INVERSE TIME CURRENT RELAYS

IMPORTANT — Save for future reference.

DESCRIPTION — The Bulletin 810 is a magnetically operated current relay, with time delay, for use on AC or DC applications. It has inverse time-current characteristics which are dependent upon the viscosity of the fluid in the dashpot. However, unlike thermal relays, minimum operating current is independent of ambient temperature change or cumulative heating. The relays are supplied as standard with a normally closed (NC) contact and an automatic reset. Available options are a normally open (NO) contact, hand reset, and bifurcated contacts with a clear plastic (poly-carbonate) cover. Tripping current and time delay are adjustable.

CONTACT RATINGS —

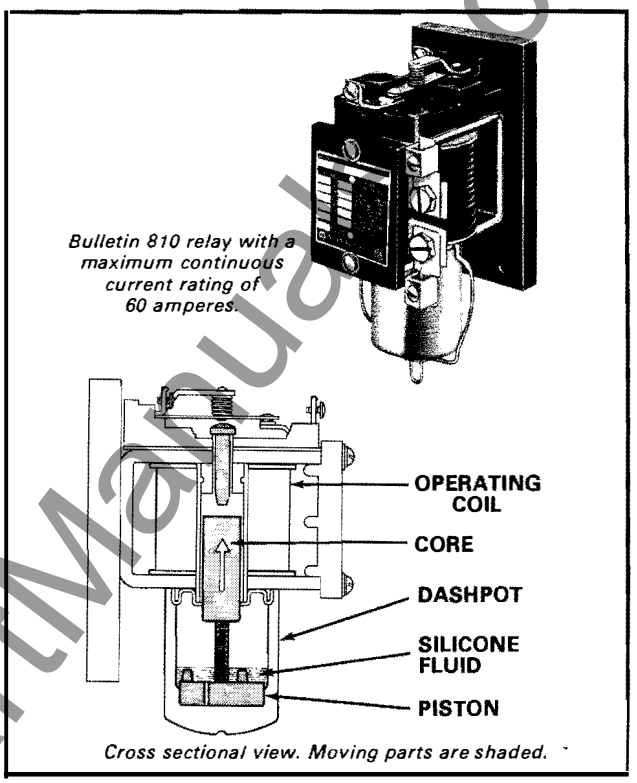
AC						DC	
Maximum Contact Rating Per Pole NEMA Rating Designation A600						Voltage Range	Ampere Rating
Max. AC Voltage 60 or 50 Hz	Amperes		Continuous Carrying Current	Volt-amperes			
	Make	Break		Make	Break		
120	60	6	10	7200	720	115-125	0.4
240	30	3	10	7200	720	230-250	0.2
480	15	1.5	10	7200	720	550-600	0.1
600	12	1.2	10	7200	720		

TIME DELAY TRIP — Current relays are used when it is desirable to take a motor off the line in a certain period of time after a predetermined load condition is reached. A typical application would be starting a large motor, where the Bulletin 810 is used to automatically open the motor starter control circuit if the motor is not up to speed in the maximum acceleration time allowed. In this and other applications of the automatic reset type relay, three wire control must be used, with a provision for interrupting the current through the relay coil immediately after the relay trips (see typical schematic diagram on page 4). On two wire control applications such as float switches, pressure switches or thermostats, a hand reset type overload relay must be used to provide this protection to the coil. The relay can carry its rated continuous current in the non-tripped position only.

OPERATION — Current through the Bulletin 810 operating coil imparts an electromagnetic force on the movable core. The vertical position of the core in the coil is adjustable, thereby providing an adjustable trip point. When the coil current increases to the trip point, the core raises to operate the contact mechanism. Time delay is provided by a silicone fluid dashpot mounted below the core and coil assembly. An adjustable valve in the dashpot piston provides for time delay adjustment.

NORMAL CURRENT — The electromagnetic force caused by normal continuous current through the operating coil is not great enough to lift the core and piston. The relay remains inoperative.

