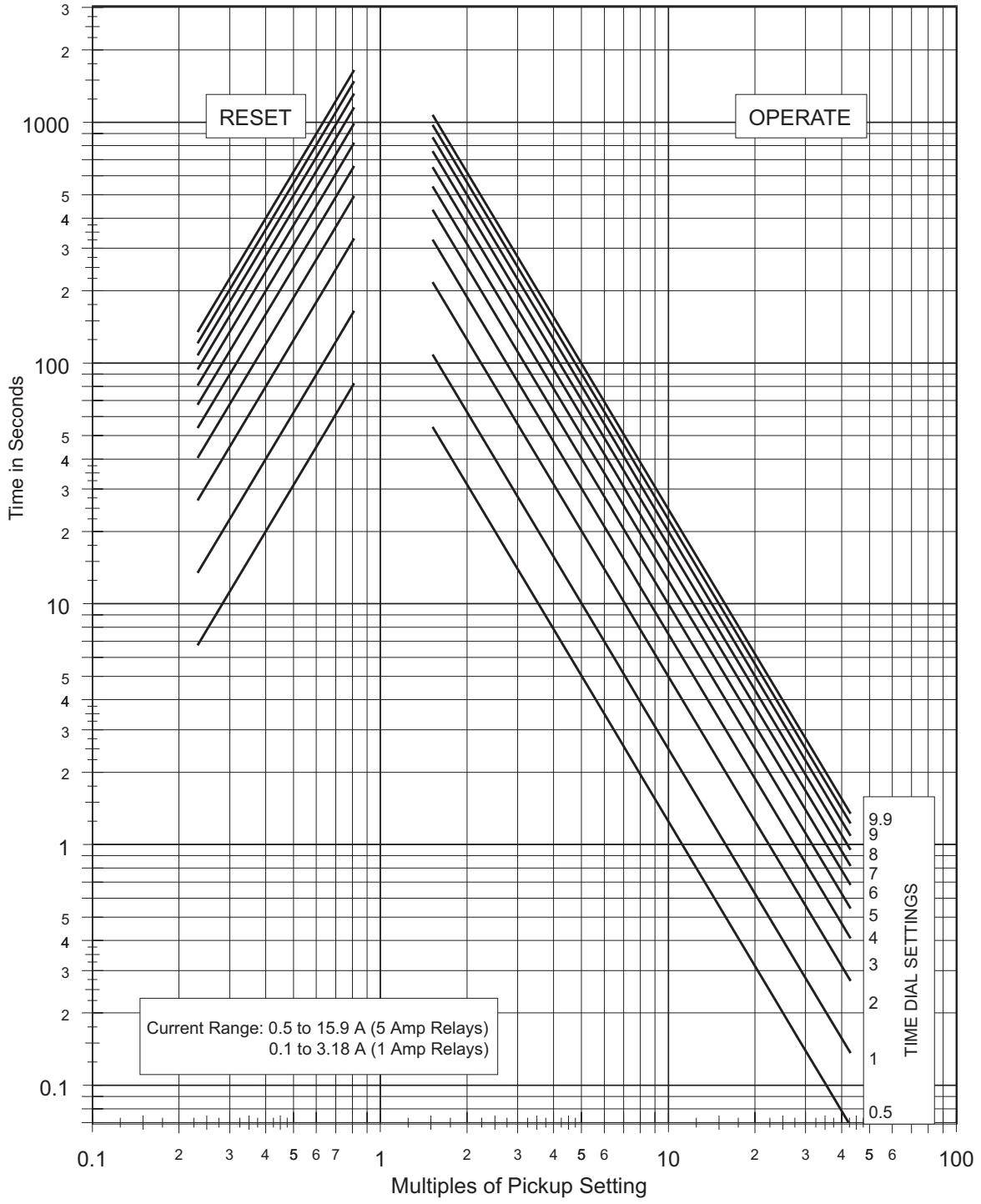


RESET TIME: $t = TD \cdot \left(\frac{250}{M^2 - 1}\right)$; PICKUP TIME: $t = TD \cdot \left(\frac{250}{M^2}\right)$

