INSTRUCTIONS

GEI-44203D
Supersedes GEI-44203C

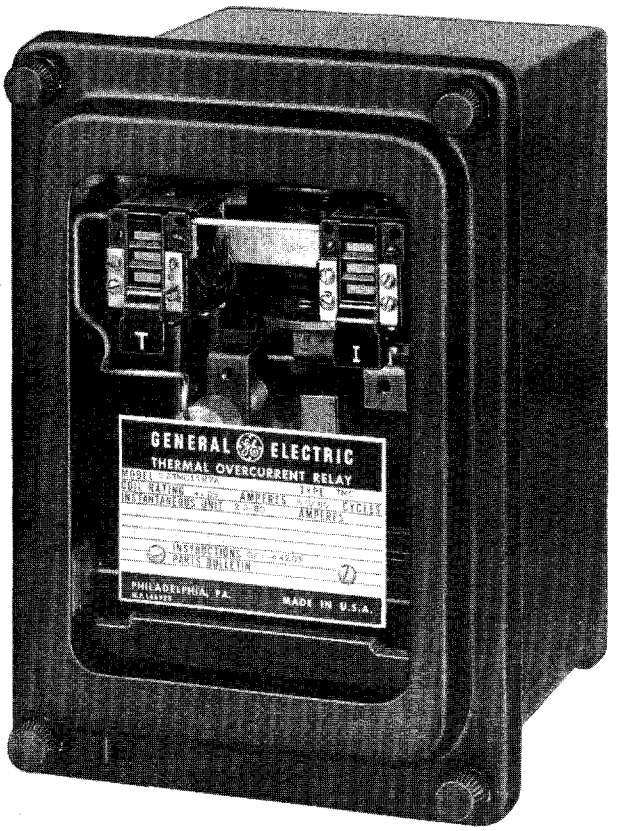
THERMAL OVERCURRENT RELAY

TYPES

TMC11B

TMC12B

TMC13B



GENERAL ELECTRIC

CONTENTS

THERMAL OVERCURRENT RELAY
TYPES TMC11B, TMC12B AND TMC13B

DESCRIPTION

Type TMC single pole thermal overcurrent relays provide both instantaneous and thermal overload protection for motors with compensation for changes in relay ambient temperature. It consists of an induction thermal unit, an instantaneous unit and a universal seal-in unit and target coil (see Fig. 1). Both the thermal and instantaneous units have independent open contacts with separate targets (the seal-in unit is energized by the closing of the thermal unit contacts). The thermal unit contacts are hand reset while the instantaneous unit contacts are self-reset. The two targets are reset by the same mechanism which resets the thermal unit contacts.

The internal connections for these relays are shown in Figure 3. A typical external connection diagram is shown in Figure 4. Two relays are required for protection of a motor as is shown. The relay is mounted in a size S-1 drawout case. Outline and panel drilling are shown in Figure 8.

APPLICATION

The TMC relay is not intended for use directly in primary motor circuits but should always be applied with current transformers. It is self-protecting on primary short circuit because the CT's will saturate before excessive secondary currents can be reached.

The relay rating should be selected so that the maximum full load motor current on a secondary basis falls between the minimum and maximum values of current shown in the RELAY SELECTION TABLE. The full load motor current is determined as the nameplate current multiplied by the correction factor given in the following table depending upon the type of motor being used:

TEMPERATURE RATING OF MOTOR	CORRECTION FACTOR
Continuous, 1.15 service factor	1.0
Continuous, 1.0 service factor	0.9
Short time, 60 minutes	0.8
Short time, 30 minutes	0.75
Short time, 15 minutes	0.7
Short time, 5 minutes	0.6

The thermal unit tripping current is adjustable over the range of 90 to 110 percent of the nominal coil rating. The relay is calibrated at 40°C to just trip at the coil rating current with a -10 percent +0 percent tolerance. If the motor full load current (with correction factor applied) is near the maximum of the current selection range for the chosen relay, unnecessary tripping may occur because of the negative tolerance for the calibration current. If such unnecessary tripping should occur, the thermal unit tripping current should be increased to 110 percent of coil rating to eliminate the problem.

Although the relay has built-in compensation for changes in ambient temperature, the compensation is not perfect. There is a 2 percent variation in trip point per 10°C change in temperature from the 40°C calibration temperature. The trip point will decrease as the ambient temperature increases.

RATINGS

* The current-closing rating of the contacts is 30 amperes for voltages not exceeding 250 volts. The current-carrying ratings are affected by the selection of the tap on the seal-in unit coil as indicated in the following table:

0.2/2.0 AMP TARGET SEAL-IN UNIT			
Tap Used		0.2	2.0
Carry 30 Amps For	(sec)	0.05	2.2
Carry 10 Amps For	(sec)	0.45	20
Carry Continouosly	(amps)	0.37	2.3
Minimum Operating	(amps)	0.2	2.0
Minimum Drop-Out	(amps)	0.05	0.5
D-C Resistance	(ohms)	8.3	0.24
60 Hertz Impedance	(ohms)	50	0.65
50 Hertz Impedance	(ohms)	42	0.54
Interrupting Rating			
Non-Inductive Circuit 125VDC	(amps)	2.5	2.5

* Indicates revision

* The TMC11B, 12B, and 13B are available in the following ratings for 60 hertz and 50 hertz applications.

