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Supersedes I.L. 41-759K, dated June 1985
(|) Denotes Change Since Previous Issue

Type AR

Auxiliary Relay

High Speed



Before putting protective relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment. Make sure that all moving parts operate freely. Inspect the contacts to see that they are clean and can close properly. Operate the relay to check the settings and electrical connections.

1.0 APPLICATION

The AR relay is a four-pole auxiliary type relay, especially designed for ultra high speed circuit breaker tripping duty in protective relaying systems. The AR relay is well suited for bus arrangements where more than one breaker must be tripped. It can provide isolation as well as high speed tripping. The AR relay may also be applied to provide isolation of primary and back-up relaying, and provide high speed tripping for zone 1 faults.

However, when the AR relay is energized by the thyristor trip circuit of the SDG, SKD, SRU, SBFU, STU-91, or STU-92 relays a 22 ohm resistor or its equivalent must be added in parallel with the AR coil. Without this resistor, it is possible that when dc voltage is suddenly applied to the relay, sufficient current will flow through the series RC circuit paralleling the tripping thyristor to cause the 10-watt AR relay to pickup.

AR relays are available with time delayed dropouts of 0.1 seconds (6 cycles 60 hertz base) or 0.2 seconds (12 cycles 60 hertz base).

The AR relay has a high seismic fragility rating.

2.0 CONSTRUCTION AND OPERATION

2.1 AR UNIT

The relay consists of four stationary contact screws, four leaf spring moving contacts, a moving armature and card assembly, which operates the moving contacts; a U-shaped laminated core, a coil, a frame, a molded insulation block and a series resistor. Refer to Figures 1 and 2, page 5.

The armature and card assembly slip over a hinge pin which is inserted in the laminations. The moving and stationary contacts are mounted on the molded insulation block. The molded block and coil and lamination assembly are mounted to the frame. All contacts are fine silver.

When the coil and resistor are energized, the armature is attracted to the laminations. The card moves with the armature thereby operating the moving contacts. The tension of the moving contacts is the resetting force.

High speed operation is obtained by the low inertia of the moving parts, a sensitive electromagnet, and the proper L/R ratio of the operating circuit.

The AR unit used for a time delay dropout is similar to the one described above. The series resistor in the above is replaced by a resistor and capacitor combination shunting the AR coil.

2.2 OPERATION INDICATOR (OI) (When used)

The dc indicating contactor switch is a small operated clapper type device. A magnetic armature is attracted to the magnetic core upon energization of the switch. During this operation, two fingers on the armature deflect a spring located on the front of the switch, which allows the operation indicator target to drop.

All possible contingencies which may arise during installation, operation or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding this particular installation, operation or maintenance of this equipment, the local ABB representative should be contacted.

The target is reset from the outside of the case by a push-rod located at the bottom of the cover.

The front spring, in addition to holding the target, provides restraint for the armature and thus controls the pickup value of the switch.

3.0 CHARACTERISTICS

The AR unit without a series resistor has a sensitivity of 500 milliwatts. By the proper combination of the AR unit and a series resistor, an optimum speed of 2 milliseconds can be obtained for an energy input of 10 watts.

Typical operating times and effective contact bounce are outlined in the Tables 1 and 2.

All relays are capable of being energized continuously. All high speed relays will pick up at 80% of rated voltage or less; and drop out at 5% of rated voltage or higher.

Relays with delayed dropout are available with a minimum dropout time of 0.1 second and also available with a minimum dropout time of 0.2 seconds.

3.1 CONTACT RATING (Table 3)

Each relay contact is rated 3 amps continuous and 30 amps long enough to trip a breaker.

Table 1:

Operate and Reset Times			
Rated Operating † Energy (Watts)	Operate Time (Milliseconds)		Reset Time (Milliseconds)
	No Contact Closes	NC Contact Opens	NC Contact Closes
10	2.0	1.5	4.0
2.25	3.5	2.5	3.5

† 2.25 W AR is a different style than the 10W AR

Table 2:

Contact Bounce		
Contact Loading	Effective Bounce Time in Milliseconds	
	Normally Open	Normally Closed
Dry Circuit	2	6 - 8
10 Watt (One AR Relay)	1	--
Breaker Trip Coil	.2	--

Table 3:

Contact Rating					
Contact Circuit Volts dc	Interrupting Rating (Amps)				Carry Rating (Amps)
	Resistive		Inductive L/R = .005		Continuous
	Single	Double	Single	Double	
48	3.750	20.0	1.750	20.0	3
125	0.500	1.7	0.350	1.2	3
250	0.250	0.5	0.150	0.250	3

4.0 SETTINGS

4.1 AR UNIT

No settings are required.

4.2 OPERATION INDICATORS (OI)

The only setting required on the OI is the selection of the 0.2 or 2.0 ampere tap setting. This selection is made by connecting the lead located in front of the tap block to the desired setting by means of the connecting screw.

5.0 INSTALLATION

The relays should be mounted on switchboard panels or their equivalent in a location free from dirt, moisture, excessive vibration, and heat. Mount the relay vertically by means of the four mounting holes on the flange for a semi-flush mounting or by means of the rear mountings stud or studs for projection mounting. Either a mounting stud or the mounting screws may be utilized for grounding the relay. The electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal studs furnished with the relay for thick panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detailed FT case information refer to I.L. 41-076.

6.0 ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of this relay have been made at the factory and should not require readjustment after receipt by the customer. If the adjustments have been changed or the relay taken apart for repairs, the calibration instructions below should be followed.

6.1 ACCEPTANCE CHECK

The following check is recommended to insure that the relay is in proper working order.

Contact Gaps

- Normally open contacts should have a gap of .018 to .023 inch.
- Normally closed contact gap should be .013 minimum.