Figure 2–16: I^2T TIME CURVE

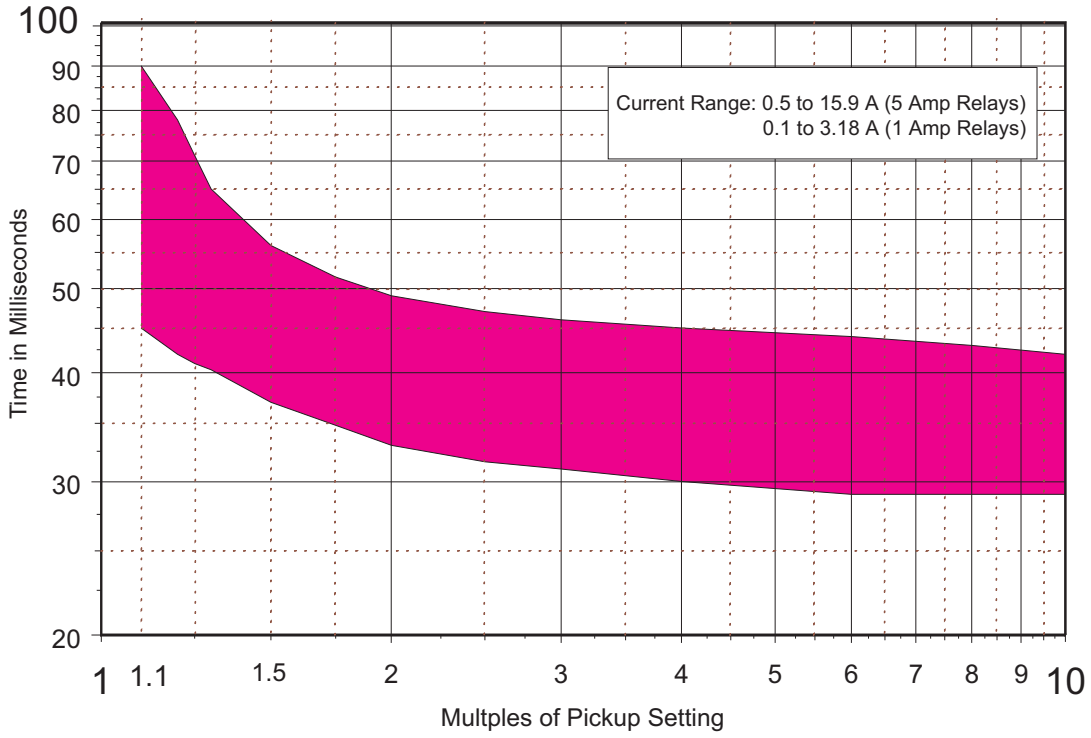


Figure 2–17: IOC CURVE FOR THE HDO INSTANTANEOUS UNIT

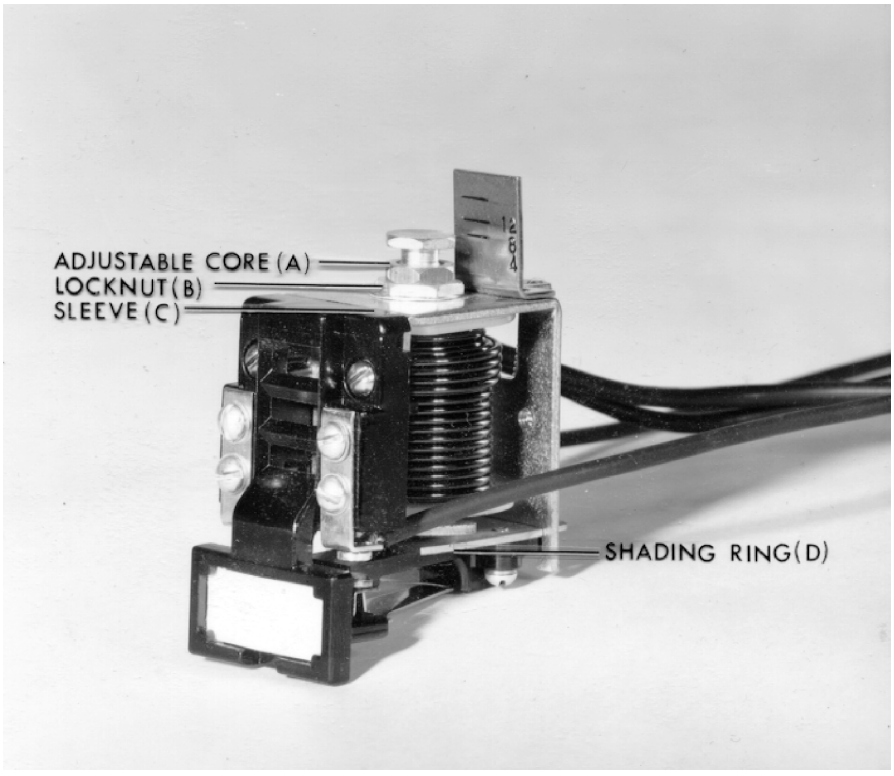


Figure 2–18: STANDARD (EM) INSTANTANEOUS UNIT

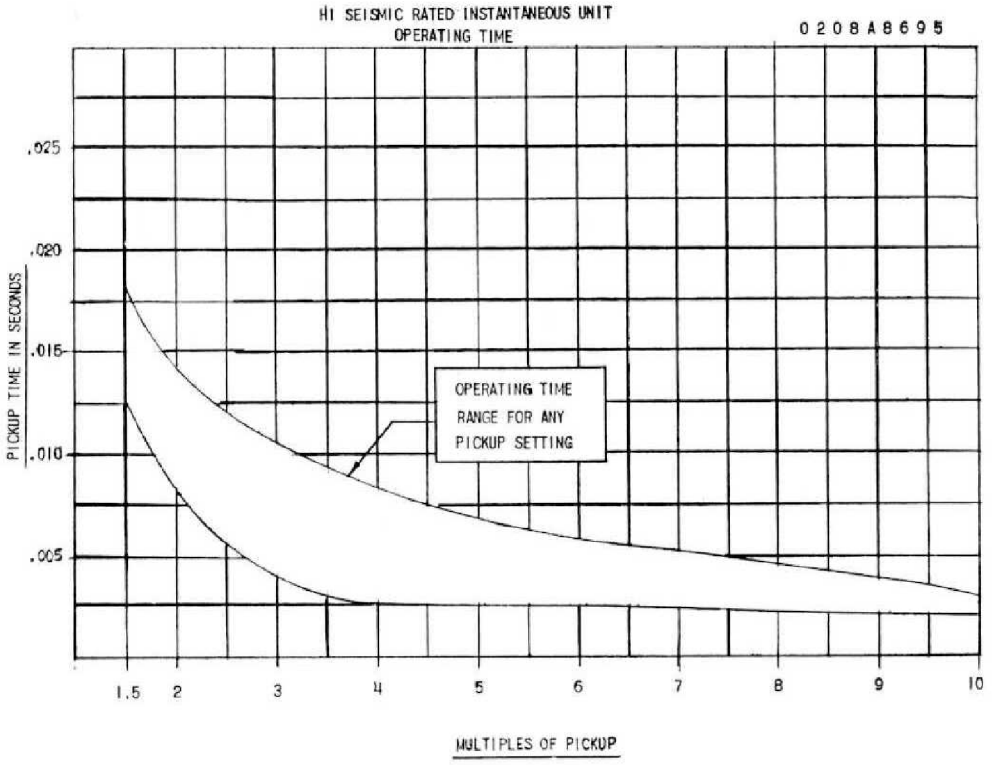


Figure 2–19: IOC CURVE FOR THE STANDARD (EM) INSTANTANEOUS UNIT

3.1 DESCRIPTION

When replacing IAC 66K relays, review the time current curves of the digital relays to verify that they conform to the relays being replaced. In some cases it may be necessary to redo the coordination study to assure coordination with other devices.

The base time of the Definite Time Curve is 1 second. The base time is multiplied by the time dial to provide the actual operating time. The default or lowest time dial setting for the Definite Time Curve is 0.1.

The I^2T curve has a K value of 250 @ time dial of 1. The range is from 25 to 2475 in steps of 25 set by the time dial. The default or lowest time dial setting for the I^2T curve is 0.1.

Pickup for the TOC/ Inst unit is settable from 0.5 to 15.9 amps in 0.1 amp increments for the 5 amp model, and 0.1 to 3.18 amps in 0.02 amp increments for the 1 amp model, a setting of 0 disables the TOC element. The time dial can be set from 0.5 to 9.9 in 0.1 increments on both the 5 amp model and the 1 amp model. The only exception is for the Definite Time and I^2T curves where 0.1 is the minimum value.

The IOC function is settable from 1 to 159 amps in 1 amp increments for the 5 amp model, and 0.2 to 31.8 amps in increments of 0.2 amps for the 1 amp model. Setting the pickup to 0 disables the IOC element. Both models have an IOC delay adjustment from 50 to 400 milliseconds in 25 millisecond steps.

The formula is:

$$\textit{IOC delay}\ (\text{in milliseconds}) = DS \times 25 + 25$$

where *DS* is setting on IOC delay dial.

The TOC reset characteristic can be controlled from the front panel. The TOC reset can be set to “timed reset” which emulates the characteristic of an induction disk relay, or “instantaneous reset” where the reset is fixed at 40 to 50 milliseconds.

The system frequency can be set for 50 or 60 Hz controlled from the front panel.

The High Set Standard (EM) Instantaneous unit pickup range can be adjusted continuously over a four to one range by using the adjustable pose piece. When the top of the core is lined up with the calibration stamping, an approximate value of pickup can be determined. Dropout is at least 40 to 50 percent of pickup.

3

4.1 CASE

The DIAC relay consists of a case, cover, support structure, and a connection plug to make up the electrical connection. The case is shown in Figure 6–5: DIAC 66K FRONT AND REAR VIEWS on page 6–9. The external connections are shown in Figure 5–3: TYPICAL EXTERNAL CONNNECTIONS FOR MOTOR PROTECTION on page 5–4. It has 10 connection points and a CT shorting bar. As the connection plug is withdrawn, the trip circuit is broken prior to the current shorting bar engagement.

4.2 ADJUSTMENTS: DIGITAL UNITS

All customer settings for the TOC Alarm and TOC/IOC are accessible from the front of the relay. The relay cover must be removed to gain access to the settings. The cover has provisions for a sealing “wire.” The settings are left to right, pickup current level for the time element, time dial, curve selection, frequency/reset time, pickup current level for the instantaneous element, and the instantaneous element time delay. The settings are all calibrated and are set by turning the rotary switch to the desired value. The switches are recessed, a small screw driver is required to make the adjustment.

The relay may be supplied with one of three pointer styles as shown. The color is the color of the indicator, note the arrow location, all switches are shown in the 9:00 position.

Figure 4–1: DIAC 66K POINTER STYLES

The TOC pickup current is set directly in Amps with two rotary switches. An arrow is used to indicate setting position. Setting the TOC or the IOC pickup current between, but not including 0 and a value less than minimum 0.5 (5amp) or 0.1 (1Amp) will result in the relay defaulting to its minimum setting. Setting the TOC or IOC pickup current to 0 will disable their respective elements. Although the time dial can be set to a value less than minimum the relay will use the minimum setting.

4.3 ADJUSTMENTS: STANDARD INSTANTANEOUS UNIT

The standard instantaneous unit is an electromagnet that attracts a hinged armature when sufficient current is applied. The armature carries a “T” shaped moving contact that bridges two stationary contacts when the coil is energized. A target is displayed when the unit operated. Pressing the button in the lower left corner of the relay cover resets the target.

The pickup range can be adjusted continuously over a four to one range by using the adjustable pole piece. When the top of the core is lined up with the calibration stamping, an approximate value of pickup can be determined. Dropout is about 40 to 50 percent of pickup.

Figure 2–19: IOC CURVE FOR THE STANDARD (EM) INSTANTANEOUS UNIT on page 2–20 shows the variation of operating time with applied current for this unit. Burden data of the standard unit is given the table below.

Table 4–1: DIAC 66K BURDEN DATA

Pickup Range (A)	Frequency (Hz)	Amps	Volt-Amps †	Impedance (Ω)	Power Factor
0.5 to 2	50	5	310	12.4	0.84
	60	5	330	13.2	0.78
1 to 4	50	5	94	3.75	0.77
	60	5	100	4.0	0.71
2 to 8	50	5	23	0.94	0.77
	60	5	25	1.0	0.71
4 to 16	50	5	5.8	0.23	0.77
	60	5	6.2	0.25	0.71
10 to 40	50	5	0.9	0.04	0.77
	60	5	1.0	0.04	0.71
20 to 80	50	5	0.23	0.01	0.77
	60	5	0.25	0.01	0.71
40 to 60	50	5	0.07	0.003	0.71
	60	5	0.07	0.003	0.71

† **Volt-Amperes at five amps calculated from input at minimum pickup (I^2Z).**

4.4 TARGETS AND INDICATORS

The yellow pick-up LED, will come on solid for the TOC function when the input current to the relay is higher than the set point. The location of the LED is between the frequency/reset switch and the IOC pickup level switch.

It may be desirable to know when the relay is powered up and operating. The relay must be energized at or above 95% of the minimum possible setting and below pick-up set point. To activate, turn the SELECT switch one step clockwise or one step counterclockwise. This will cause the pickup LED to blink at 4 second intervals while current is below the pick-up set point. Minimum current is 95% of minimum TOC pickup setting for both the 1amp and 5 amp models. A blinking LED indicates the microprocessor is executing code and outputting signals.

The relay uses a target and seal-in unit as its TOC/IOC tripping element. And the relay uses one target for the high set standard IOC unit. The targets are mechanically latched when the function trips. The TOC/IOC contacts will remain closed until the trip circuit current drops below 0.19 or 2.0 Amps, depending on the Seal-In tap setting.

NOTE: The current will continue conducting through Stud 1 to Stud 10 while the trip signal is still being sent to the TOC/Inst. Unit.

4.5 RESET TARGETS

Targets can be reset by lifting the target reset level at the lower left edge of the cover on the DIAC. The relay also provides a front panel trip circuit test. A actuating lever that must be pulled and then lifted is provided to trip the device connected to the relay. The level directly operates the trip contacts.

4.6 MANUAL TRIP CIRCUIT TEST

The front panel contains two manual trip levers to test the trip circuit. The relay cover must be removed to access the lever. The lever must be pulled and then lifted which prevents unintentional uplifted to prevent unintentional operation.

4.7 TRIP CIRCUIT

The trip circuit is NOT polarity sensitive. The trip circuit will not be damaged if connected in reverse.

NOTE: Both trip circuits are suitable for use with Cap-Trip devices.

4.8 DIAC 66K COVER INSTALLATION

When replacing the cover on the DIAC relays the reset wire should be “locked” behind the nameplate by a slight left to right motion to place the reset wire in the correct position.

4.9 RECEIVING, HANDLING, AND STORAGE

Immediately upon receipt, the relay should be unpacked and examined for any damage sustained during shipment. If damage occurred during shipment a damage claim should be filed at once with the transportation company, and the nearest GE sales office should be notified. If the relay is not installed immediately, it should be stored in its original carton in a location that is dry and protected from dust, metallic chips and severe atmospheric conditions.