OVERCURRENT — When the current through the operating coil increases beyond the trip point, the resultant electromagnetic force causes the core and piston to raise. Upward motion is dampened through the use of the silicone fluid dashpot. The core rises slowly until the piston reaches an increased diameter in the dashpot, where it is free, to trip the contact with a quick action. Time and current required to complete this cycle are inversely related as shown by the time-current characteristics curves on page 2.



Bulletin 810 relay with a maximum continuous current rating of 60 amperes.

Cross sectional view. Moving parts are shaded.

RESET — Standard models of the Bulletin 810 are automatically reset as soon as the current through the coil is interrupted or decreased to approximately 20% of the tripping current. The core is designed to drop quickly, returning the contacts to their normal position. A check valve allows the piston to bypass the fluid in its return to the bottom of the dashpot. The action of hand reset models differs only in that the contacts do not reset until a lever on the contact block is operated. There is no waiting period as with thermal relays.

EFFECTS OF AMBIENT TEMPERATURE — The minimum operating current (100% on the time-current characteristics graph) is independent of ambient temperature at the relay. However, the operating time at overcurrent varies directly to the viscosity of the silicone fluid. Since the viscosity varies inversely with ambient temperature, the operating time is also inversely affected. The time temperature table shows the correction factors to be applied to the operating times for various temperatures.

TIME TEMPERATURE RELATIONSHIP (+40° C Reference) —

Ambient Temperature (°C)	0°	+10°	+20°	+30°	+40°
Operating Time Correction Factor	2.25	1.80	1.45	1.20	1.0

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Supersedes Publication 810-5.0 Dated October, 1976

OPERATING CURRENT ADJUSTMENT — (Not necessary if factory set to user's specified value). The minimum operating current (100% on the time-current characteristics graph) is adjusted by changing the vertical position of the core within the operating coil. Calibration lines on the core correspond to current values in the table below and stamped on the nameplate. After the core and dashpot assembly is removed, the core is turned up or down on the piston's threaded stem till the line corresponding to the desired operating current is in line with the **top edge of the dashpot.** Currents other than those indicated by the lines are possible by interpolation.

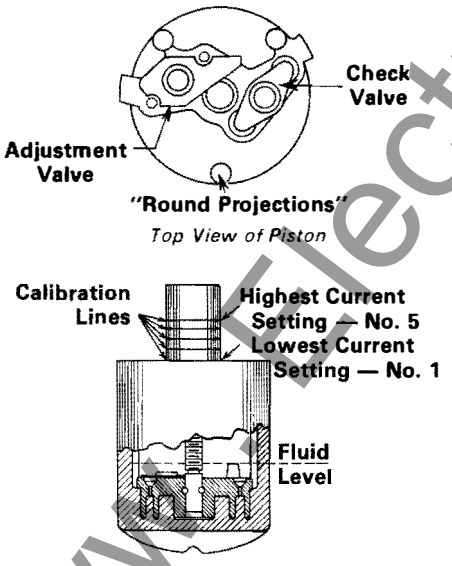
NOTE: If electrical tests are made of current calibrations they should be done **without** fluid in the dashpot (clean and dry).

ADDING DASHPOT FLUID — (See note above) The dashpot fluid is shipped separately. To add fluid, remove the core and dashpot assembly by unfastening the spring clamp. Remove the dashpot cover by pulling the core straight out of the dashpot. Remove and discard red plastic shipping spacer if present. Add the silicone fluid with the dashpot cover removed, with the piston and core in place. Fill the dashpot to the top of the three round projections on the piston. See illustration below. The fluid must be free of dirt or grit, and the dashpot and piston must be **absolutely clean. Check fluid level periodically.**

OPERATING TIME ADJUSTMENT — Unless ordered with a specified time delay setting, the relays are set for minimum time delay when shipped. To increase the time delay, remove the piston from the dashpot and decrease the opening of the adjustment valve by rotating its cover counterclockwise. See illustration below.