Contact Pressure

- On four normally open contact relays, the normally open contacts should have approximately 4 grams pressure on the card in the de-energized position, and 15 to 30 grams contact pressure in the energized position.
- On relays with two normally open and two normally closed contacts, the normally closed contacts should have approximately 15 grams contact pressure in the de-energized position.

Each normally open contact spring should have approximately 8 grams pressure against the card.

NOTE: For this check to be made accurately, it is necessary to back out the NC stationary contact screw. This will disturb the factory calibration and therefore it is recommended this check not be made on a relay which passes all other checks.

Armature Gap

The armature gap should be approximately .009 inches measured at the narrowest part of the armature gap.

Contact Operate Time

Per Table 1.

Operation Indicator (OI)

Close the main relay contacts and pass sufficient dc current through the circuit to drop the OI. This value of current should be not greater than the particular OI tap setting being used. The operation indicator target should drop freely.

6.2 SPECIAL AR RELAY WITH TIME DELAY DROPOUT

Connect the relay as shown in Figure 16 page 12. When the AR coil has been energized for 25-35 milliseconds its dropout time should be a minimum of 100 milliseconds. The AR relay should be adjusted such that its contact break time is 25-35 milliseconds. Also the timer should be of the type which may be started and stopped by break contacts.

6.3 AR RELAYS WITH TIME DELAY DROPOUT

Connect the relay as shown in Figure 17 page 13. When the AR coil has been energized approximately 3 cycles, (40 millisecond or longer) the dropout time

should be a minimum of 100 milliseconds or the dropout time should be a minimum of 200 milliseconds depending upon the relay style.

7.0 CALIBRATION

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs or the adjustments disturbed. This procedure should not be used until it is apparent that the relay is not in proper working order. (See "Acceptance Check", page 3)

7.1 TRIPPING RELAY (AR)

The type AR tripping relay unit has been properly adjusted at the factory to insure correct operation, and under normal field conditions should not require readjustment. If, however, the adjustments are disturbed in error, or it becomes necessary to replace some part, use the following adjustment procedure. This procedure should not be used until it is apparent that the relay is not in proper working order.

- a. Adjust the set screw at the rear of the top of the frame to obtain a 0.009-inch gap at the rear end of the armature air gap.
- b. On the four normally open contact relay adjust each contact spring to obtain 4 grams pressure at the very end of the spring. This pressure should be sufficient to move the spring away from the edge of the slot of the card.

On the two normally open two normally closed contact relay, adjust each normally

open contact spring for 8 grams to just move the contact away from the card. Adjust the normally closed contact for 15 grams spring pressure, to just move contact spring away from the card. Then adjust the stationary contact to just move the contact spring away from the card. ***For this check to be made accurately, it is necessary to back out the NC stationary contact screw. This will disturb the factory calibration and therefore it is recommended this check not be made on a relay which passes all other checks.***

- c. Adjust each normally open stationary contact screw to obtain a contact gap of 0.020 to 0.022 inches. Energize the relay and the normally open contacts should have 15 to 30 grams contact pressure. The normally closed, if any, should have a contact gap of .015 inches.

When calibrated as outlined above, the relay should meet the characteristics of Tables 1 and 2.

8.0 RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

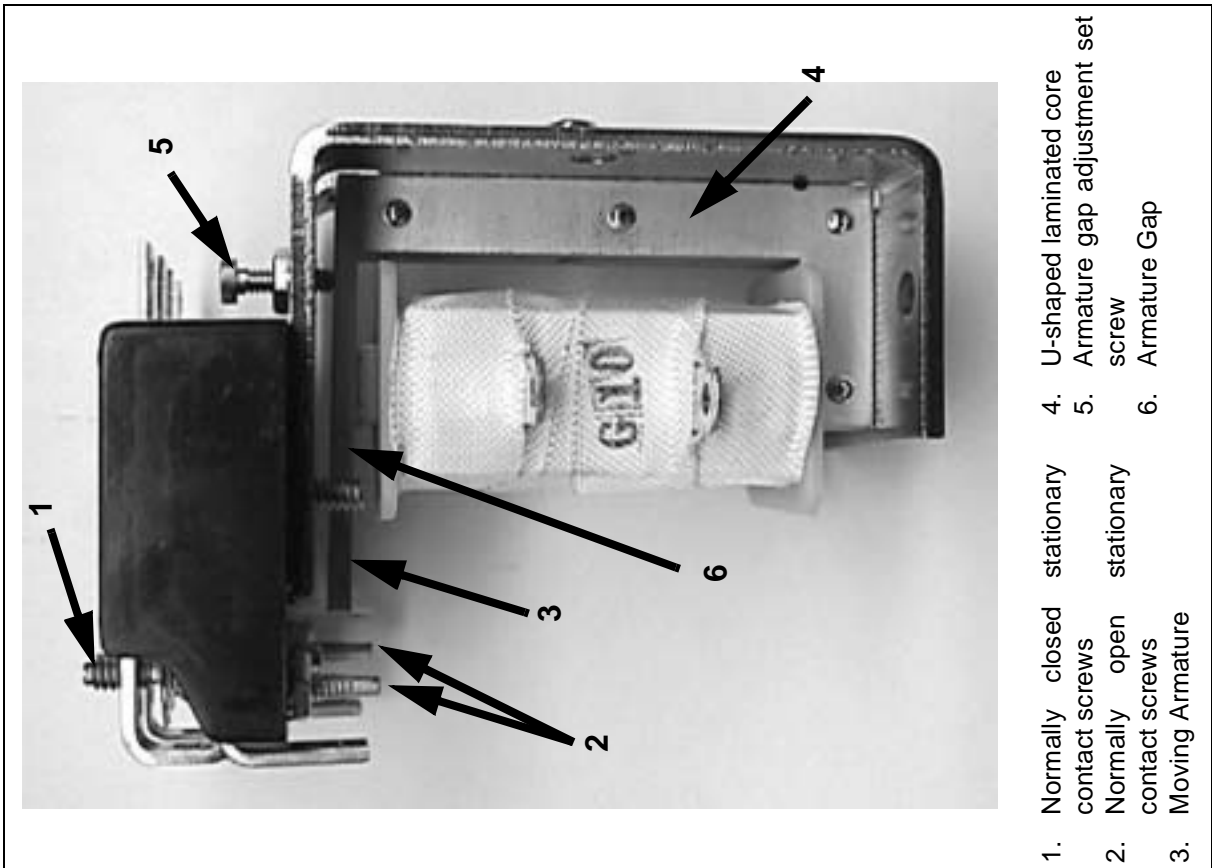


Figure 2. Type AR Unit with 2 Break Contacts (Side View).

