

# Instructions for Adjustable Voltage or Current, D.C. Type AV Relays

I.L. 15-827-11C

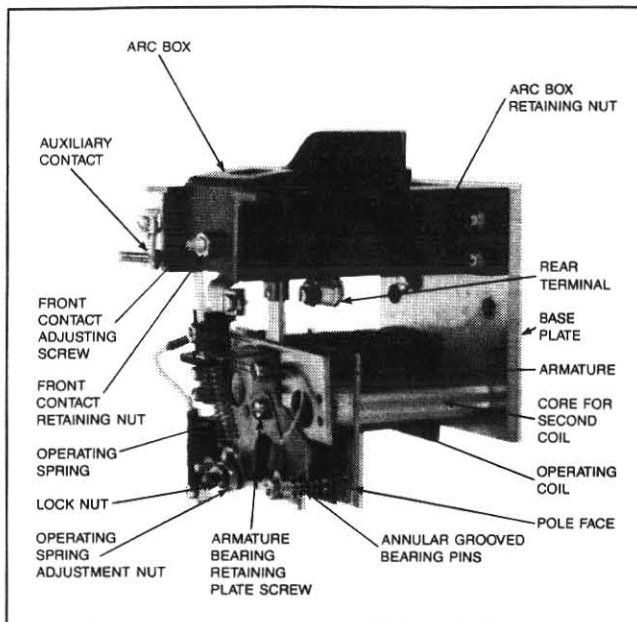


Fig. 1 Type AV Relay with One Auxiliary Contact

## THE RELAY

Type AV relays are for general use where it is desired to open or close electrical circuits after a relatively small change in current or voltage in the relay circuit. Applications are as a field accelerating relay, field fluttering relay, reverse current or adjustable voltage/current relay. The relays will respond to current or voltage changes as low as ten percent, depending upon the coil and the setting of the individual relay.

The DC ratings of the main and auxiliary contacts are shown in Table I. The arc is blown up when the rear contact is positive polarity. The main contact is a single-pole transfer type, solid or resilient-mounted. The auxiliary contacts may be normally-open or normally-closed, as desired.

The operating magnet is designed for direct current (DC) only. The operating coils are rated for continuous duty at the currents or voltages indicated in Table III. Type AV relays can operate with one or two coils. Two coils may be any combination of those shown in Table III, wired to have an additive effect (coils energized from different sources reinforcing each other), or a subtractive effect (coils energized from different sources creating opposing fields). The ampere-turn values shown in Table II are net sums of both coils selected and connected to be either additive or subtractive.

## INSTALLATION

This industrial type control is designed to be installed, operated, and maintained by adequately trained work-

TABLE I — INTERRUPTING RATING — D.C.			
RELAY CONSTRUCTION	With Blowout Magnets Installed		
RELAY APPLICATION	Volts DC	Arc Blown Up*	Arc Blown Down
	230	5A	3A
	600	2A	1A
	230	10A	6A
	600	4A	2A
	230	5A	1A
	600	2A	.4A
INTERRUPTING RATING — AUXILIARY CONTACTS (Direct Current)			
230 Volts — .5 Amp.		600 Volts — .15 Amp.	

\*Rear contact positive

men. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

## MOUNTING

The relay may be directly mounted on insulating panels or on metal panels with the stand-off insulators furnished, using the two mounting holes in the base plate. The relay must be mounted in a vertical position with the arc box at the top. Outline and mounting dimensions are shown in Figure 2. Adequate electrical clearance must be maintained from the base in all directions since the metal base is a live part, at the potential of the main moving contact.

## OPERATION

The armature is supported by a bearing plate resting on two annular grooved pins which provide a knife-edge bearing and armature air gap (gap between armature and pole faces) adjustment. The operating spring is arranged so that the spring force is varied by turning the adjustment nut.

The arc box is adjustable so that it may be moved to conform to the armature adjustment. The front contact may be adjusted to provide a contact gap of  $\frac{1}{16}$ " to  $\frac{5}{16}$ ".

TABLE II — OPERATING CHARACTERISTICS VERSUS SETTINGS

Gap Between Armature and Pole Face		MAIN NORMALLY-OPEN CONTACT GAP (Inches)										ADJUSTING SCREW TURNS*
		1/16		1/8		3/16		1/4		5/16		
		Pick-up Ampere-Turns	Drop-out Ampere-Turns	Pick-up Ampere-Turns	Drop-out Ampere-Turns	Pick-up Ampere-Turns	Drop-out Ampere-Turns	Pick-up Ampere-Turns	Drop-out Ampere-Turns	Pick-up Ampere-Turns	Drop-out Ampere-Turns	
Groove No.	(in.)											
1	1/16	150-380	100-275	150-450	100-275	150-500	100-275	160-550	100-275	170-600	100-275	35-0
2	3/16	225-725	200-640	250-800	200-640	260-825	200-640	270-880	200-640	280-920	200-640	30-0
3	5/16	340-1000	300-900	350-1070	300-900	360-1100	300-900	370-1150	300-900	370-1220	300-900	26-0
4	7/16	550-1380	520-1250	560-1450	520-1250	570-1550	520-1250	580-1650	520-1250	600-1750	520-1250	20-0
5	9/16	660-1800	600-1600	670-1900	600-1600	680-2000	600-1600	690-2200	600-1600	710-2400	600-1600	17-0