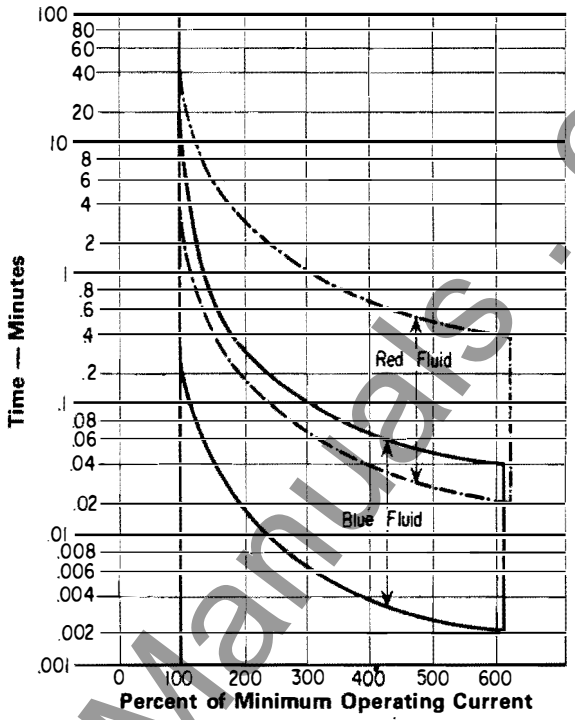
CAUTION: Do not attempt to change the position of the check valve cover, which holds the steel balls of the check valve in place.

The range of operating times possible with the Bulletin 810 is shown by the time-current characteristics curves to the right. The area labeled "blue fluid" represents the range of curves possible using the low viscosity blue fluid supplied as standard with the relay.



Core and Dashpot Assembly

TIME-CURRENT CHARACTERISTICS AT +40°C



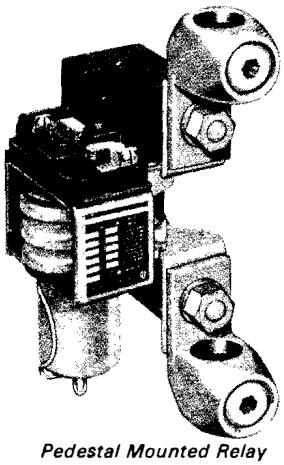
The overlapping area labeled "red fluid" represents the range of curves possible with a higher viscosity red fluid, supplied when requested. Each area is bounded by curves that represent the operating times with the valve fully opened and fully closed. Intermediate settings must be verified by electrical tests.

COIL CURRENT — The maximum continuous current rating of the coil appears on the relay nameplate. The current at which the relay is set to trip should not exceed this value except when an additional device protects the coil against sustained overcurrent. To avoid relay damage, **current** through the relay coil **must be interrupted** after the relay trips. Relay can carry rated continuous current in the non-tripped position only.

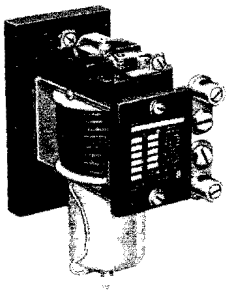
Max. Continuous Coil Current Amps.	Catalog Number [1]	AC Calibrations 1	2	3	4	5	DC Calibrations 1	2	3	4	5	Coils 600V Max. 60 Hz Max. Part No.
2	810-A01A	1.1	1.5	2.0	2.6	3.1	0.95	1.4	1.9	2.3	2.8	X-67400
3	A02A	1.6	2.3	3.0	3.8	4.5	1.4	2.1	2.9	3.5	4.3	X-67404
4	A03A	2.1	3.0	4.0	5.1	6.1	1.9	2.9	3.8	4.7	5.7	X-67407
6	A04A	3.2	4.5	6.0	7.6	9.1	2.8	4.3	5.7	7.0	8.5	X-67415
9	A05A	4.8	6.8	9.0	11.4	13.6	4.2	6.4	8.5	10.5	12.8	X-67420
12	A06A	6.3	9.0	12.0	15.2	18.1	5.7	8.5	11.4	14.0	17.0	X-67425
16	A07A	8.5	12.0	16.0	20.5	24.0	7.6	11.3	15.1	18.6	22.7	X-67429
20	A08A	10.5	15.0	20.0	25.5	30.0	9.4	14.1	18.9	23.2	28.3	X-67433
28	A09A	15	21	28	36	43	13	20	27	33	40	X-67439
40	A10A	21	30	40	51	61	19	29	38	47	57	X-67444
48	A11A	25	36	48	61	72	23	34	46	56	68	X-67454
56	A12A	30	42	56	72	85	27	40	54	66	80	X-67457
60	A13A	38	54	72	91	108	34	51	68	84	102	X-67461
72	810-A14A	38	54	72	91	108	34	51	68	84	102	X-86996
87	A15A	46	65	87	110	130	41	61	82	101	123	X-86999
100	A16A	53	75	100	126	150	47	71	94	116	141	X-87001
108	A17A	57	81	108	138	163	51	77	103	126	153	X-87002
120	A18A	68	97	130	165	195	61	92	123	151	184	X-67480
120	A19A	76	108	145	183	217	68	102	137	168	205	X-67479
130	810-A20A	68	97	130	165	195	61	92	123	151	184	X-88199
144	A21A	76	108	144	183	217	68	102	136	167	204	X-88198
162	A22A	85	121	162	205	244	76	115	153	188	229	X-88197
185	A23A	98	139	185	235	279	87	131	175	215	262	X-88196
210	A24A	114	162	216	274	325	102	153	204	250	305	X-88195
216	810-A25A	114	162	216	274	325	102	153	204	250	305	X-90713
259	A26A	136	194	259	328	390	122	184	245	300	367	X-90712
320	A27A	171	242	328	411	488	152	229	306	376	458	X-90711
320	A28A	227	323	432	547	650	203	305	405	502	612	X-90710