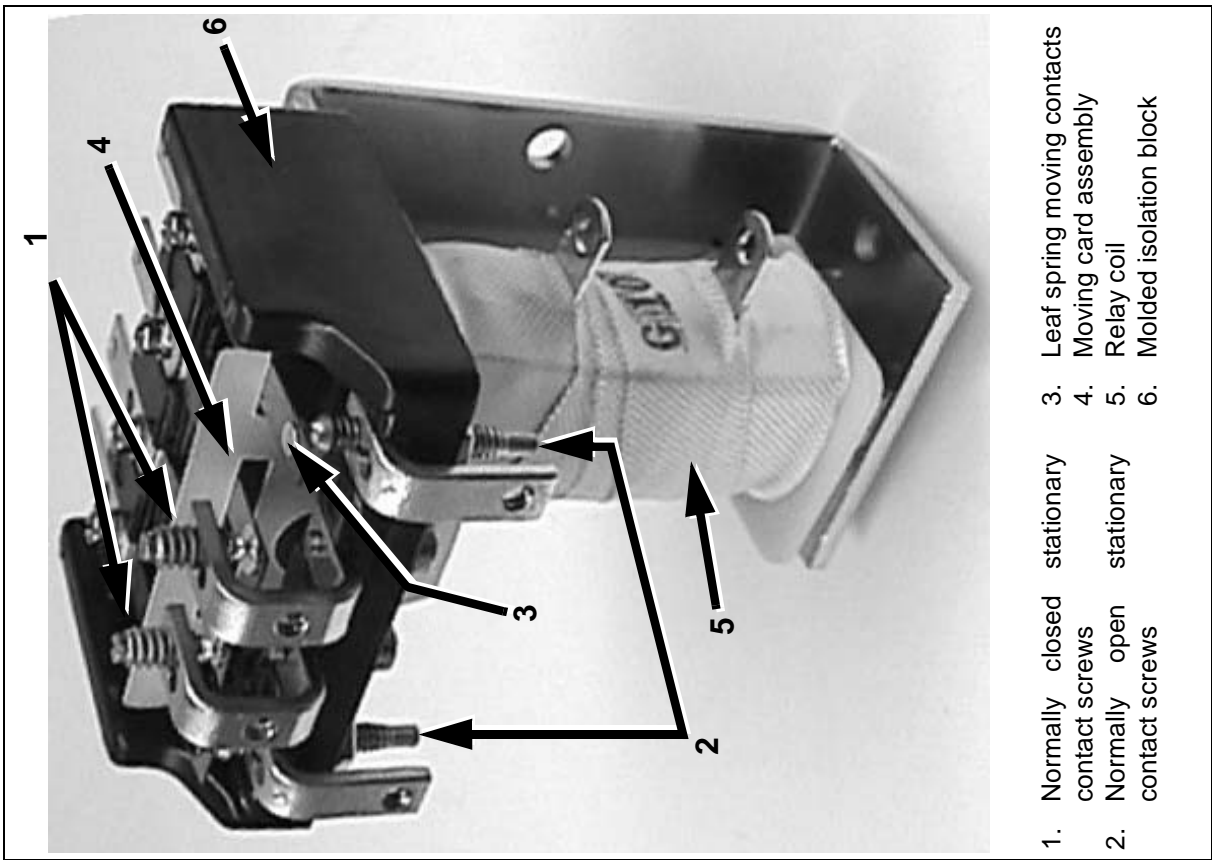


Figure 1. Type AR Unit with 2 Break Contacts (Front View).