4.10 TARGET AND SEAL-IN UNIT

The target and seal-in unit has an operating coil tapped at 0.2 and 2.0 amperes. The relay is shipped from the factory with the tap screw in the lower-ampere position. The tap screw is the screw holding the right-hand stationary contact. To change the tap setting, first remove one screw from the *left-hand* stationary contact and place it in the desired tap. Next, remove the screw from the first undesired tap, and place it on the left-hand stationary contact where the first screw was removed. This is shown below in Figure 4–2: OPERATING COIL TAPPED AT 2A (FACTORY DEFAULT). This procedure is necessary to prevent the right-hand stationary contact from getting out of adjustment.

NOTE: Screws should never be left in both taps at the same time!

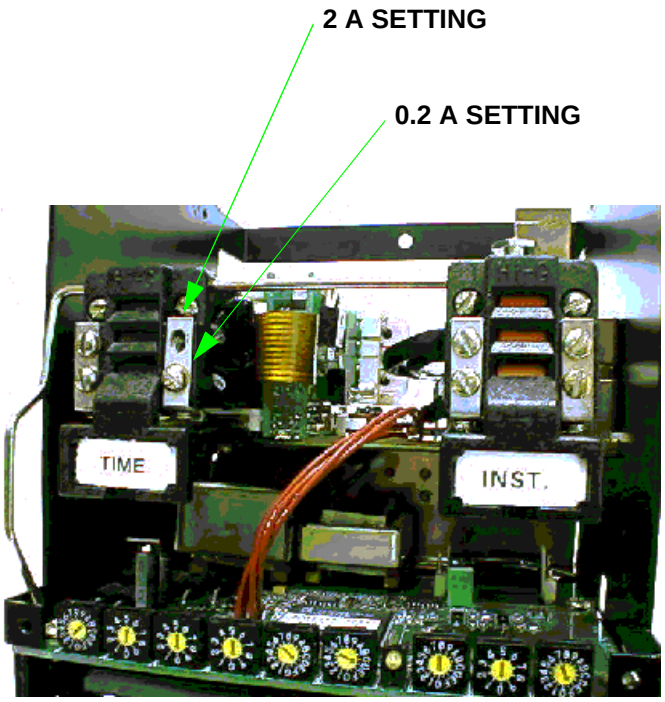


Figure 4–2: OPERATING COIL TAPPED AT 2A (FACTORY DEFAULT)

5.1 ENVIRONMENT

Installation of the relay should be in a clean dry location that is free from dust.

5.2 MOUNTING

The relay should be securely mounted on a vertical surface that provides accessibility to both the front and rear of the unit. The outline and panel drilling dimensions are provided in Figure 5–4: DIAC PANEL MOUNTING AND DRILLING on page 5–5.

5.3 SURGE GROUND

The relay should be grounded to the station ground mat with a 12 AWG braided ground lead connected to terminal 4. If the relay is to be retrofitted in a panel, terminal 4 should be removed from the new case and installed into the old case. For the surge protection to function properly the relay must be grounded.

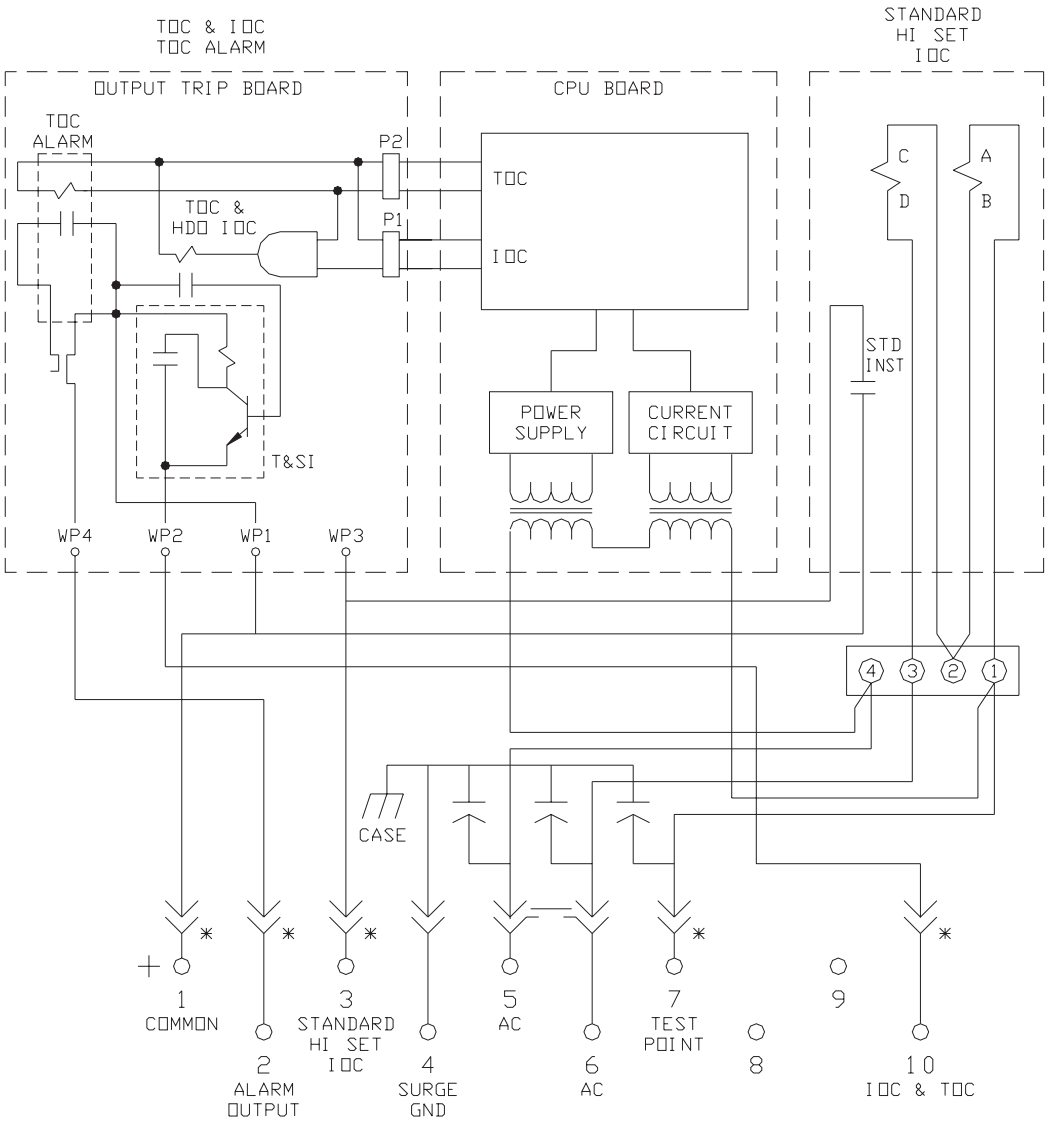
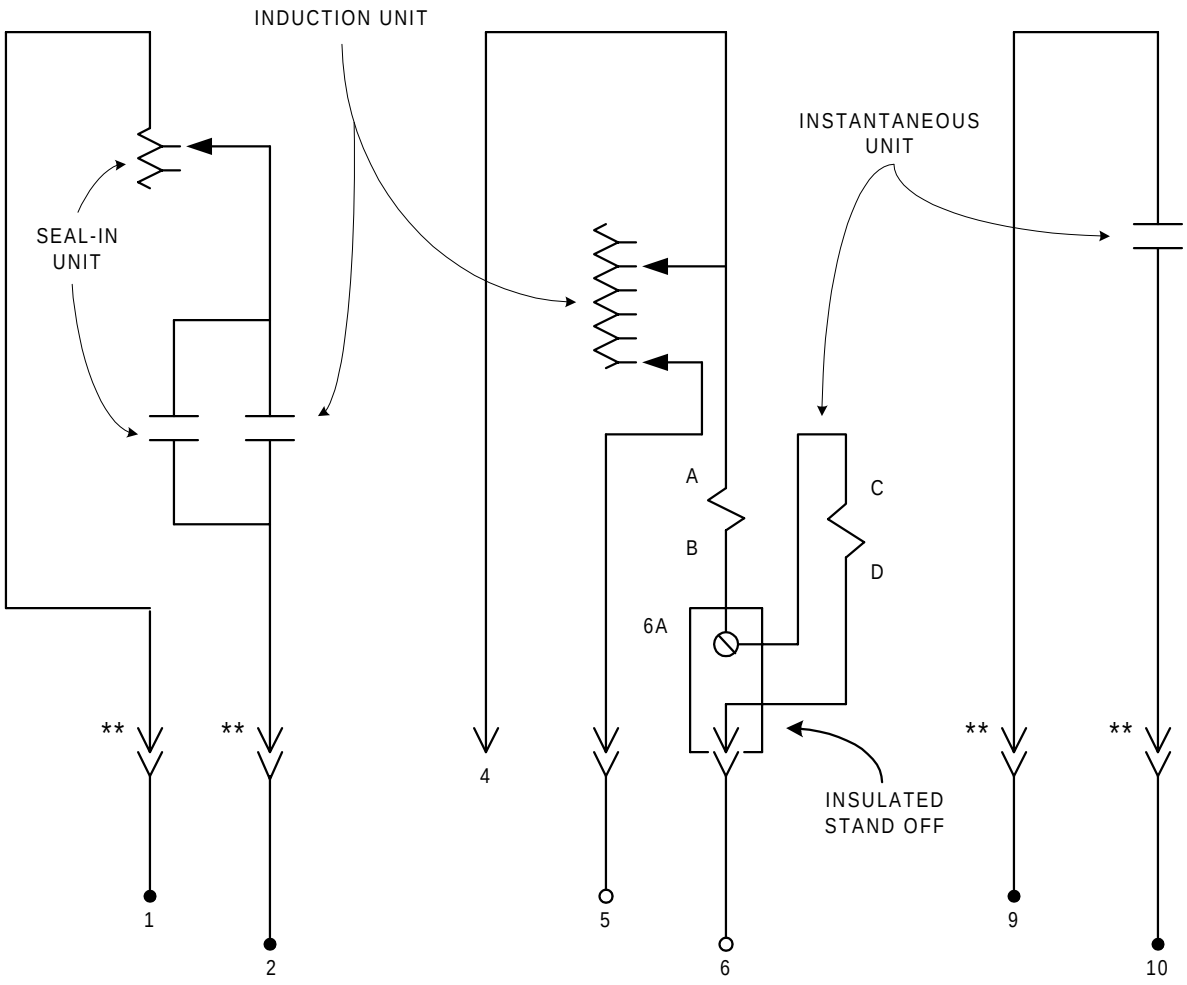