\*Nut on adjusting screw is flush with end of screw at 0-turns (zero) setting. Adjusting nut may be hexagonal nut (1/2" across flats) as shown in Figure 1. The zero turns setting is related to the higher value of ampere-turns in all cases. One turn equals 1/32". The fewer adjusting nut turns used, the more stable the armature will be.



### OPERATION (cont.)

When the specified number of ampere-turns is created by current through one or two coils, the relay will pickup and close the normally-open contact. These pickup values are shown in Table II and are a function of (1) the armature gap as determined by the groove in which the bearing plate is placed, (2) the open contact gap, and (3) the operating-spring adjustment-nut setting.

All versions of the Type AV relay should include permanent magnets in the arc box to assure the interrupting rating. When installed, the permanent magnets are visible from the underside of the arc box. The ratings shown in Table I vary with the contact on which the arc

is blown upward. For a normally-open main pole the arc is blown upward when the rear stationary contact is positive.

### ADJUSTMENT

To adjust the relay to pick-up and drop-out at given current or voltage values, proceed as follows:

1. Select the coil or coil combinations which will produce the pick-up and drop-out ampere turn values for the application. (See Table III.)
2. Consult Table II to determine the armature gap and contact gap values that give an operating range that

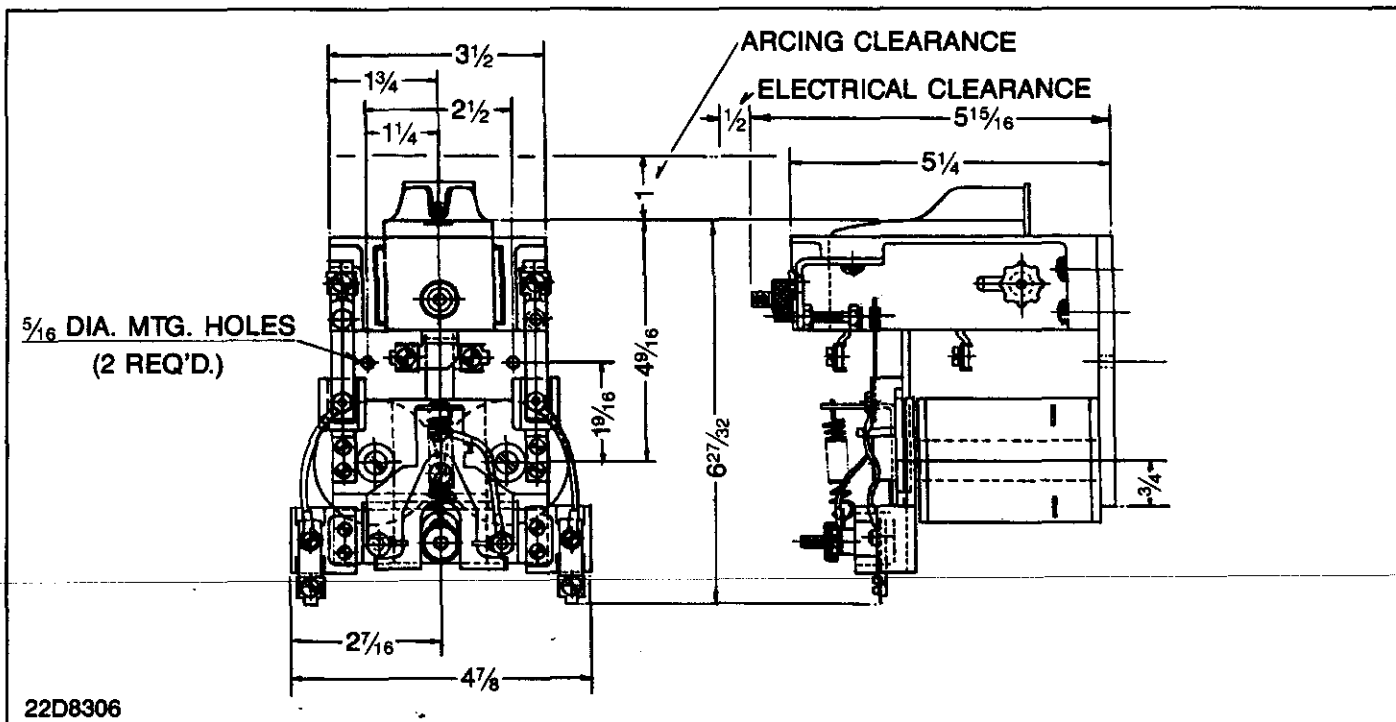


Fig. 2 Outline and Mounting Dimensions (Dimensions in inches)