60 HERTZ RELAY SELECTION TABLE

Motor Full Load Current Amperes		Current Rating Amperes		Model 12TMC		
Min.	Max.	Thermal Unit	Inst. Unit	11B Form	12B Form	13B Form
0.59	0.64	0.71	4/16	28		
0.65	0.70	0.78	4/16	29		
0.86	0.94	1.03	4/16	50		
0.94	1.02	1.13	4/16	30		
1.32	1.45	1.64	4/16	36	14	
1.32	1.45	1.64	10/40	54		
1.60	1.75	2.00	10/40	34		
1.76	1.93	2.20	10/40	21		1
1.94	2.11	2.42	10/40	1	1	2
2.12	2.33	2.65	4/16	55		
2.12	2.33	2.65	10/40	2	2	3
2.12	2.33	2.65	20/80	49		
2.34	2.55	2.92	10/40	3	3	4
2.34	2.55	2.92	20/80	44		16
2.56	2.81	3.20	10/40	4	4	5
2.56	2.81	3.20	20/80	41		
2.82	3.09	3.52	10/40	5	5	17
2.82	3.09	3.52	20/80	45	12	6
3.10	3.39	3.87	10/40	42		13
3.10	3.39	3.87	20/80	6	6	7
3.10	3.39	3.87	40/160	53		
3.40	3.74	4.25	10/40	24	16	14
3.40	3.74	4.25	20/80	7	7	8
3.40	3.74	4.25	40/160	51		
3.75	4.11	4.68	10/40	25	11	12
3.75	4.11	4.68	20/80	8	8	9
3.75	4.11	4.68	40/160	47		
4.12	4.47	5.15	10/40		18	15
4.12	4.47	5.15	20/80	9	9	10
4.48	4.97	5.60	20/80	10	10	11
4.98	5.40	6.22	20/80	23		

* Indicates revision

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50 HERTZ RELAY SELECTION TABLE

Motor Full Load Current Amperes		Current Rating Amperes		Model 12TMC		
Min.	Max.	Thermal Unit	Inst. Unit	11B Form	12B Form	13B Form
0.59	0.64	0.71	4/16	28		
0.65	0.70	0.78	4/16	29		
0.86	0.94	1.03	4/16	50		
0.94	1.02	1.13	4/16	30		
1.32	1.45	1.64	4/16	36		
1.46	1.59	1.82	10/40	22		
1.60	1.75	2.00	10/40	34		
1.76	1.93	2.20	10/40	21		
1.94	2.11	2.42	10/40	1		
2.12	2.33	2.65	4/16	55		
2.12	2.33	2.65	10/40	2		
2.12	2.33	2.65	20/80	49		
2.34	2.55	2.92	10/40	3		
2.34	2.55	2.92	20/80	44		
2.56	2.81	3.20	10/40	4		
2.56	2.81	3.20	20/80	41		
2.82	3.09	3.52	10/40	5		
2.82	3.09	3.52	20/80	45	15	
3.10	3.39	3.87	10/40	42		
3.10	3.39	3.87	20/80	6	17	
3.10	3.39	3.87	40/160	53		
3.40	3.74	4.25	10/40	24		
3.40	3.74	4.25	20/80	7		
3.40	3.74	4.25	40/160	51		
3.75	4.11	4.68	10/40	25		
3.75	4.11	4.68	20/80	8	13	
3.75	4.11	4.68	40/160	47		
4.12	4.47	5.15	10/40			
4.12	4.47	5.15	20/80	9		
4.48	4.97	5.60	20/80	10		
4.98	5.40	6.22	20/80	23		

* Indicates revision

The 2-ampere tap has a d-c resistance of 0.13 ohms and a 60 cycle impedance of 0.53 ohms while the 0.2-ampere tap has a 7 ohm d-c resistance and 52 ohm 60 cycles impedance. The tap setting used on the seal-in unit is determined by the currrent drawn by the trip coil.

The 0.2-ampere tap is for use with trip coils that operate on currents ranging from 0.2 up to 2.0 amperes at the minimum control voltage. If this tap is used with trip coils requiring more than two amperes, there is a possibility that the seven-ohm resistance will reduce the current to so low a value that the breaker will not be tripped.

The two-ampere tap should be used with trip coils that take two amperes or more at minimum control voltage, provided the tripping current does not exceed 30 amperes at the maximum control voltage. If the tripping current exceeds 30 amperes, an auxiliary relay should be used, the connections being such that the tripping current does not pass through the contacts or the target and seal-in coil of the protective relay.

BURDENS

INSTANTANEOUS UNIT

Burden data on the instantaneous unit coils are given in the following table:

Coil	Freq.	Amp.	Volt Amp.	Imp. Ohms	P F
10-40	60	5	0.83	0.033	0.95
	50	5	0.80	0.032	0.95
	25	5	0.65	0.027	0.98
20-80	60	5	0.21	0.008	0.95
	50	5	0.20	0.008	0.95
	25	5	0.15	0.007	0.98

THERMAL UNIT

For Type TMC11B and TMC12B relays, the burden of the thermal unit at rated current is approximately 13.5 volt-amperes and 12 watts for 25 and 60 cycle operation or approximately 12.5 volt-amperes and 11 watts for 50 cycle operation. For Type TMC13B relays, the burden of the thermal unit is approximately 10 percent higher than for the type TMC11B and TMC12B relays.