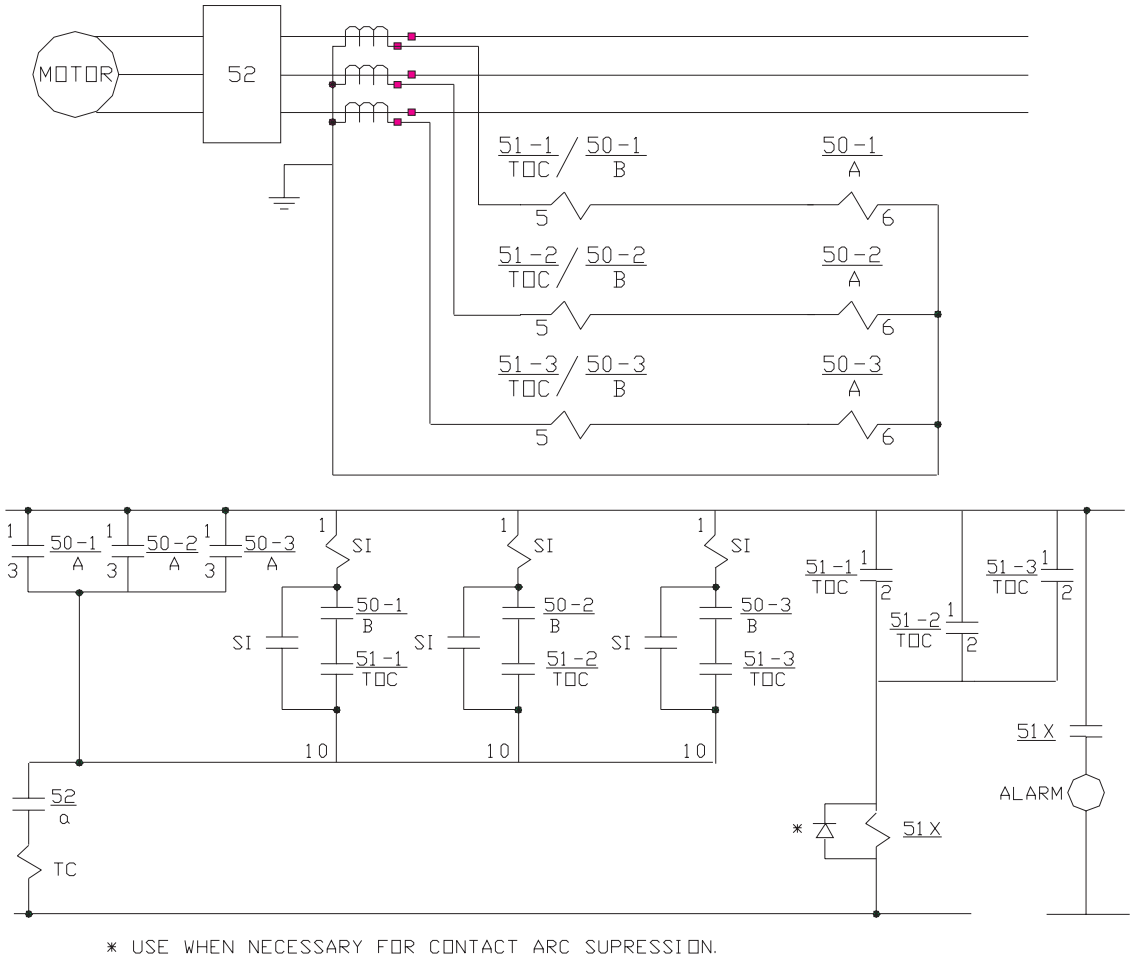
Figure 5–1: DIAC TYPE 66K INTERNAL/EXTERNAL CONNECTIONS



** SHORT FINGER

NOTE: Instantaneous unit connections are for range operation. For high range operation, connect B and D to terminal no. 6 and A and C to terminal no. 4

Figure 5–2: IAC TYPE 66K INTERNAL CONNECTIONS DIAGRAM (FOR REFERENCE)



51	TIME OVERCURRENT RELAY
51X	AUXILIARY RELAY (EXTERNAL DEVICE)
50/A	NORMAL DROPOUT INSTANTANEOUS OVERCURRENT UNIT
52	POWER CIRCUIT BREAKER
50/B	HIGH DROPOUT INSTANTANEOUS OVERCURRENT UNIT
52/a	AUXILIARY CONTACT CLOSED WHEN CIRCUIT BREAKER IS CLOSED
TC	TRIP COIL