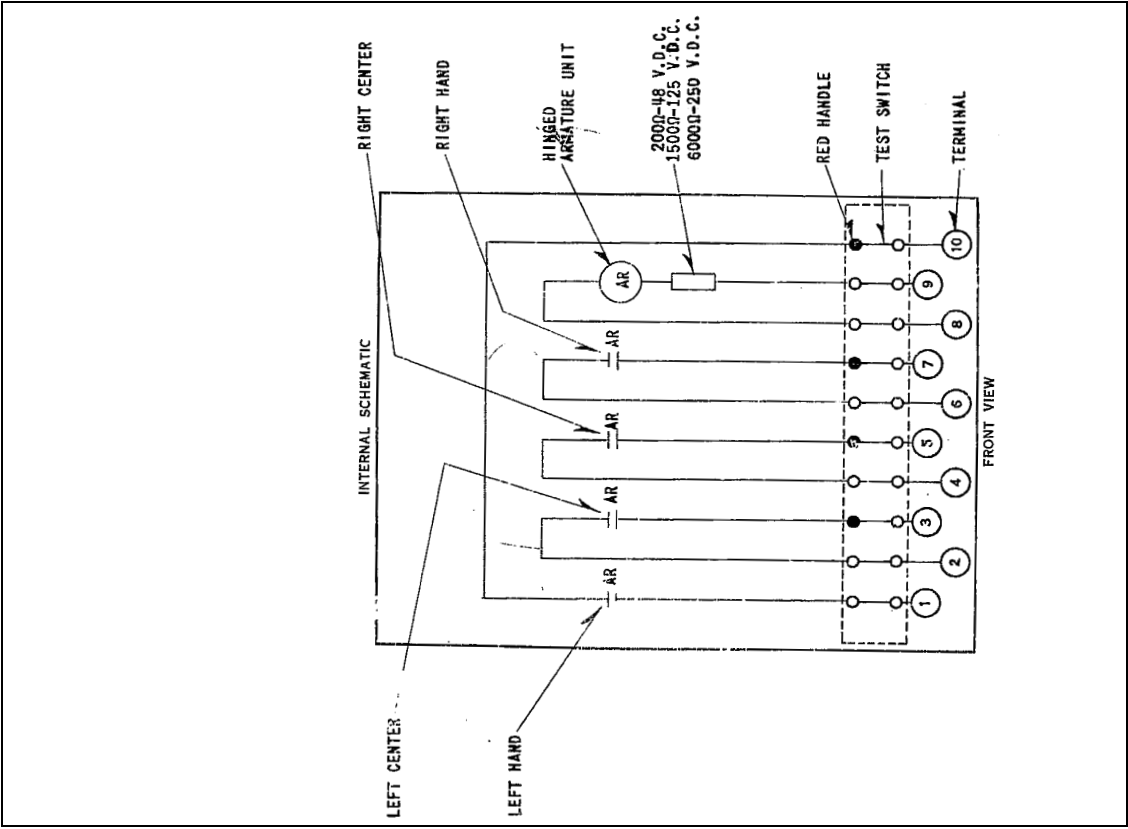


Figure 3. Internal Schematic of the Type AR Relay with 4 Make Contacts in FT-11 Case.

Sub 4
629A496

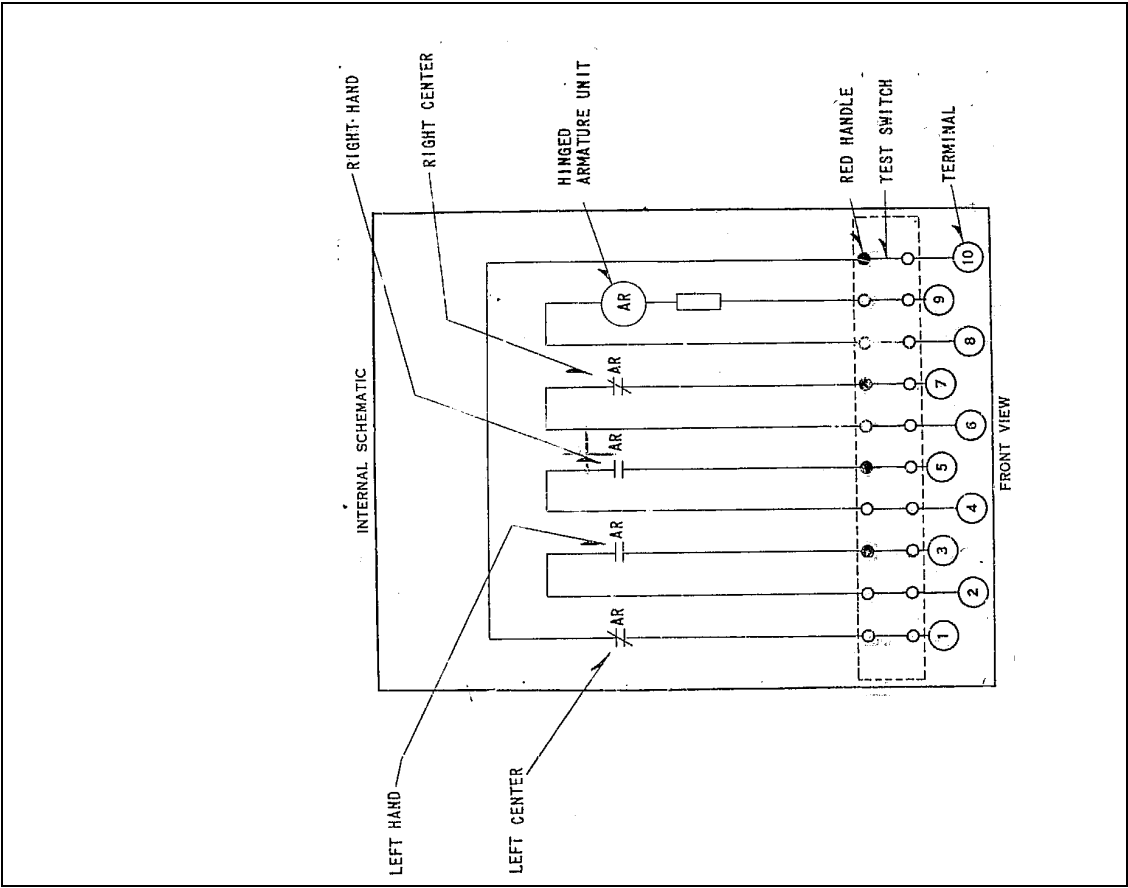
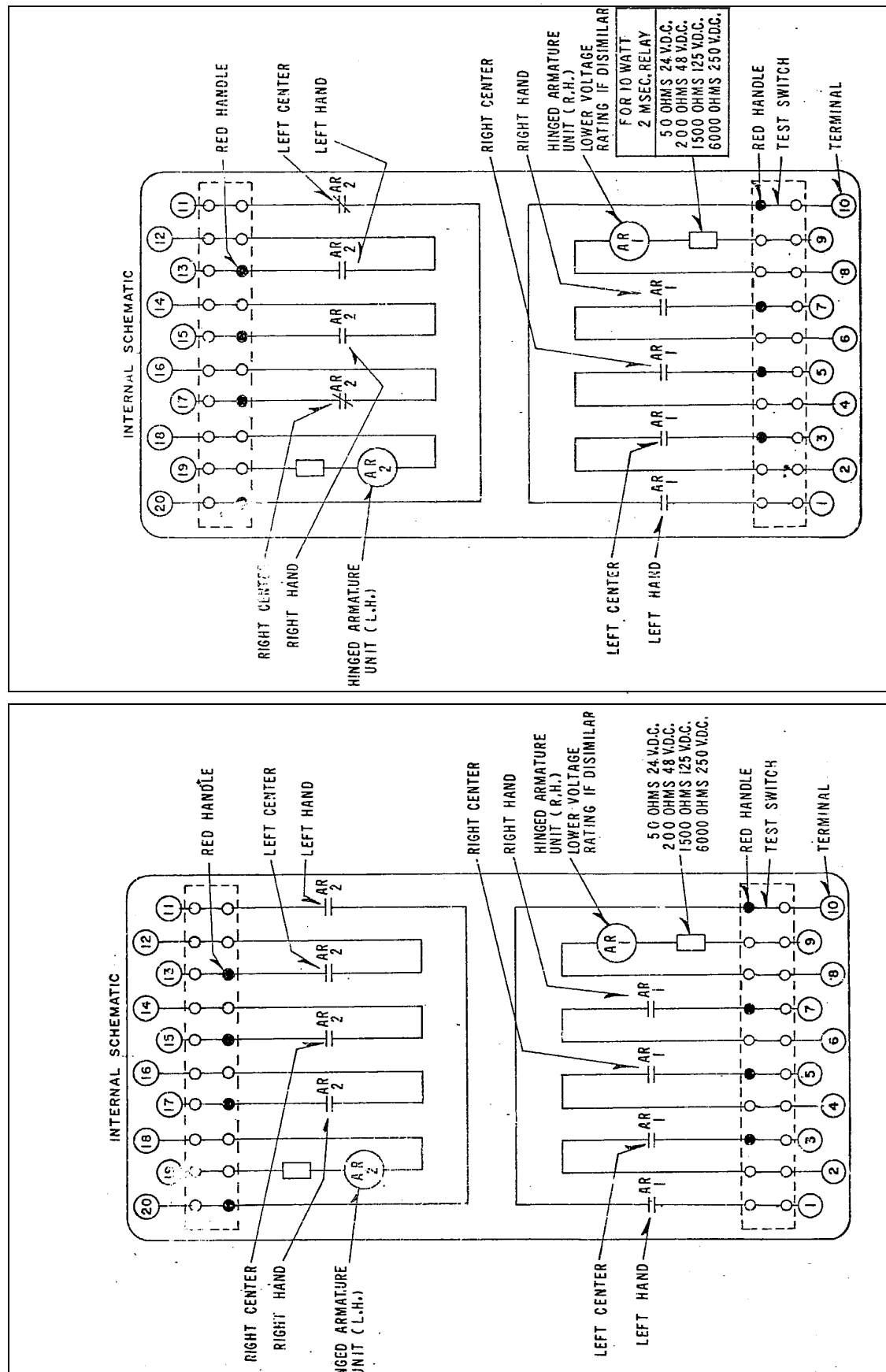