For Type TMC11B and TMC12B relays, the volt-ampere burden of the thermal unit at five amperes is approximately equal to K divided by the square of the current rating, where K is 325 for 25 and 60 cycles and 305 for 50 cycles. For Type TMC13B relays, the volt-ampere burden of the thermal unit at five amperes is approximately equal to K divided by the square of the current rating where K is 295.

CONSTRUCTION

The thermal unit consists of a current coil placed over a bi-metal helix that acts as the short-circuited secondary of a transformer. The current heats the helix causing it to rotate in a direction to close the hand reset contacts. Tripping current is adjustable from 90 to 110 percent of coil rating. The contacts cannot be reset until the unit has cooled for a time.

The instantaneous unit is the small hinge-type unit mounted on the right front side of the relay. It operates over a 4-to-1 range and has its calibration stamped on a scale mounted beside the adjustable pole piece.

The relay case is suitable for either surface or semiflush panel mounting and an assortment of hardware is provided for either mounting. The cover attaches to the case and also carries the reset mechanism.

The case has studs or screw connections at the bottom only for the external connections. The electrical connections between the relay units and the case studs are made through spring backed contact fingers mounted in stationary molded inner and outer blocks between which nests a removable connecting plug which completes the circuits. The outer block, attached to the case, has the studs for the external connections, and the inner block has the terminals for the internal connections.

The relay mechanism is mounted in a steel framework called the cradle and is a complete unit with all leads being terminated at the inner block. This terminal is held firmly in the case with a latch at the top and the bottom and by a guide pin at the back of the case. The case and cradle are so constucted that the relay cannot be inserted in the case upside down. The connecting plug, besides making the electrical connections between the respective blocks of the cradle and case, also locks the latch in place. The cover, which is fastened to the case by thumbscrews, holds the connecting plug in place.

To draw out the relay unit the cover is first removed, and the plug drawn out. Shorting bars are provided in the case to short the current transformer circuits. The latches are then released, and the relay unit can be easily drawn out. To replace the relay unit, the reverse order is followed.

A separate testing plug can be inserted in place of the connecting plug to test the relay in place on the panel either from its own source of current, or from other sources. Or, the relay unit can be drawn out and replaced by another which has been tested in the laboratory.

RECEIVING, HANDLING AND STORAGE

These relays, when not included as a part of a control panel will be shipped in cartons designed to protect them against damage. Immediately upon receipt of a relay, examine it for any damage sustained in transit. If injury or damage resulting from rough handling is evident, file a damage claim at once with the transportation company and promptly notify the nearest General Electric Apparatus Sales Office.

Reasonable care should be exercised in unpacking the relay in order than none of the parts are injured or the adjustments disturbed.

If the relays are not to be installed immediately, they should be stored in their original cartons in a place that is free from moisture, dust and metallic chips. Foreign matter collected on the outside of the case may find its way inside when the cover is removed and cause trouble in the operation of the relay.

INSTALLATION

LOCATION

The location should be clean and dry, free from dust and excessive vibration, and well lighted to facilitate inspection and testing.

MOUNTING

The relay should be mounted on a vertical surface. The outline and panel diagram is shown in Fig.8.

CONNECTIONS

The internal connections for the Type TMC relays are shown in Figure 3. A typical wiring diagram is shown in Figure 4. One of the mounting studs or screws should be permanently grounded by a conductor not less than No. 12 B&S gage copper wire or its equivalent.

OPERATION

The instantaneous unit should be set at about 1.6 times the maximum (110% normal voltage) locked rotor current of the motor. Since the required setting would seldom be less than 5 times or more than 12 times full load current, the relays rated from 2.42 to 3.52 amperes are provided with 10/40 ampere units and the 3.87 to 5.60 ampere relays are provided with 20/80 ampere units.

The relays are tested at 100 percent calibration. The relay when hot, is tested to hold (non-operative) at 90 percent of its coil rating and trip at 100 percent. Thus, an individual relay may vary as much as 10 percent in its calibration; i.e., an individual relay may trip at 90 percent of its coil rating with the adjustment screw set at 100 percent.

Example: Standard 40°C motor, full voltage started, 60 cycle, full load current 3.92 amperes (CT sec.) maximum locked rotor current 500 percent. Use Model 12TMC11B8A rated 4.68 amperes, 50/60 cycles thermal unit, 20/80 amperes instantaneous unit. The thermal unit has a nominal trip point of 4.68 amperes adjustable from 90 percent to 110 percent or 4.21 to 5.15 amperes. This corresponds to 108 to 131 percent of full load allowing operation at 115 percent continuously if desired.

If this were a 55°C motor, the current value to be used for selecting the relay would be 3.92 x 0.9 or 3.53 amperes. Use Model 12TMC11B7A rated 4.25 amperes. The nominal trip point is adjustable from 98 to 119 percent of full load allowing operation at 100 percent continuously.