[1] Catalog numbers are for single relays in the open type construction, with NC contacts and an automatic reset. The calibration table also applies to catalog numbers beginning with the letter B, C, K, or L, and ending with the letter B, C, or D.

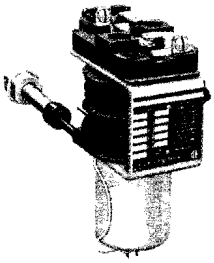
RENEWAL PARTS



Pedestal Mounted Relay



Steel Panel Mounted Relay



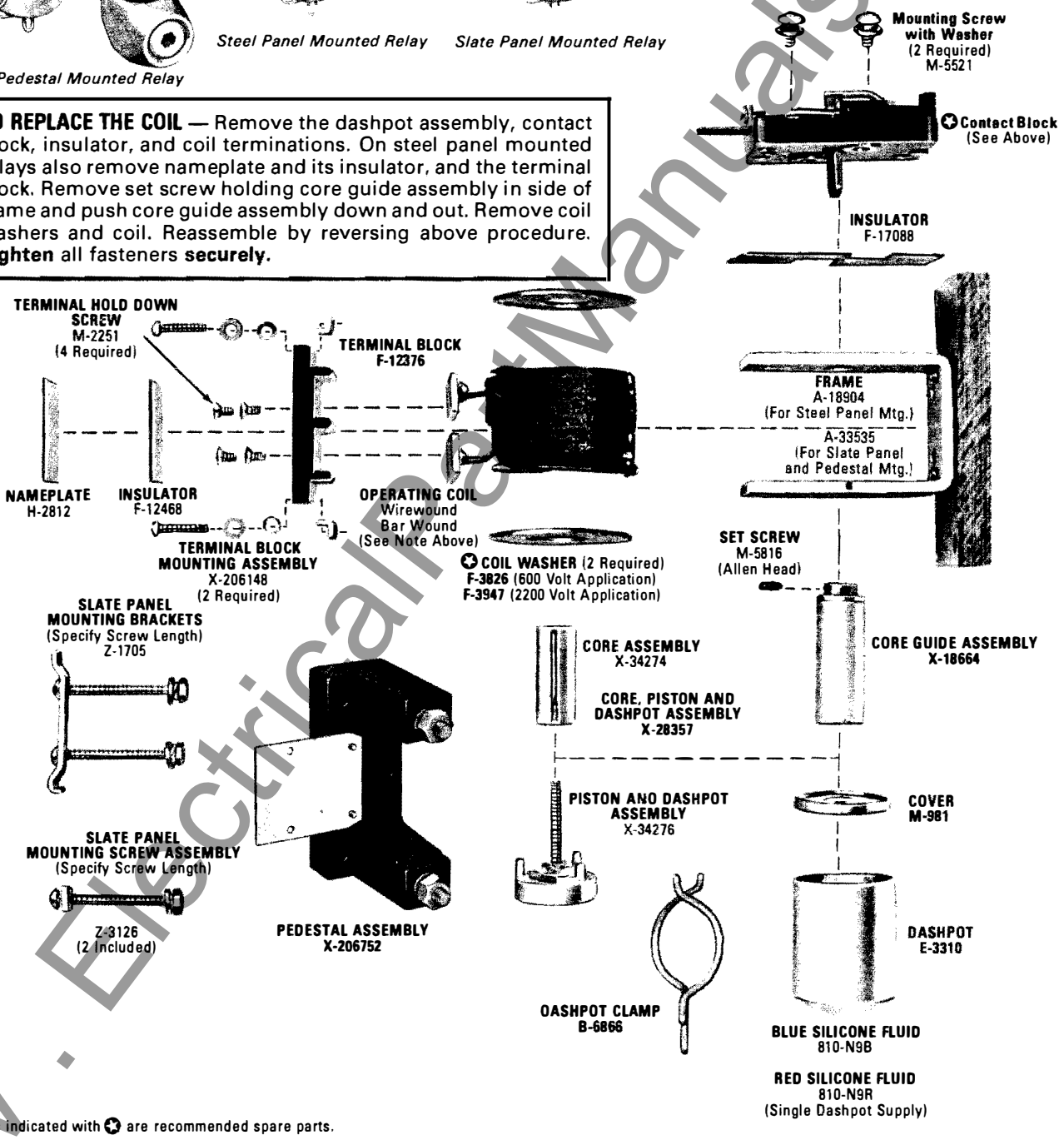
Slate Panel Mounted Relay

✪ **CONTACT BLOCK**
Z-11011 (NO Hand Reset)
Z-11012 (NC Hand Reset)
Z-11013 (NO Automatic Reset)
Z-11014 (NC Automatic Reset)
Z-15227 (NC Automatic Reset with Blowout Magnet)

Z-33833 (NO Hand Reset Bifurcated Contacts)
Z-33831 (NC Hand Reset Bifurcated Contacts)
Z-33834 (NO Automatic Reset Bifurcated Contacts)
Z-33832 (NC Automatic Reset Bifurcated Contacts)

NO — Normally Open