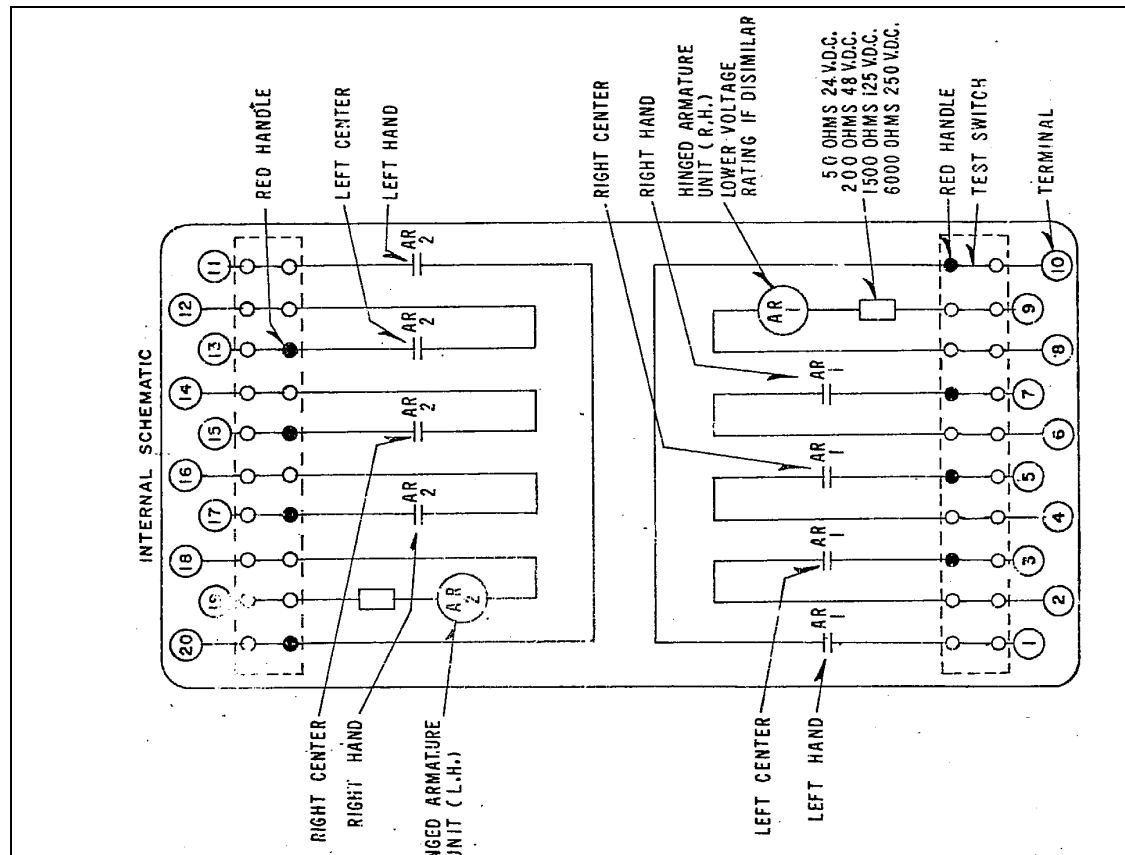
Figure 4. Internal Schematic of the Type AR Relay with 2 Make - 2 Break Contacts in FT-11 Case.