For both motors, the instantaneous unit setting would be 3.92 x 5 x 1.6 x 1.1 = 35 amperes.

The average time-current characteristic curve for this relay is shown in Figure 5.

MAINTENANCE

The relay has been adjusted at the factory; it is advisable not to disturb the adjustments. It is most important that the bimetal helix and the compensating bimetal should never be tampered with at any time.

Upon leaving the factory, the relay is set for the 100 percent calibration. If it is desired to adjust the relay to trip at a slightly higher or lower value of current, loosen the adjustment locking screw (see Figure 2). Then the adjusting screw can be turned to provide the desired adjustment. Be sure to tighten the adjustment locking screw.

To substitute a new current coil in the thermal unit, the procedure should be as follows:

1. Remove coil leads from terminals 5 and 6.
2. Loosen the three mounting screws and remove the retaining plate (see Figure 2).
3. Lift out the present coil and substitute the replacement taking care that the coil is mounted with the two locating pins on the lower side.
4. Replace the retaining plate so that it rests squarely against the end of the core.
5. Tighten the three mounting screws.
6. Connect coil leads to terminals 5 and 6.

CONTACT CLEANING

For cleaning fine silver contacts, a flexible burnishing tool should be used. This consists of a flexible strip of metal with an etched roughened surface, resembling in effect a superfine file. The polishing action is so delicate that no scratches are left, yet corroded material will be removed rapidly and thoroughly. The flexibility of the tool insures the cleaning of the actual points of contact. Sometimes an ordinary file cannot reach the actual points of contact because of some obstruction from some other part of the relay. The burnishing tool described above can be obtained from the factory.

Fine silver contacts should not be cleaned with knives, files or abrasive paper or cloth. Knives or files may leave scratches which increase arcing and deterioration of the contacts. Abrasive paper or cloth may leave minute particles of insulating abrasive material in the contacts and thus prevent closing.

RENEWAL PARTS

It is recommended that sufficient quantities of renewal parts be carried in stock to enable the prompt replacement of any that are worn, broken or damaged.

When ordering renewal parts, address the nearest Sales Office of the General Electric Company, specify quantity required, name of part wanted, and give complete nameplate data, including serial number. If possible, give the General Electric Company requisition number on which the relay was furnished.