NC — Normally Closed

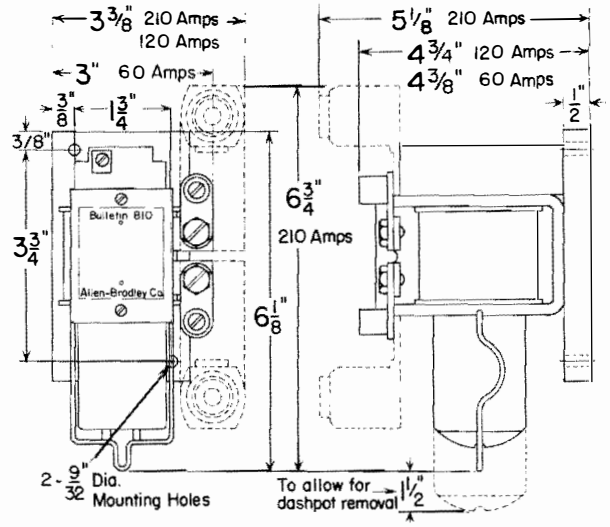
TO REPLACE THE COIL — Remove the dashpot assembly, contact block, insulator, and coil terminations. On steel panel mounted relays also remove nameplate and its insulator, and the terminal block. Remove set screw holding core guide assembly in side of frame and push core guide assembly down and out. Remove coil washers and coil. Reassemble by reversing above procedure. **Tighten** all fasteners **securely.**



Parts indicated with ✪ are recommended spare parts.

ORDERING INFORMATION — Your order cannot be entered unless the following information is given: Part number, description of part, catalog number and series letter of the relay. This instruction sheet applies also to the above relays when used on control apparatus listed under other Bulletin numbers.