Sub 2
837A113



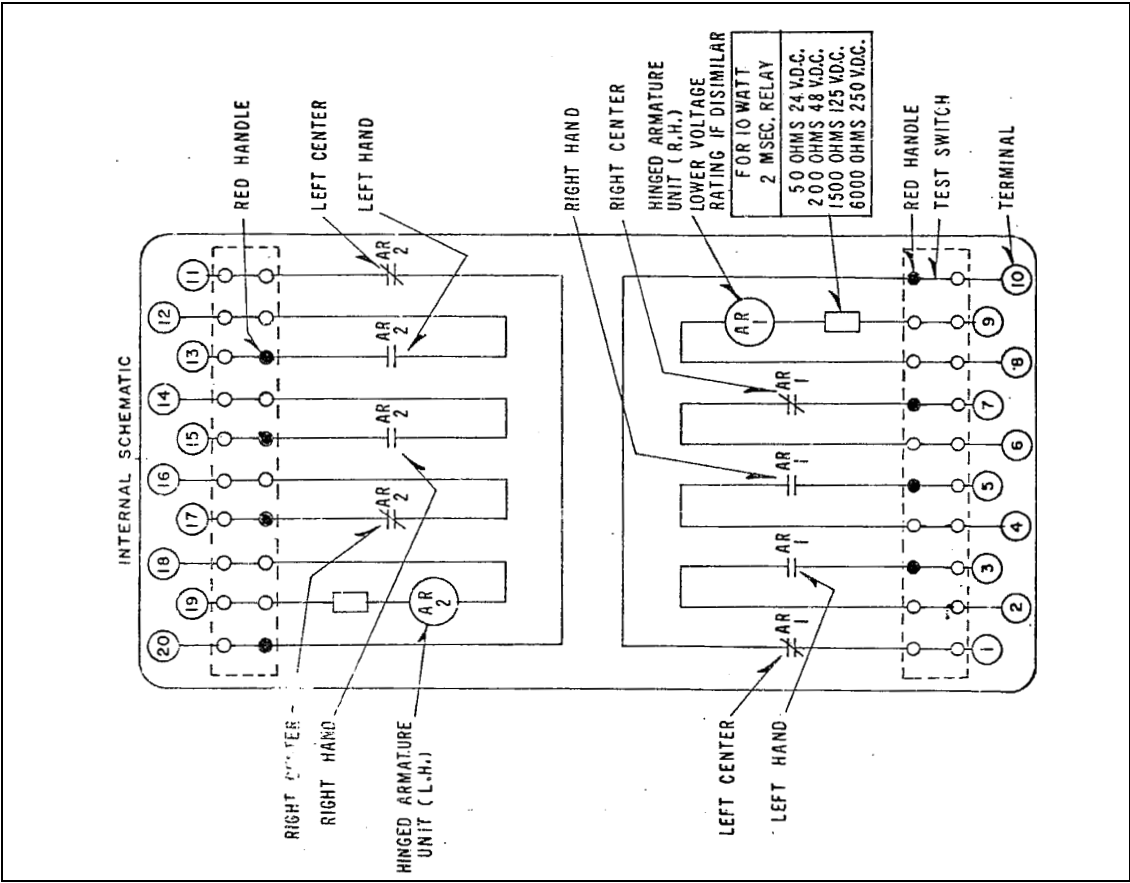
Sub 2
762A529

Figure 6. Internal Schematic of the Type AR Relay in Ft-22 Case, Double Unit, with 6 Make - 2 Break Contacts.