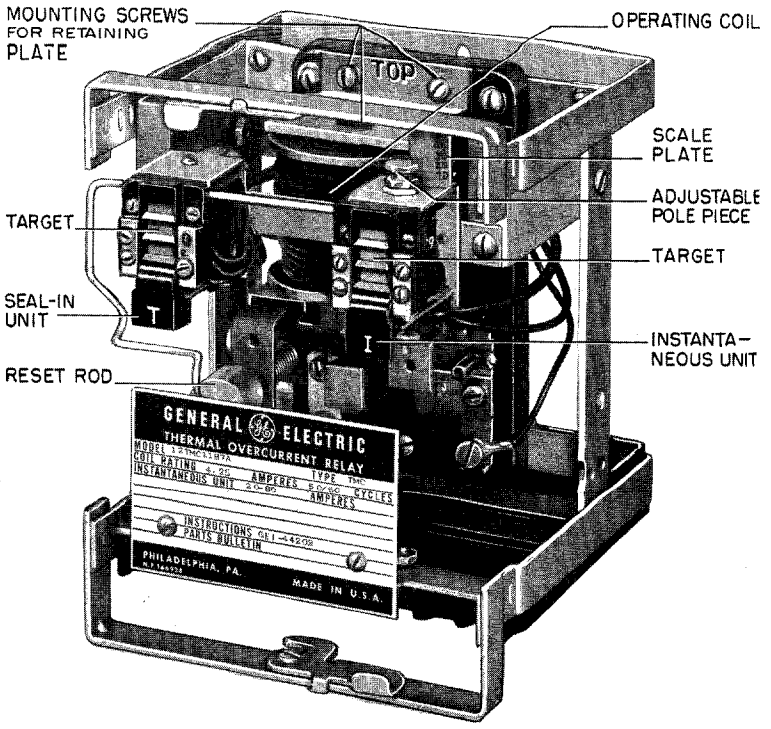

Fig. 1 (8020944) Type TMC11B Relay Withdrawn From Case

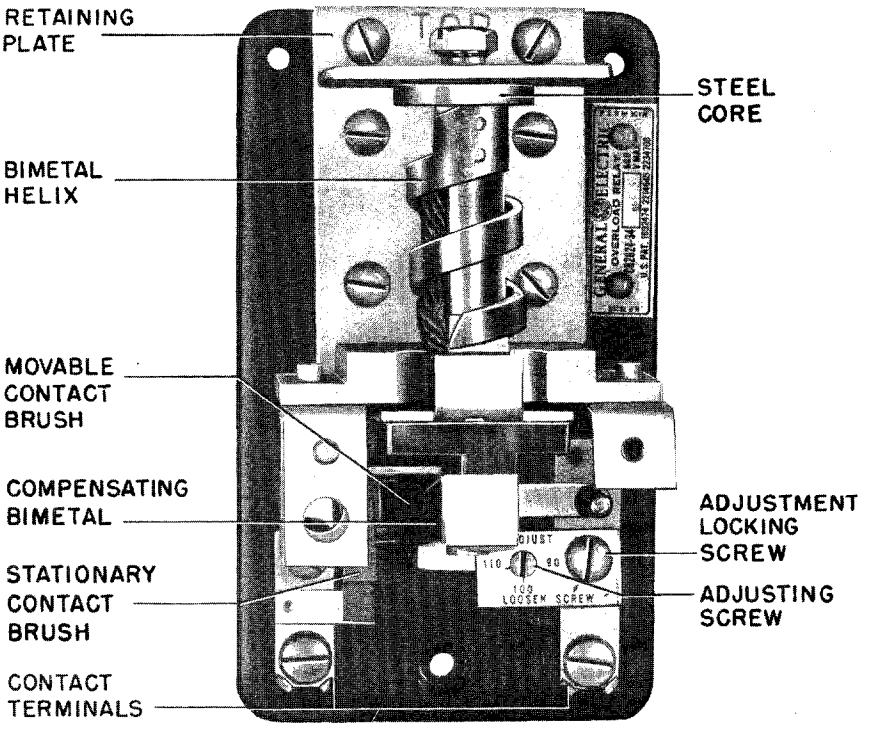

Fig. 2 (8007955) Thermal Unit With Current Coil and Reset Rod Removed

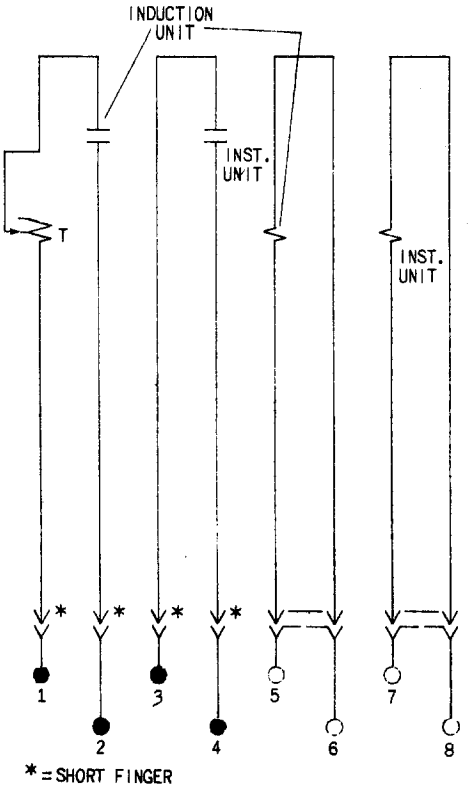

Fig. 3 (0403A0188-1) Internal Connections for Type TMC11B, TMC12B, & TMC13B Relays