Figure 5–3: TYPICAL EXTERNAL CONNNECTIONS FOR MOTOR PROTECTION

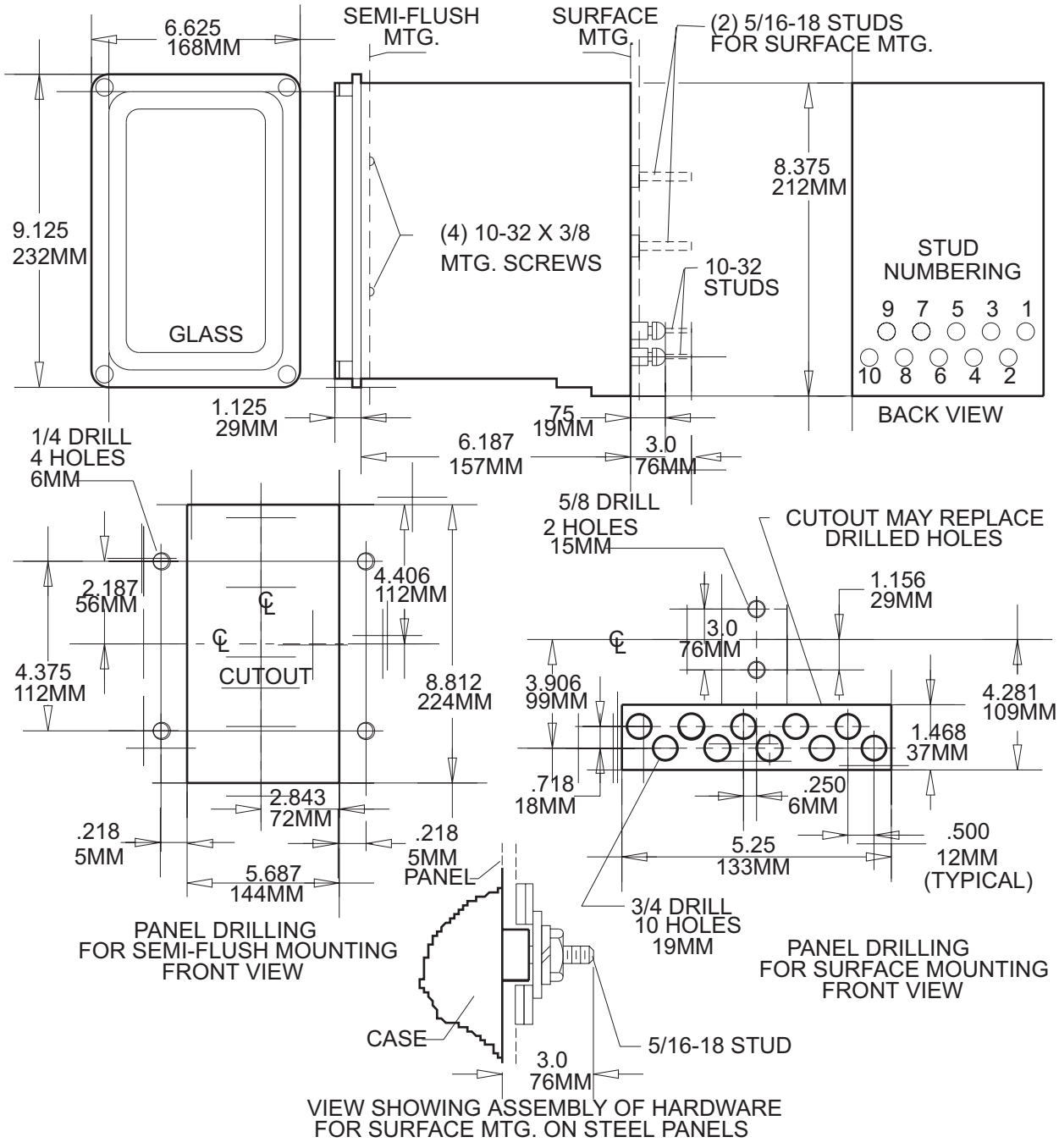


Figure 5–4: DIAC PANEL MOUNTING AND DRILLING

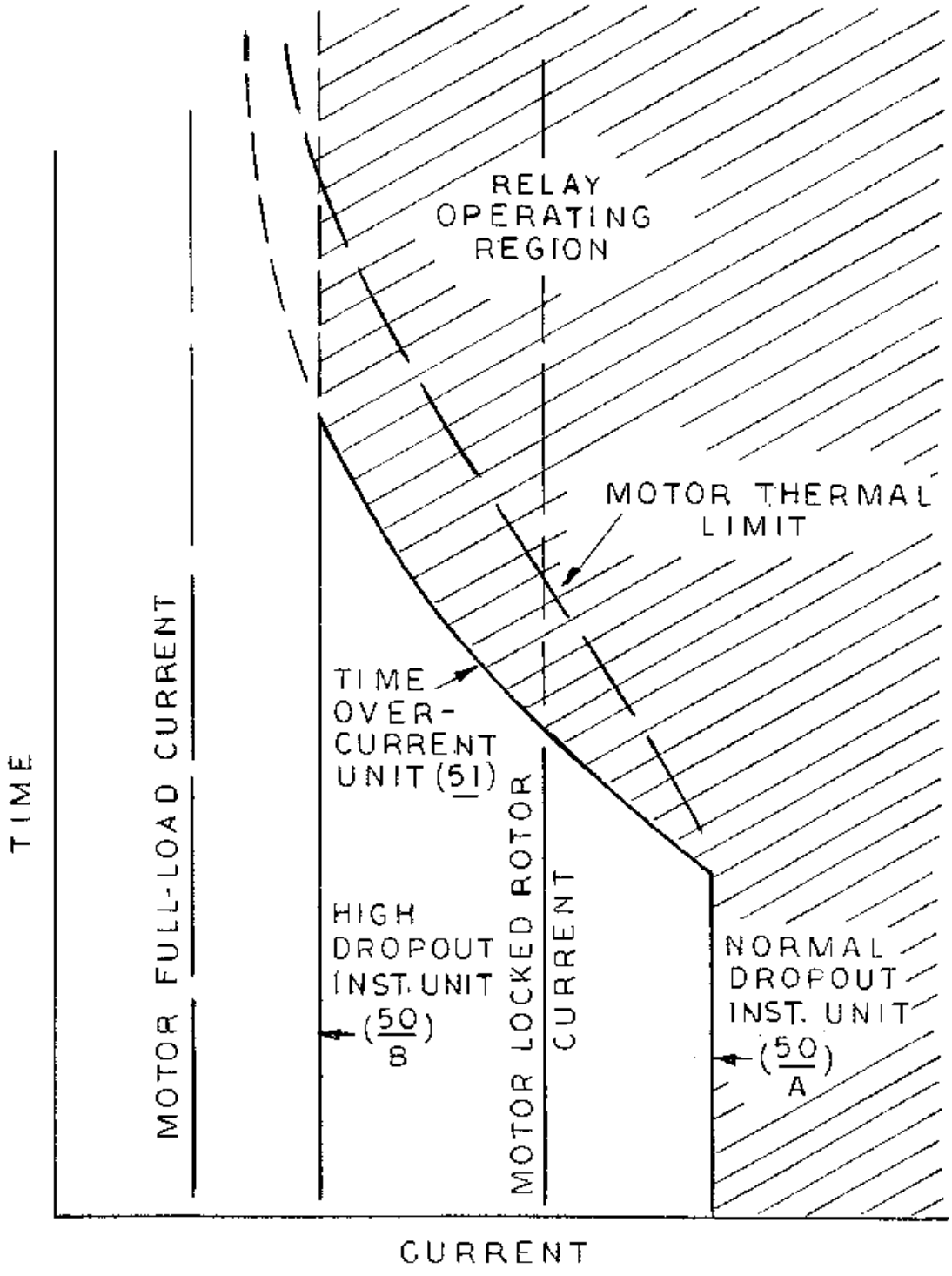


Figure 5–5: MOTOR PROTECTION CHARACTERISTIC CURVE

6.1 DESCRIPTION

Immediately upon receipt of the relay, an inspection and acceptance test should be made to make sure that no damage has been sustained in shipment, and that the relay calibrations have not been disturbed.

6.2 VISUAL INSPECTION

Check the nameplate stamping to make sure that the model number and rating of the relay agree with the requisition. Remove the relay from its case and check that there are no broken or cracked molded parts or other signs of physical damage, and that all screws are tight.

6.3 MECHANICAL INSPECTION

1. The target and seal-in unit, pull and lift the TOC/Instantaneous HDO lever to test the target, repeat the test for the IOC Standard High Set target. The Target flag should re-main when the lever is released. Reset the target by pushing the reset bar.
2. Make sure that the fingers and shorting bars agree with the internal connections diagram.

CAUTION: Every circuit in the drawout case has an auxiliary brush. It is especially important on current circuits and other circuits with shorting bars that auxiliary brush be bent high enough to engage

6.4 DRAWOUT RELAYS, GENERAL

Since all drawout relays in service operate in their cases, it is recommended that they be tested in their cases or an equivalent case. A relay may be tested without removing it from the panel by using the appropriate test plug. For an S case use the XLA series test plug, refer to the GE Power Management Product Catalog, Products CD, or website (the URL is www.ge.com/indsys/pm). Although the test plugs provide greater flexibility, it re-quires CT shorting jumpers and exercise of greater care since connections are made to both the relay and the external circuitry.

NOTE: Pickup calibration for any of the digital controlled outputs are calibrated by the factory and are not user set-able. Also the same electronics sample the analog signals whether TOC or IOC with the only difference being the software calculations.

The TOC Alarm unit Is designed to operate an external alarm unit or auxiliary relay which can draw a maximum of 1 Amp continuously.

a) PICKUP VERIFICATION

- Connect the relay as indicated in Figure 6–1: TOC ALARM UNIT TEST SETUP. In order to apply current to the relay, use a 50/60 Hz voltage source, with a variable resistor in series, or an electronic current source.
- Set the relay at the desired pickup TOC and the Instantaneous HDO unit by setting the instantaneous current setting to zero.

Apply current to the relay and verify that the Pickup LED on the front of the relay lights between 98% and 102% of the pickup TOC setting. If the relay is set to blink between power up and pickup, please set it not to blink.

Reduce the current applied, verifying that at a value between 95% and 100% of the pickup TOC, the relay Pickup LED turns off or blinks if set to blink.

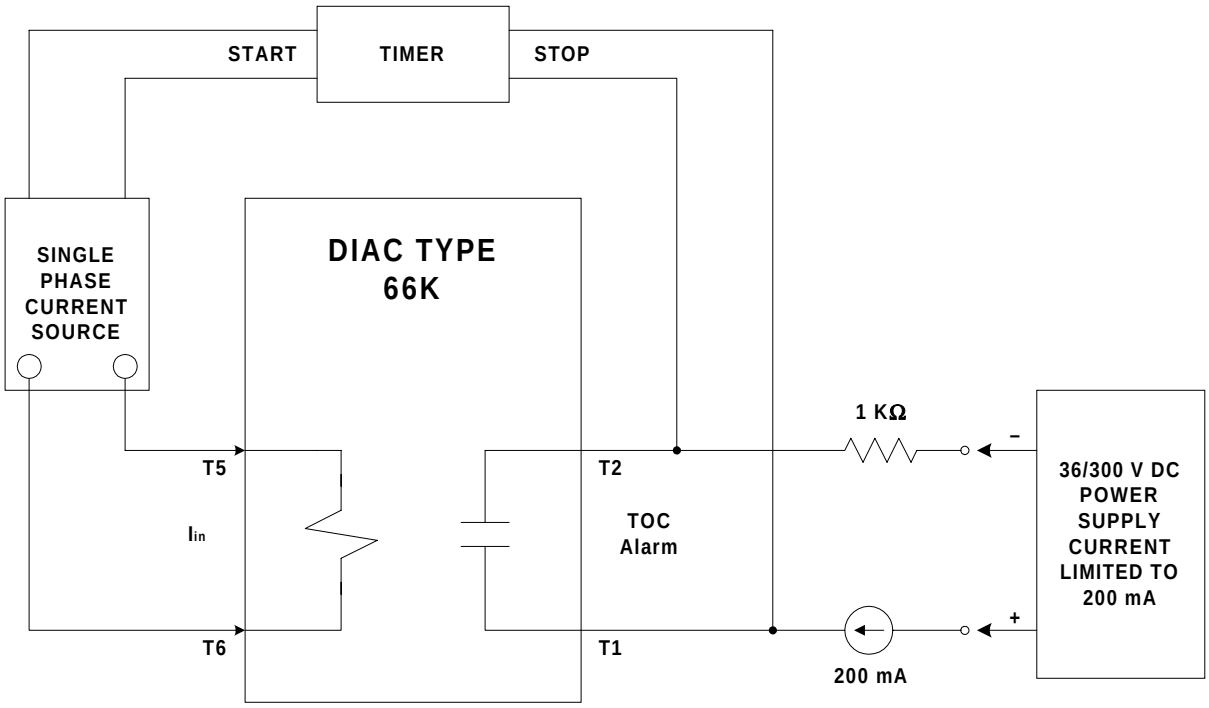


Figure 6–1: TOC ALARM UNIT TEST SETUP

b) VERIFICATION OF OPERATING TIME

Because the Digital self powered series of relays has many different curve characteristics, the basic test instruction will be given and the data for each of the curves can be found in Table 6–1: PICKUP TIMES FOR VARYING MULTIPLES OF PICKUP (MPU) on page 6–3. With the relay still connected as indicated in Figure 6–1: TOC ALARM UNIT TEST SETUP, set the time overcurrent unit to minimum pickup and set the corresponding time dial to 5.