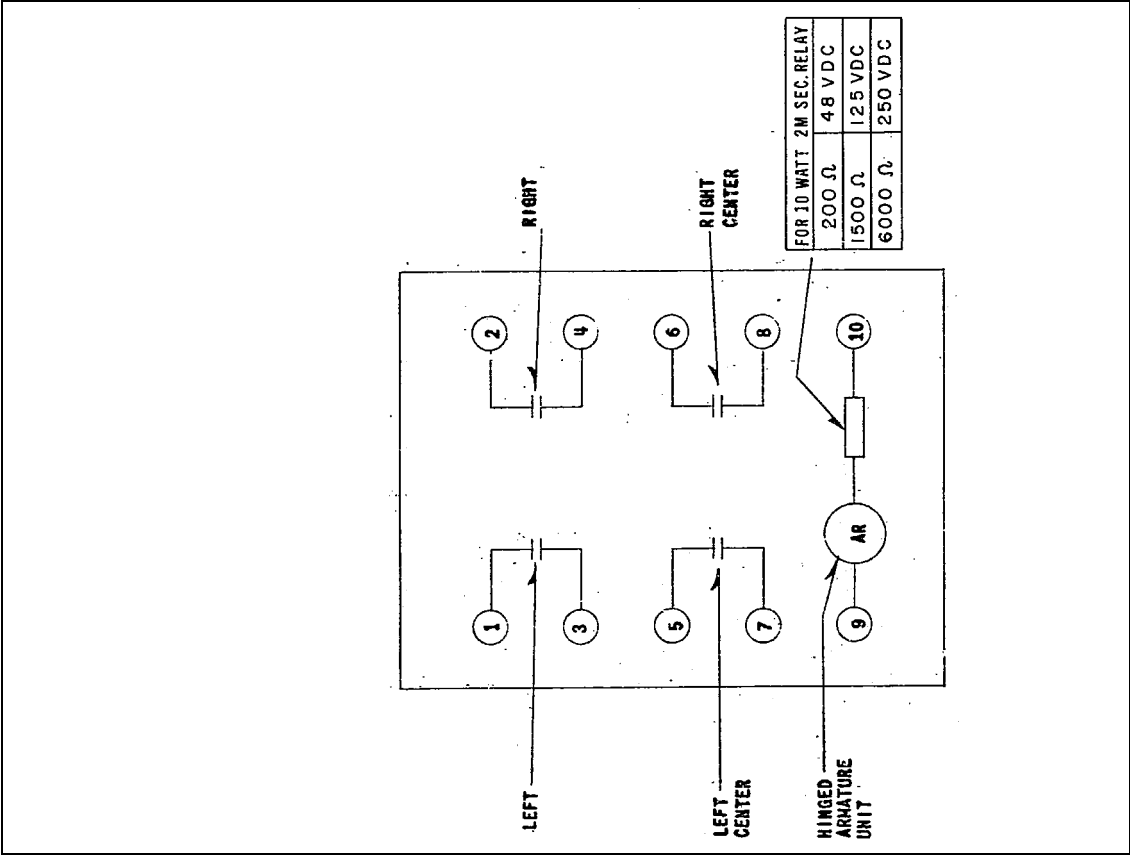
*Sub 5
629A495

Figure 5. Internal Schematic of the Type AR Relay in FT-22 Case, Double Unit, with 8 Make Contacts.



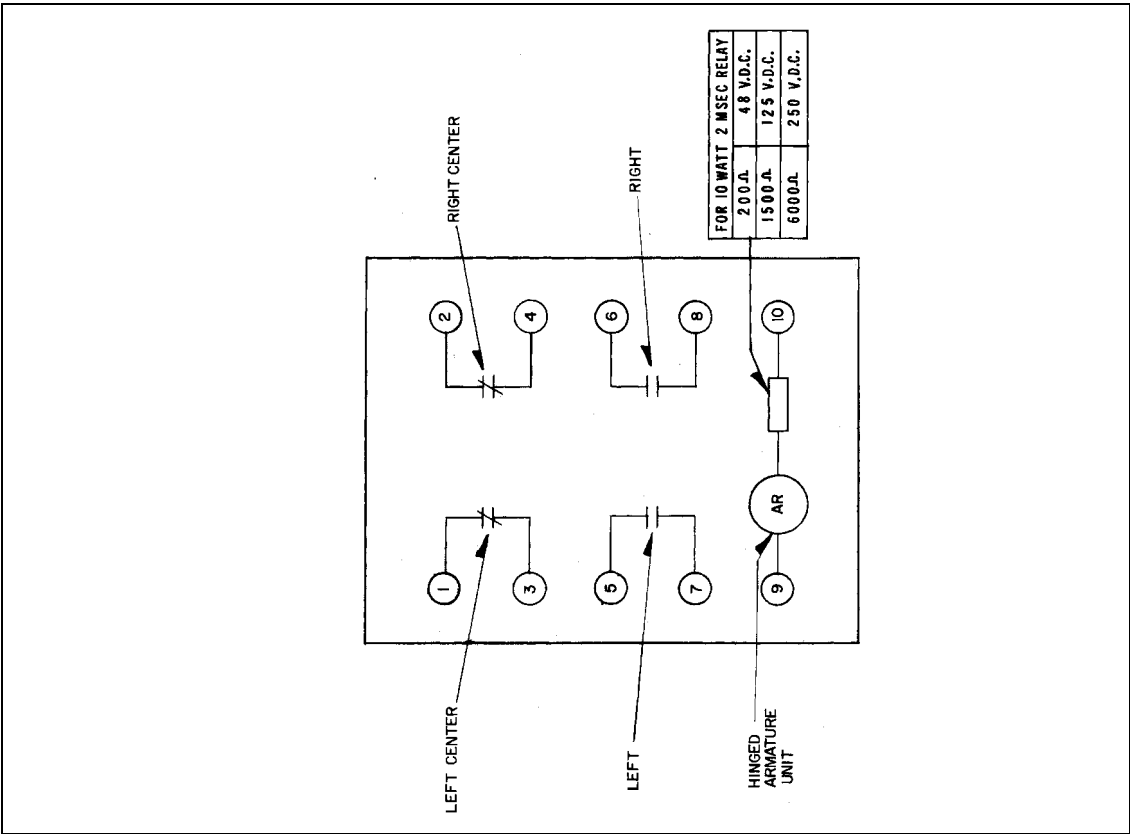
*Sub 4
762A580

Figure 7. Internal Schematic of the Type AR Relay in Ft-22 Case, Double Unit, with 4 Make - 4 Break Contacts.