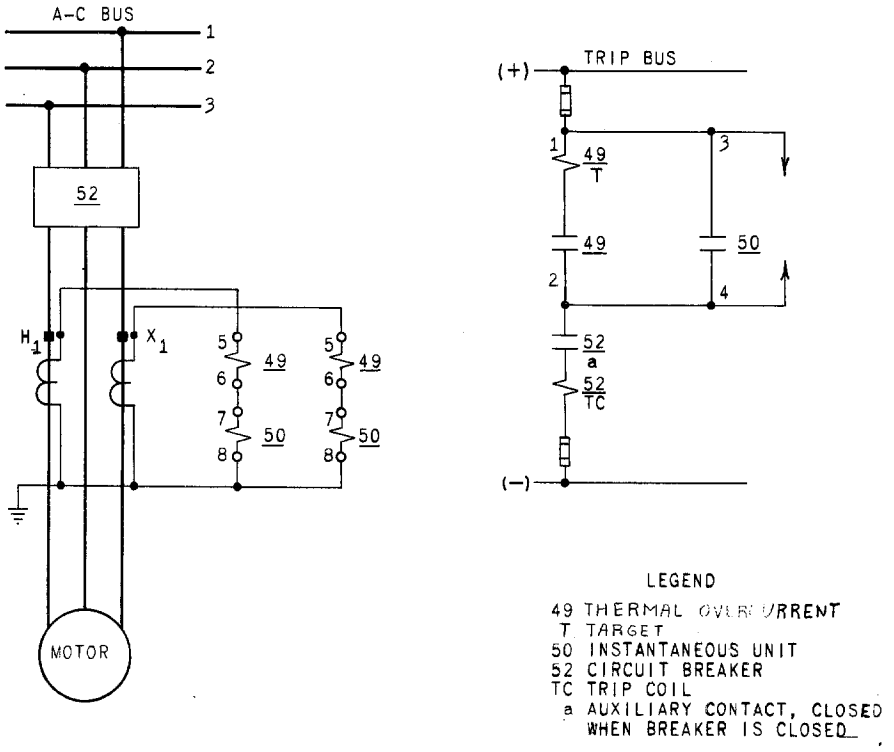

Fig. 4 (06375737-1) Typical External Connections for Type TMC11B Relay

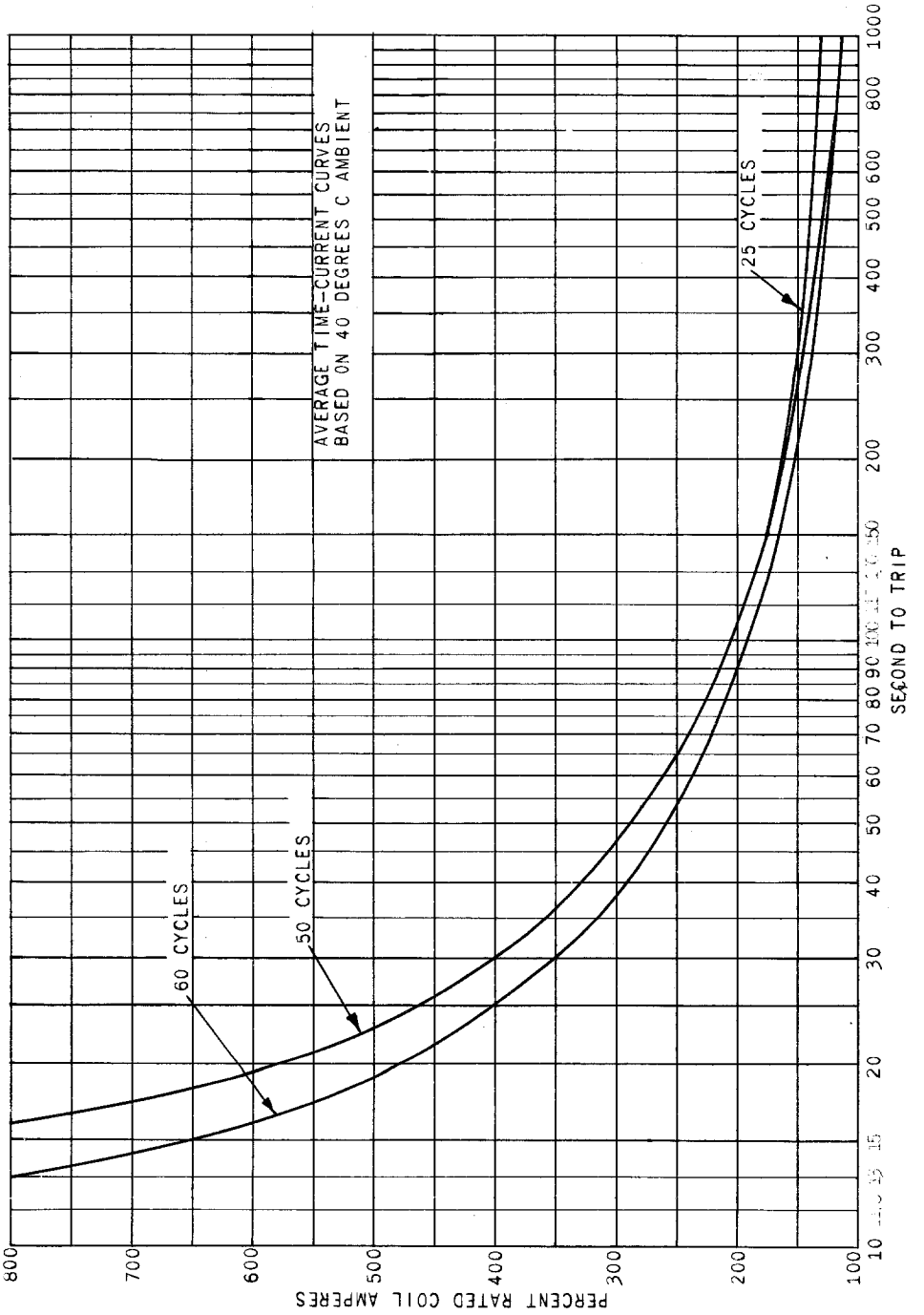

Fig. 5 (06375736-1) Average Time-Current Characteristic Curve for Type TMC11B Relay