Successively apply currents of 2, 5, and 10 times pickup TOC, verifying that the operating times are within the margins indicated in Table 6–1: PICKUP TIMES FOR VARYING MULTIPLES OF PICKUP (MPU)

Table 6–1: PICKUP TIMES FOR VARYING MULTIPLES OF PICKUP (MPU)

CURVE	PICKUP TIMES (IN SECONDS)		
	2 MPU	5 MPU	10 MPU
IAC 51	3.62 to 4.05	1.69 to 1.86	1.19 to 1.32
IAC 53	6.66 to 7.36	1.25 to 1.37	0.687 to 0.759
55-ST	0.298 to 0.330	0.155 to 0.170	0.133 to 0.140
57-MT	20.40 to 22.62	8.82 to 9.75	5.7 to 6.3
66-LT (Type 66K) †	42.7 to 47.2	17.28 to 19.10	10.78 to 11.90
75-ST	0.748 to 0.827	0.3113 to 0.3440	0.2440 to 0.2707
IAC 77	6.49 to 7.17	0.859 to 0.954	0.266 to 0.296
95-ST	0.895 to 0.994	0.356 to 0.396	0.276 to 0.303
IEEE Inverse	3.59 to 3.99	1.59 to 1.76	1.12 to 1.25
IEEE Very Inverse	6.51 to 7.24	1.21 to 1.34	0.64 to 0.71
IEEE Extremely Inverse	8.76 to 9.73	1.18 to 1.32	0.374 to 0.412
IEC Inverse	4.73 to 5.26	2.00 to 2.22	1.39 to 1.54
IEC Very Inverse	6.310 to 7.014	1.56 to 1.73	0.690 to 0.768
IEC Extremely Inverse	12.3 to 13.7	1.51 to 1.67	0.369 to 0.410
Definite Time	4.71 to 5.24	4.71 to 5.24	4.71 to 5.21
I^2T	1.175 to 1.310	0.191 to 0.212	0.051 to 0.056

† TD = 5

6.6 TOC / INSTANTANEOUS HDO UNIT – INVERSE TIME

The TOC/ Instantaneous HDO unit is designed similarly to a hinged armature instantaneous unit.

a) PICKUP VERIFICATION

- Connect the relay as indicated in Figure 6–2: DIAC 66K TOC INVERSE TIME TEST SETUP. In order to apply current to the relay, use a 50/60 Hz voltage source, with a variable resistor in series, or an electronic current source.
- Set the TOC unit at the desired pickup and the Instantaneous HDO unit by setting the Instantaneous current pickup to lowest possible setting not including zero. This will allow the Instantaneous HDO unit to operate without affecting the TOC trip time which is coordinated with the Instantaneous HDO unit.

Apply current to the relay and verify that the Pickup LED on the front of the relay lights between 98% and 102% of the pickup TOC setting. If the relay is set to blink between power up and pickup, please set it not to blink.

Reduce the current applied, verifying that at a value between 95% and 100% of the pickup TOC, the relay Pickup LED turns off or blinks if set to blink.

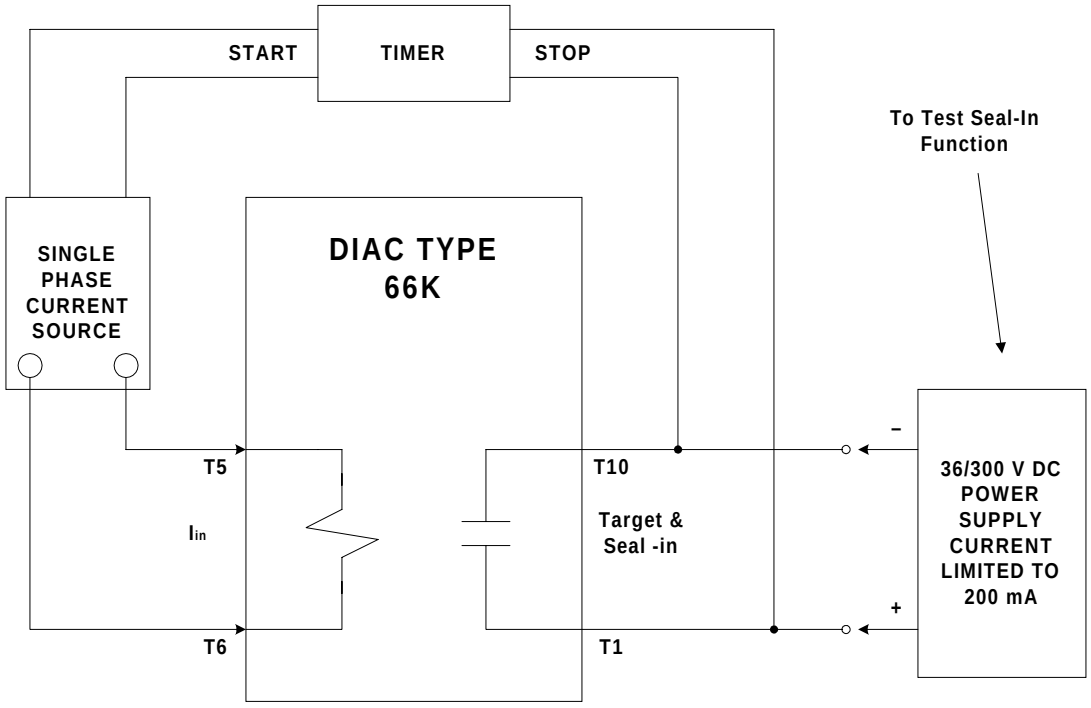


Figure 6–2: DIAC 66K TOC INVERSE TIME TEST SETUP

b) VERIFICATION OF OPERATING TIME

Because the Digital self powered series of relays has many different curve characteristics, the basic test instruction will be given and the data for each of the curves can be found in Table 6–1: PICKUP TIMES FOR VARYING MULTIPLES OF PICKUP (MPU) on page 6–3. With the relay still connected as indicated in Figure 6–2: DIAC 66K TOC INVERSE TIME TEST SETUP, set the time overcurrent unit to minimum pickup and set the corresponding time dial to 5. Enable the Instantaneous HDO settings by setting the pickup to the lowest setting (not including zero). This allows the TOC function to operate without coordinating with the Instantaneous HDO unit. Successively apply currents of 2, 5, and 10 times pickup TOC, verifying that the operating times are within the margins indicated in Table 6–1: PICKUP TIMES FOR VARYING MULTIPLES OF PICKUP (MPU) on page 6–3.

6.7 TOC / INSTANTANEOUS HDO UNIT – DEFINITE TIME

For the Definite Time Characteristics, based on any current input, the time should be half of the maximum value.

a) VERIFICATION OF TIME DIAL

Set the relay at the minimum pickup TOC and verify that with an input current of five times (5x) pickup TOC, the operating time is between the margins shown in Table 6–2: PICKUP TIMES FOR VARYING TIME DIALS.

Table 6–2: PICKUP TIMES FOR VARYING TIME DIALS

CURVE	PICKUP TIMES (IN SECONDS) FOR TIME DIAL SETTINGS			
	10	7	3	1
IAC 51	3.62 to 4.05	2.42 to 2.69	0.996 to 1.106	0.372 to 0.413
IAC 53	2.73 to 3.03	1.78 to 1.98	0.742 to 0.824	0.025 to 0.028
55-ST	0.29 to 0.32	0.21 to 0.23	0.10 to 0.12	0.058 to 0.064
57-MT	17.3 to 19.3	12.20 to 13.65	5.27 to 5.86	1.783 to 1.980
66-LT (Type 66K) †	33.9 to 37.7	24.1 to 26.7	10.3 to 11.4	3.460 to 3.848
75-ST	0.577 to 0.641	0.424 to 0.471	0.200 to 0.221	0.09 to 0.10
IAC 77	1.810 to 2.013	1.20 to 1.33	0.545 to 0.605	0.228 to 0.253
95-ST	0.690 to 0.767	0.490 to 0.544	0.230 to 0.252	0.102 to 0.110
IEEE Inverse	3.108 to 3.450	2.206 to 2.450	0.95 to 1.06	0.345 to 0.384
IEEE Very Inverse	2.390 to 2.635	1.69 to 1.88	0.745 to 0.828	0.273 to 0.304
IEEE Extremely Inverse	2.32 to 2.58	1.65 to 1.84	0.734 to 0.815	0.266 to 0.296
IEC Inverse	3.94 to 4.37	2.79 to 3.10	1.21 to 1.34	0.431 to 0.478
IEC Very Inverse	3.060 to 3.402	2.170 to 2.415	0.95 to 1.05	0.332 to 0.369
IEC Extremely Inverse	2.950 to 3.284	2.109 to 2.330	0.913 to 1.015	0.329 to 0.364
Definite Time	9.5 to 10.5	6.65 to 7.31	2.83 to 3.15	0.95 to 1.05
I^2T	0.3510 to 0.3865	0.256 to 0.282	0.124 to 0.137	0.0664 to 0.0730

† MPU = 5X

6.8 INSTANTANEOUS HDO UNIT

The instantaneous HDO unit will react differently depending on how the signal is applied. If the signal is applied suddenly with no prefault current, the operating time will be longer. If a prefault current is applied prior to the fault the operating time will be shorter. The following test determines that the instantaneous unit is working correctly and confirms the operating time for faults applied with no prefault current.