TABLE III — OPERATING COILS

VOLTAGE COILS (Allow for a decrease in ampere-turns as the coil resistance increases with temperature in continuous duty service)					
Continuous Rating	Coil Resistance at 25°C (Ohms)	Coil Part Number	Coil Turns	Ampere-turns at Rated Voltage	Coil Construction
600 VDC	30400	3450D52G18	81000	1600	Wire-wound
400 VDC	13150	3450D52G31	55000	1675	Wire-wound
310 VDC	8460	3450D52G01	46500	1700	Wire-wound
250 VDC	5430	3450D52G27	37000	1700	Wire-wound
230 VDC	5030	3450D52G02	35000	1600	Wire-wound
150 VDC	2080	3450D52G03	23000	1660	Wire-wound
125 VDC	1325	3450D52G04	18300	1725	Wire-wound
62.5 VDC	350	3450D52G05	9300	1660	Wire-wound
50 VDC	215	3450D52G11	7400	1720	Wire-wound
40 VDC	135	3450D52G12	5900	1750	Wire-wound
30 VDC	83	3450D52G33	4600	1665	Wire-wound

CURRENT COILS				
Continuous Rating	Coil Turns	Coil Part Number	Ampere-turns at Rated Current	Coil Construction
.72 Amp.	2500	3450D52G07	1800	Wire-wound
.90 Amp.	2000	3450D52G08	1800	Wire-wound
1.14 Amp.	1600	3450D52G35	1824	Wire-wound
1.44 Amp.	1250	3450D52G09	1800	Wire-wound
1.56 Amp.	1150	3450D52G10	1794	Wire-wound
2.10 Amp.	860	L548844G01	1806	Wire-wound
2.50 Amp.	770	L548823G01	1925	Wire-wound
2.70 Amp.	650	L548824G01	1755	Wire-wound
3.30 Amp.	540	L548845G01	1782	Wire-wound
3.80 Amp.	480	L548825G01	1824	Wire-wound
4.50 Amp.	390	L548846G01	1755	Wire-wound
5.70 Amp.	308	L548826G01	1755	Wire-wound
6.30 Amp.	280	L548847G01	1764	Wire-wound
8.70 Amp.	210	L548827G01	1827	Wire-wound
10.2 Amp.	176	L548848G01	1795	Wire-wound
12.9 Amp.	140	L548828G01	1806	Wire-wound
16.2 Amp.	112	L548849G01	1814	Wire-wound
18.0 Amp.	100	L548829G01	1800	Wire-wound
21.0 Amp.	88	L548830G01	1848	Wire-wound
26.0 Amp.	56	L548831G01	1456	Strap-wound
27.0 Amp.	66	L548850G01	1782	Wire-wound
41.0 Amp.	36	L548832G01	1476	Wire-wound
49.0 Amp.	30	L548833G01	1470	Wire-wound
58.0 Amp.	26	L548834G01	1508	Wire-wound
78.0 Amp.	20	L548835G01	1560	Wire-wound
90.0 Amp.	18	14C6520G01	1620	Strap-wound
107 Amp.	14	14C6519G01	1498	Strap-wound
125 Amp.	12	14C6518G01	1500	Strap-wound
150 Amp.	10	14C6517G01	1500	Strap-wound
188 Amp.	8	14C6516G01	1504	Strap-wound
250 Amp.	6	14C6515G01	1500	Strap-wound
300 Amp.	5	14C6514G01	1500	Strap-wound
375 Amp.	4	14C6513G01	1500	Strap-wound
500 Amp.	3	14C6512G01	1500	Strap-wound
750 Amp.	2	14C6511G01	1500	Strap-wound
850 Amp.	1	14C6510G01	750	Strap-wound

**ADJUSTMENT (cont.)**

brackets the net ampere-turn value for pick-up to be used. Note that the range of drop-out ampere-turn values remains constant for each contact gap. Use a  $\frac{3}{16}$  or  $\frac{1}{4}$ " contact gap if it provides satisfactory operating characteristics.

3. Loosen the screw securing the armature bearing retaining plate and place the armature bearing plate in the annular grooves in the bearing pins at the selected

armature gap. Tighten the retaining plate screw.