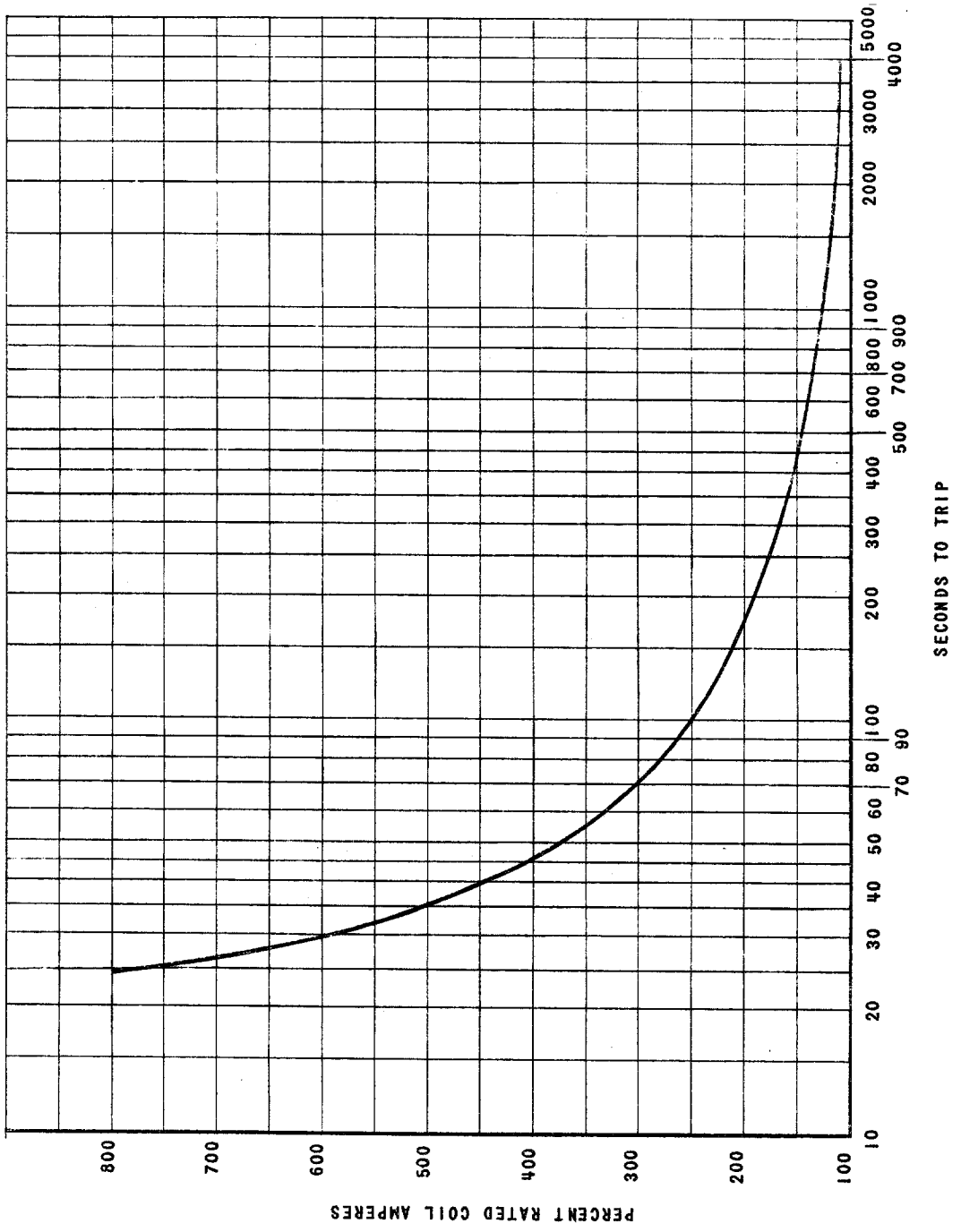

Fig. 6 (0403A0127-0) Average Time-Current Characteristics Curve for Type TMC12B Relay