Connect the relay as shown in Figure 6–2: DIAC 66K TOC INVERSE TIME TEST SETUP on page 6–4. Set the instantaneous unit pickup to 2 Amps (for the 5 Amp rated relay) or 0.4 Amps (for the 1 Amp rated relay) with a zero IOC delay setting. Also set the TOC pickup to its lowest setting not including zero. This allows the Instantaneous HDO unit to function without coordinating with the TOC unit. Apply 6 Amps (for the 5 Amp rated relay) or 1.2 Amps (for the 1 Amp rated relay) and measure the operating time. The operating time should be between 32ms and 46ms. This time is subject to dependent on the multiple of pickup current and the fault incidence angle. A graph of how the instantaneous unit varies as a function of input current is provided for reference in Figure 2–17: IOC CURVE FOR THE HDO INSTANTANEOUS UNIT on page 2–19.

Connect the relay as shown in Figure 6–3: DIAC TYPE 66K INSTANTANEOUS UNIT TEST SETUP. The standard instantaneous unit is designed to use one of several coils. Table 6–3: PICKUP TIMES FOR VARYING TIME DIALS lists the pickup range, continuous current ratings and short time ratings of each of these coils.

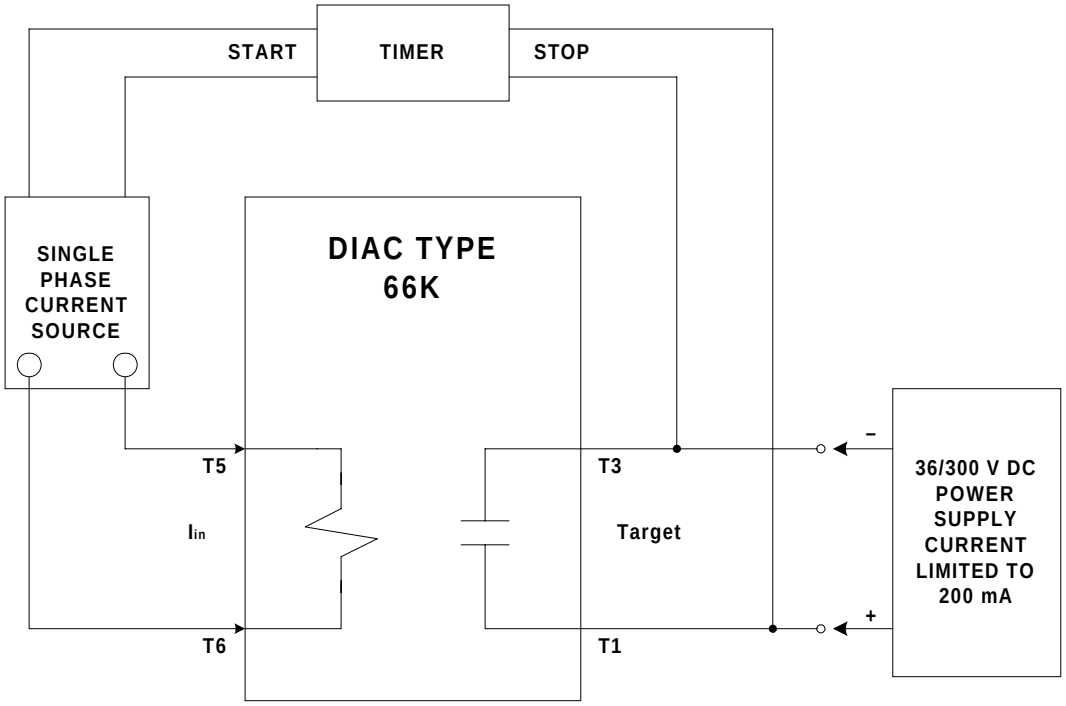


Figure 6–3: DIAC TYPE 66K INSTANTANEOUS UNIT TEST SETUP

Table 6–3: PICKUP TIMES FOR VARYING TIME DIALS

RANGE	SUB-RANGE	SERIES OR PARALLEL	RATINGS	
			CONTINUOUS	1 SECOND
0.5 to 4.0	0.5 to 2.0	SERIES	0.75	25.0 †
	1.0 to 4.0	PARALLEL	1.5	50.0 †
2.0 to 16.0	2.0 to 8.0	SERIES	3.0	130.0 †
	4.0 to 16.0	PARALLEL	6.0	260.0 †
10.0 to 80.0	10.0 to 40.0	SERIES	15.0	400.0 †
	20.0 to 80.0	PARALLEL	25.0	600.0 †
20.0 to 160.0	20.0 to 80.0	SERIES	25.0	600.0 †
	40.0 to 160.0	PARALLEL	25.0	600.0 †

† Higher currents I may be applied for shorter lengths of time t in accordance with the formula: $I = \frac{\sqrt{K}}{t}$, K = constant

6.10 PERIODIC TESTS

It is recommended that the user perform a periodic test to verify that the relay is operating properly. It is recommended that a portion of the acceptance tests be performed to verify the relay. An inspection of the seal-in contacts can be performed by removing the relay from its case and visually inspecting the contacts for corrosion.

6.11 SERVICING

If the relay fails to perform as specified in this instruction manual consult the factory or call your local GE sales office. Before returning the relay consult with the GE Power Management technical support.

It is not recommended that the relay be serviced to the component level. This requires substantial investment in repair/test equipment and in technical expertise, and usually results in a longer down time than if a spare relay were used in its place, while the unit is shipped back to the factory.

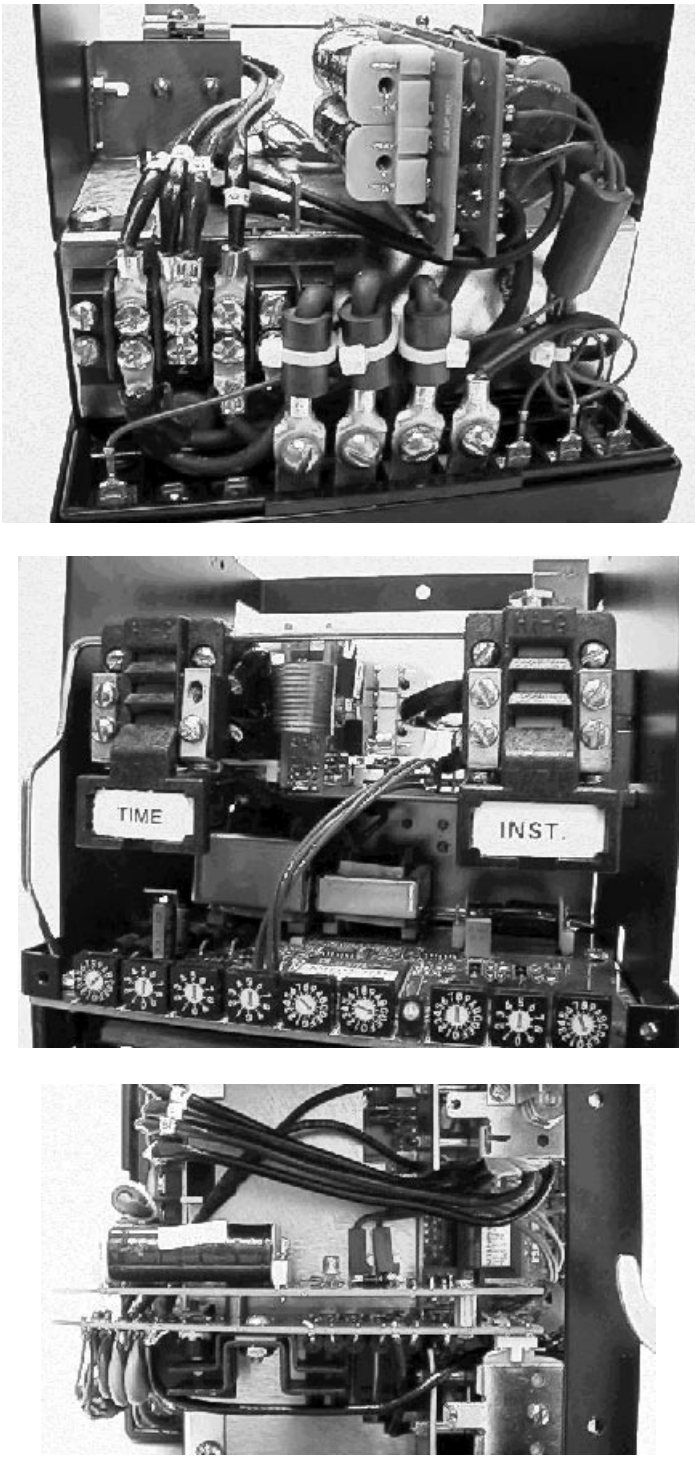


Figure 6–4: REAR, FRONT, AND TOP VIEWS OF THE DIAC TYPE 66K INTERIOR

Figure 6–5: DIAC 66K FRONT AND REAR VIEWS

7.1 BURDENS

Burdens for the over-current units are listed in Table 7–1: BURDEN SETTINGS. Burdens decrease with increasing current above minimum setting, due to the power supply shunting in the power supply circuit. Since the power supply is the major portion of the burden, the burden for a given input current will be constant, irrespective of pick-up settings on both TOC and IOC units.