4. Holding the armature in the closed (main contact held closed) position, adjust the arc box so that the armature plate is parallel to the pole faces. Tighten the arc box retaining nut with the fingers; do not use tools to tighten this nut.

5. Loosen the front contact retaining nut and adjust the front contact to obtain the contact gap desired. A gauge, inserted from the under side of the arc box

## ADJUSTMENT (cont.)

between the contacts, expedites this adjustment. Tighten the contact retaining nut.

6. With the net value of ampere-turns for pick-up applied to the relay, turn the nut on the operating spring adjusting screw to obtain pick-up. Check for satisfactory drop-out performance.

7. Check to see that the moving contact is centrally located in and does not rub against the sides of the arc box.

8. Tighten the lock nuts on the operating spring adjusting screw and the front contact adjusting screw.

## AUXILIARY CONTACTS

Each Type AV Relay can operate two auxiliary contacts in any combination of normally-open or normally-closed poles except those relays having two strap-wound coils connected in series. These latter can accommodate only one. When using only one auxiliary contact, mount it on the left hand side as shown in Figure 1. See Figure 3 for proper assembly of an auxiliary contact. Replacement or additional auxiliary contacts can be ordered as **Part Number 417C434G05**. This collection of loose parts can be assembled as either a normally-open or normally-closed auxiliary contact. Install the movable contact with respect to the stationary contact such that the two silver contacts meet. See Figure 3.

## MAINTENANCE

Failure of the armature to close may be caused by an open coil circuit, a power failure, mechanical interference or improper adjustment of the relay for the operating ampere-turns applied to the coils. The operating spring specified must be used with this relay.

## CONTACT INSPECTION OR REPLACEMENT

To inspect or replace the main contacts first remove the one-piece molded arc box by unscrewing the single screw at the top center of the arc box and rotating the arc box away from the metal piece to disengage it from two roll pins. Be alert to the lock nut behind the metal piece to which the arc box is attached, and to the orientation of the permanent magnets which serve as blowouts. The latter are held in place by magnetic action only and their orientation is critical to proper blowout action.

When needed, order a replacement arc box complete with both stationary contacts by **Part Number 55B5549G01**.

When needed, order a replacement movable main

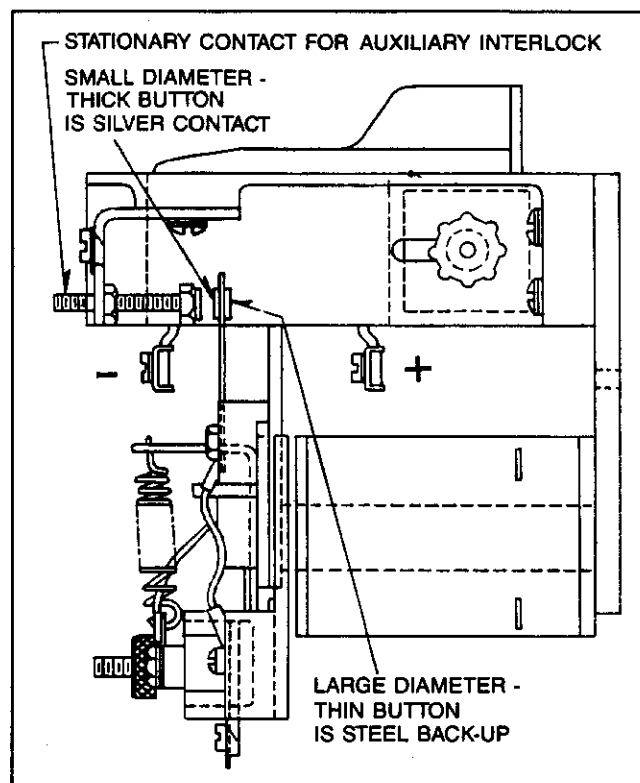


Fig. 3 Type AV Relay with Auxiliary Contact Assembled for Normally-closed Position

contact by **Part Number 416C814G02** (resilient-mounted contact) or **Part Number 22D7726G01** (solid contact). To replace the main movable contact, first unhook the operating spring from the bearing bracket. Remove the two pan-head screws in the center of the armature plate. This frees the movable contact. Reassemble the new contact, making sure the upper end is centrally located in the arc box before finally tightening the screws.

## COIL REPLACEMENT

In order to replace one or two coils, remove the two pole-face mounting screws by inserting a screwdriver through the two holes provided in the armature plate. This permits removal of the pole face, bearings, armature, and moving contact assembly as a unit, without affecting any of the adjustments.

Remove and replace the coils; then reassemble the armature unit, making sure that the pole-face screws are securely tightened. Check to see that the moving contact is centrally located in and does not rub against the sides of the arc box.