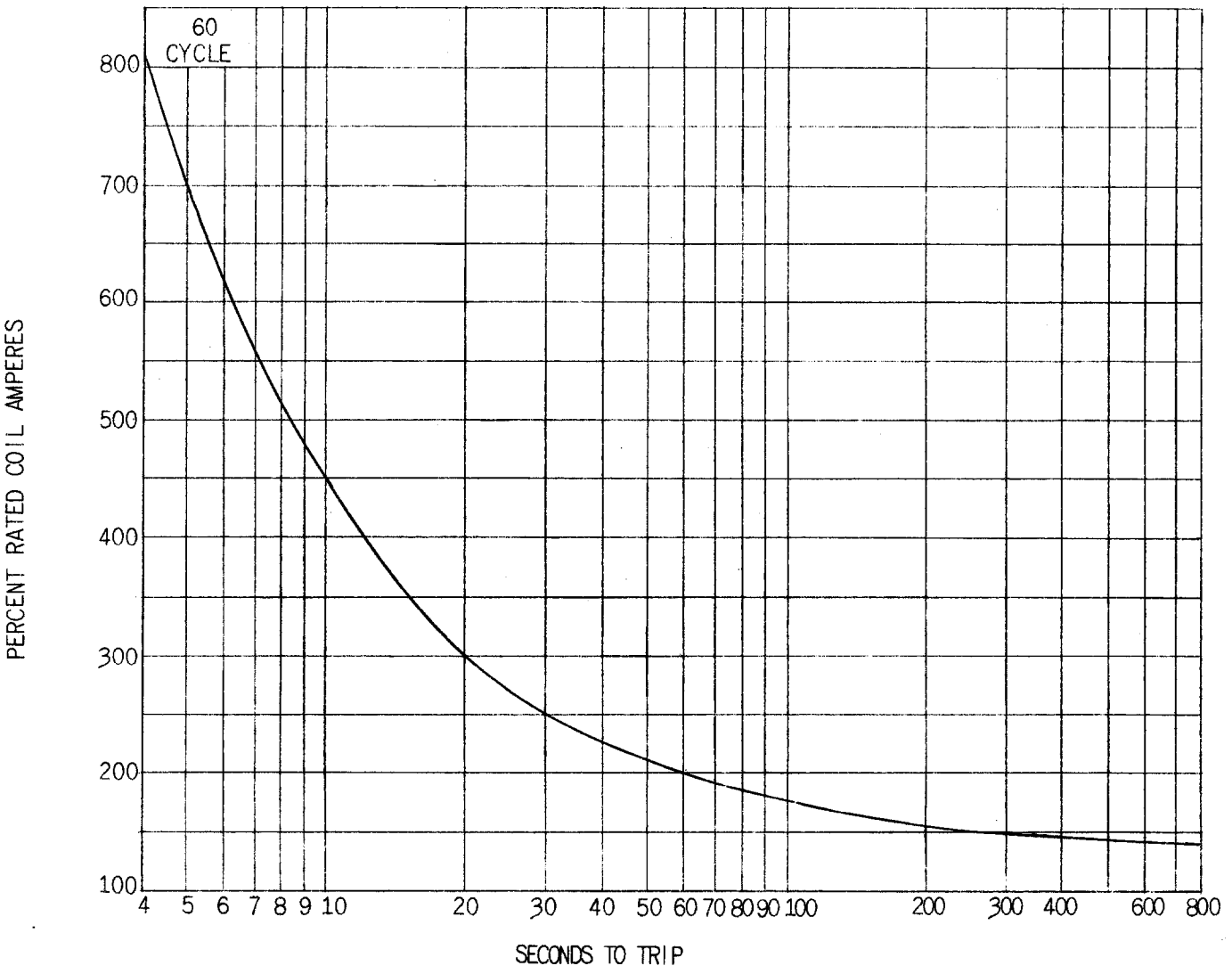

Fig. 7 (0418A0800-0) Time-Current Characteristic Curve for Type TMC13B Relay

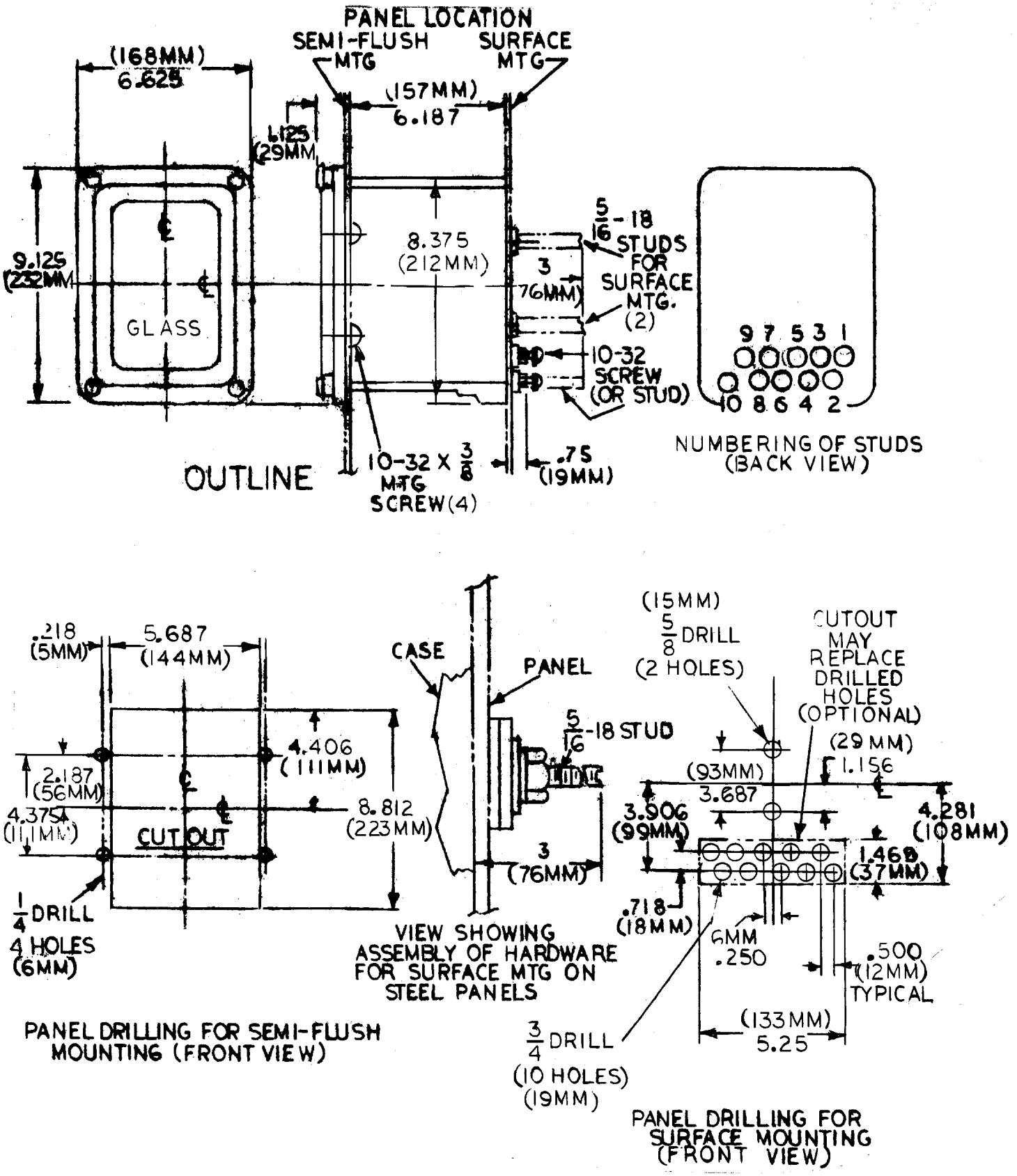

Fig. 8 (06209271-5) Outline and Panel Drilling for Types TMC11B, TMC12B and TMC13B

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