Table 7–1: BURDEN SETTINGS

			BURDEN at MINIMUM SETTING				BURDEN IN Ω (Z) at MULTIPLES OF MINIMUM PICKUP			
UNIT	RANGE	Hz	R	jX	Z	∠	3x	10x	20x	100x
1A	0.1 / 31.8	60	28.8	29.2	41.3	45°	9.36	2.32	1.24	0.768
5A	0.5 / 15.9	60	1.28	1.15	1.74	42°	0.394	0.094	0.052	0.034

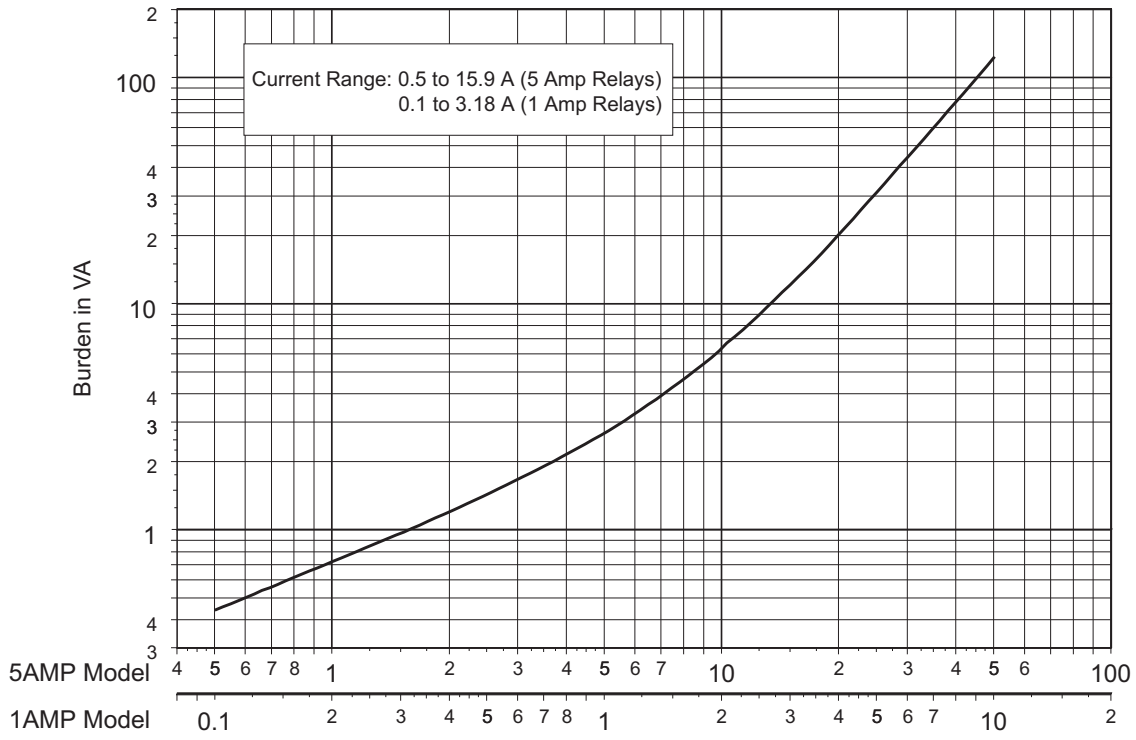


Figure 7–1: BURDEN CURVE

BURDENS:

0.1A / 0.5 A unit 0.45 VA

1.0A / 5.0 A unit 2.6 VA

7.2 RATINGS

FREQUENCY
System Frequency 50/60 Hz

CURRENT (1A OR 5A MODELS)

Table 7–2: MAXIMUM PERMISSIBLE CURRENT

	1 A MODEL	5 A MODEL
Continuous	3 A	15 A
3 seconds	50 A	250 A
1 second	100 A	500 A

Table 7–3: OPERATING CURRENT RANGE

	1 A MODEL	5 A MODEL
minimum	0.095 A	0.475 A
I^2T (constant)	1520	38000

TRANSIENT OVERREACH
Maximum Transient Overreach 7%

CONTACT RATINGS

Table 7–4: MAXIMUM PERMISSIBLE CURRENT

	Voltage	Cont.	Make & Carry 1 sec	Break	Max. Load
DC resistive	125V 250V	10A	30A	0.5 A 0.3 A	60 W
DC inductive L/R=40 ms	125V 250V 370V	10 A	30A	0.25 A 0.15 A 0.05 A	50 V

7.3 ENVIRONMENTAL

AMBIENT TEMPERATURE
Storage: –40 to +85°C

Operation: –25 to +70°C

Humidity: Up to 95% without condensing

INSULATION WITHSTAND TESTS
Impulse Voltage: 5 KV peak, 1.2/50 µs, 0.5 Joules per IEC255-5, Class III

SURGE WITHSTAND CAPABILITY
Fast Transient: Per ANSI C37.90.2-1989
Per IEC 60255-22-4

Oscillatory: Per ANSI C37.90.1-1989
Per IEC 255-4

RADIO FREQUENCY WITHSTAND
25 MHz to 1 GHz, keyed every 1 MHz for 2 seconds

Per ANSI C37.90.2

Per IEC 60255-22-3

ELECTROSTATIC DISCHARGE
Per IEC 60255-22-2

NOTE: The DIAC Type 66K relay must be powered up at least once per year to avoid deterioration of electrolytic capacitors and subsequent relay failiure.

A.1.1 REVISION HISTORY

Table A–1: REVISION HISTORY

MANUAL P/N	DIAC 66K REVISION	RELEASE DATE	ECO
GEK-106261	---	---	---
GEK-106261A	---	---	---
GEK-106261B	SPDV130.A03	November 1, 1999	---
GEK-106261C	SPDV130.A03	November 16, 2000	DIAC66K-007

A.1.2 ADDITIONS/CHANGES TO DIAC 66K MANUAL

Table A–2: ADDITIONS/CHANGES TO DGP MANUAL GEK-106261C

PAGE IN GEK-106261B	ADDITION/CHANGE (to GEK-106261C)
cover	Updated GE contact information and manual part number. Moved warning concerning electrolytic capacitor deterioration to the SPECIFICATIONS chapter.
4-4	Updated Figure 4-2 to reflect the correct taps for 2 A and 0.2 A.

A

Numerics

A

B

C

D

E

F

H

I

M

O

P

R

S

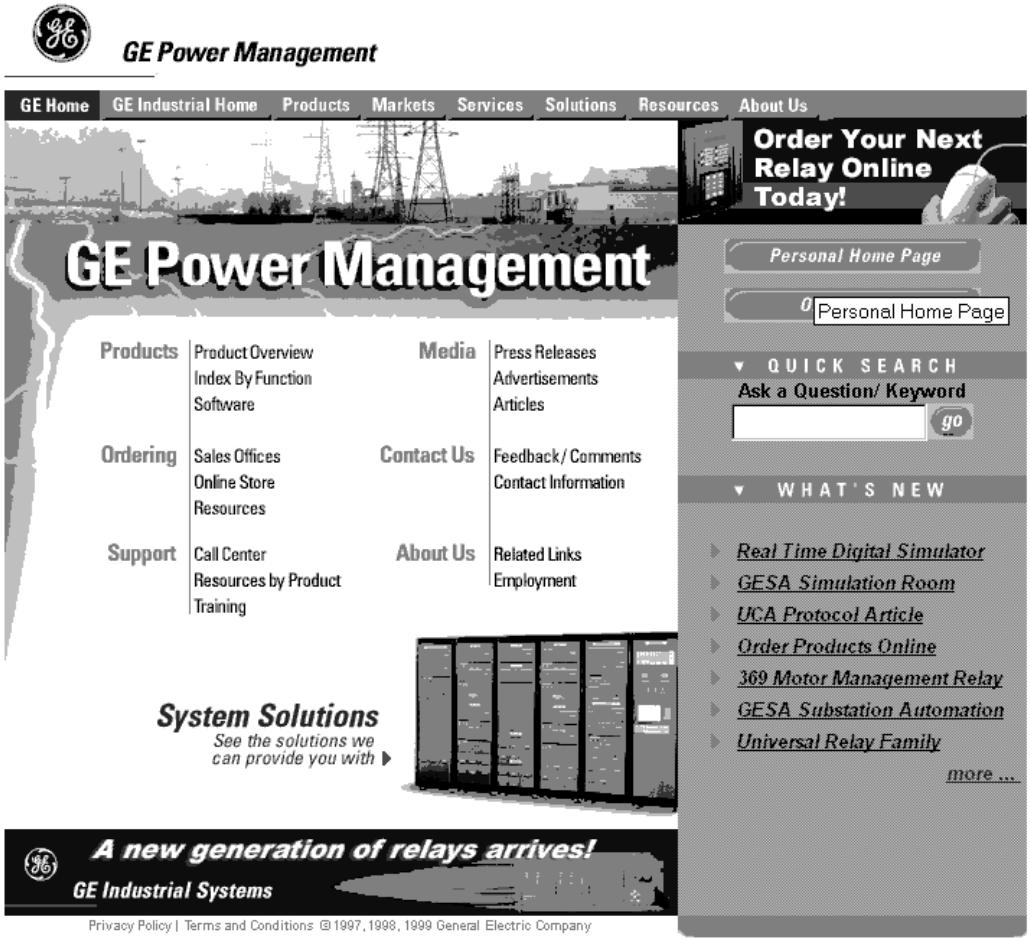
T

V

GE POWER MANAGEMENT WEBSITE

The latest product information for the DIAC 66K relay is available on the Internet via the GE Power Management home page:

http://www.GEindustrial.com/pm



This site provides access to the following customer services:

- Digital Products Directory
  A brief description of products can be viewed online.
- Product Catalog
  Individual product brochures can be downloaded and printed
- Product Selector Guide
  A graphical tool for finding the product you are interested in
- Sales Offices
  A complete listing of world-wide sales offices
- Technical Support
  Complete contact information is available
- Instruction Manuals
  Manuals for many products are now available online
- GE Product Software
  The latest working versions of product software
- Technical Drawings
  Many technical drawings are available in either AutoCAD, CorelDRAW, or PDF formats.
- Order Codes
  Order codes for many products can be downloaded and printed
- Technical Publications
  Papers related to power management

Much more is also available. Visit us online at www.GEindustrial.com/pm.