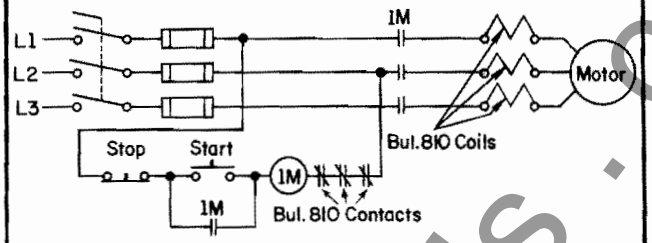
APPROXIMATE DIMENSIONS



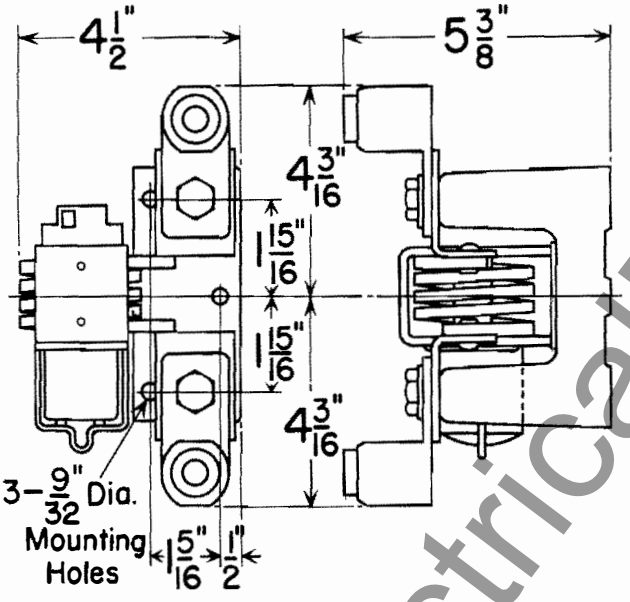
OPEN TYPE
Maximum Current thru 60, 120, and 210 Amp.

TYPICAL SCHEMATIC DIAGRAM

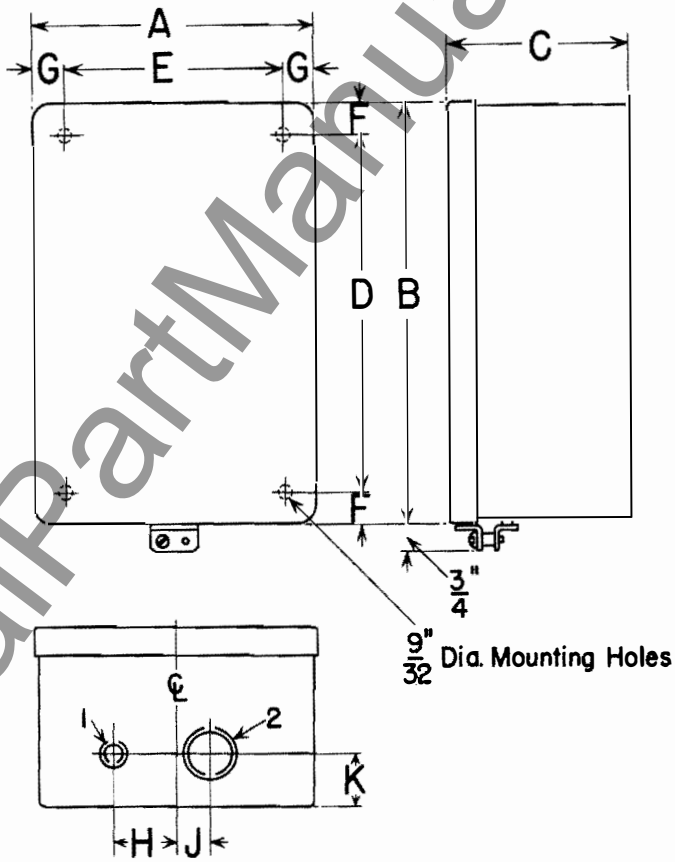
(See Applicable Codes and Laws)



Three Bulletin 810 relays used for overload protection.



OPEN TYPE
Maximum Current thru 320 Amp.

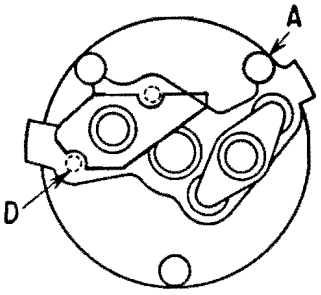


NEMA Type 1 Enclosure

Number of Relays	Maximum Continuous Current Amperes	NEMA Type 1 Enclosure — Dimensions in Inches										Conduit Sizes in Inches	
		A Wide	B High	C Deep	D	E	F	G	H	J	K	1 Top & Bottom	2 Top & Bottom
Single Relay	60	6⅜	11⅜	6⅛	9¼	4¼	1 1/16	1 1/16	1¼	⅞	2 1/16	½ & ¾	1 & 1¼
	120	6⅜	11⅜	6⅛	9¼	4¼	1 1/16	1 1/16	1¼	⅞	2 1/16	½ & ¾	1 & 1¼
	210	7⅜	16⅜	7¾	14¼	5¼	1 1/16	1 1/16	1¾	⅞	2	½ & ¾	1½ & 2
	320	9⅜	21⅜	7¾	19¼	7¼	1 1/16	1 1/16	1⅞	1⅛	2⅝	½ & ¾	2 & 2½
Two Relay Panel	60	9⅞	11⅜	6⅛	9¼	7¾	1 1/16	1 1/16	2	1¼	2 1/16	½ & ¾	1¼ & 1½
	120	9⅞	11⅜	6⅛	9¼	7¾	1 1/16	1 1/16	2	1¼	2 1/16	½ & ¾	1¼ & 1½
	210	10⅜	16⅜	7¾	14¼	8¼	1 1/16	1 1/16	2	1¼	2 5/16	½ & ¾	2 & 2½
	320	12⅞	21⅜	7¾	19¼	10¾	1 1/16	1 1/16	3	1¾	2 9/16	½ & ¾	2½ & 3

ALLEN-BRADLEY
Milwaukee, Wisconsin 53204

Instructions For
BULLETIN 810 OVERLOAD RELAYS



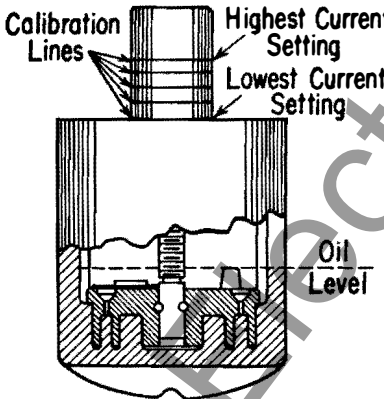
PISTON

1. When the relays are first installed, clean off all dirt and examine them carefully to see that they have not been damaged in transit.

2. **Remove the dashpot** by swinging spring clamp forward. The dashpot will come off as a unit.

3. **Remove the dashpot cover** by pulling on core. Three or four light taps with the piston should be sufficient.

4. **Fill the dashpot with silicone fluid,** using that furnished with the relays. This should be done with the dashpot removed from the relay and the cover off, but with the piston and core in place. The surface of the fluid should be level with the tops of the three round projections on top of the piston "A". The fluid must be free from dirt or grit, and the dashpot and piston **absolutely clean.**



DASHPOT

5. **To adjust the current setting** remove the dashpot. The lines on the core correspond with the ampere scale on the name plate. Screw the core until the line which corresponds to the desired ampere rating, as shown on the nameplate, is flush with the edge of the dashpot.

6. **To adjust time limit** remove piston from dashpot. The piston has two valve plates. One is diamond-shaped over an opening with steel balls. The other valve plate without steel balls is intended for the time limit adjustment. *Caution:—Do not move valve over opening containing the steel balls.*

To make relay act faster increase opening of valve "D"; which is without the steel balls. To retard the action decrease opening. The relays when shipped are set for minimum time limit.

Milwaukee ALLEN-BRADLEY CO. Wisconsin

FORM 810-01D