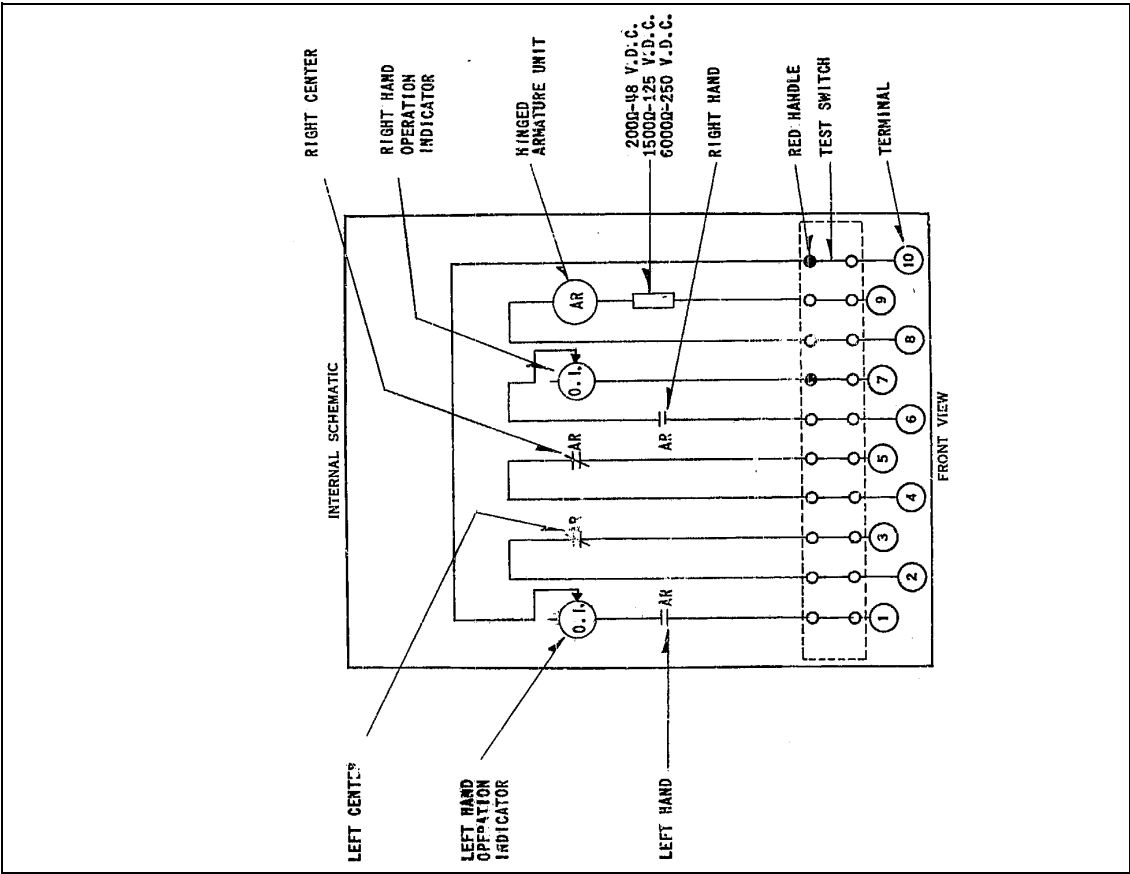
*Sub 4
629A899

Figure 8. Internal Schematic of the Type AR Relay in Front Connected Molded Case with 4 Make Contacts.



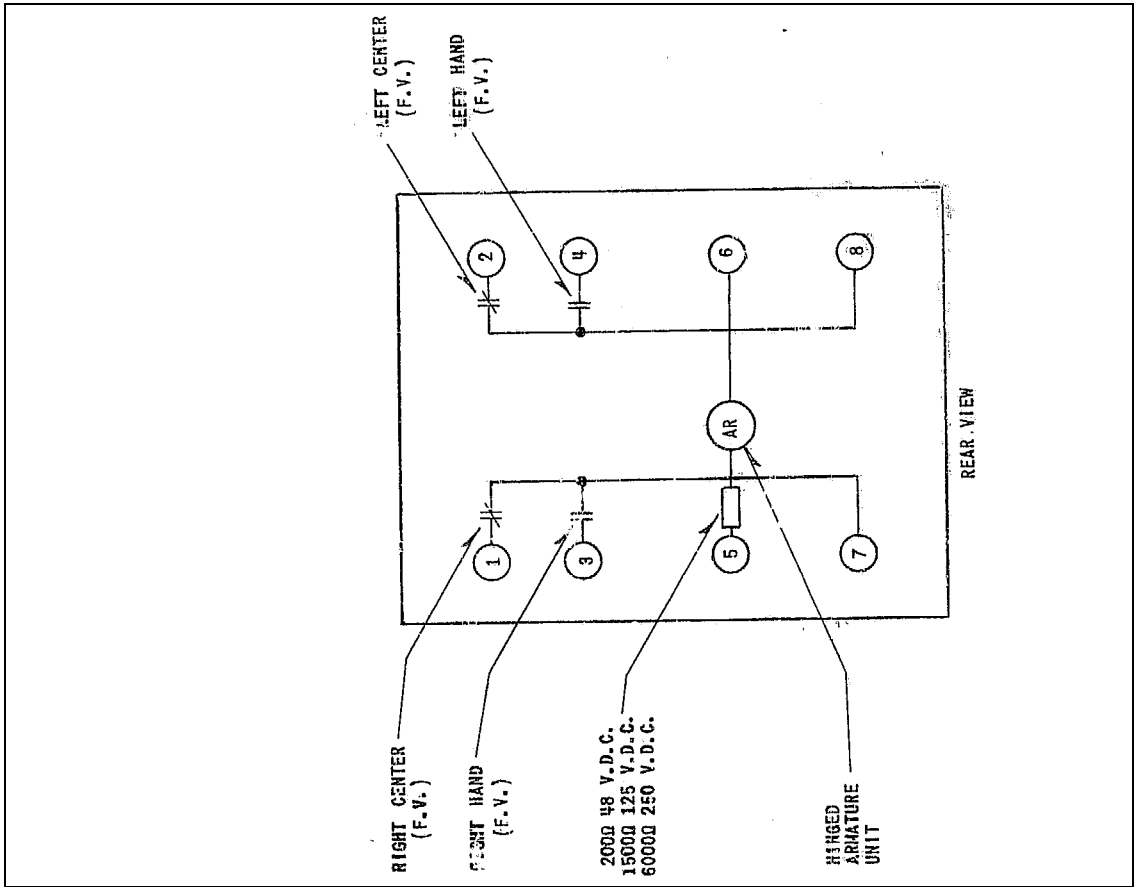
*Sub 4
837A112

Figure 9. Internal Schematic of the Type AR Relay in Front Connected Molded Case with 2 Make - 2 Break Contacts.



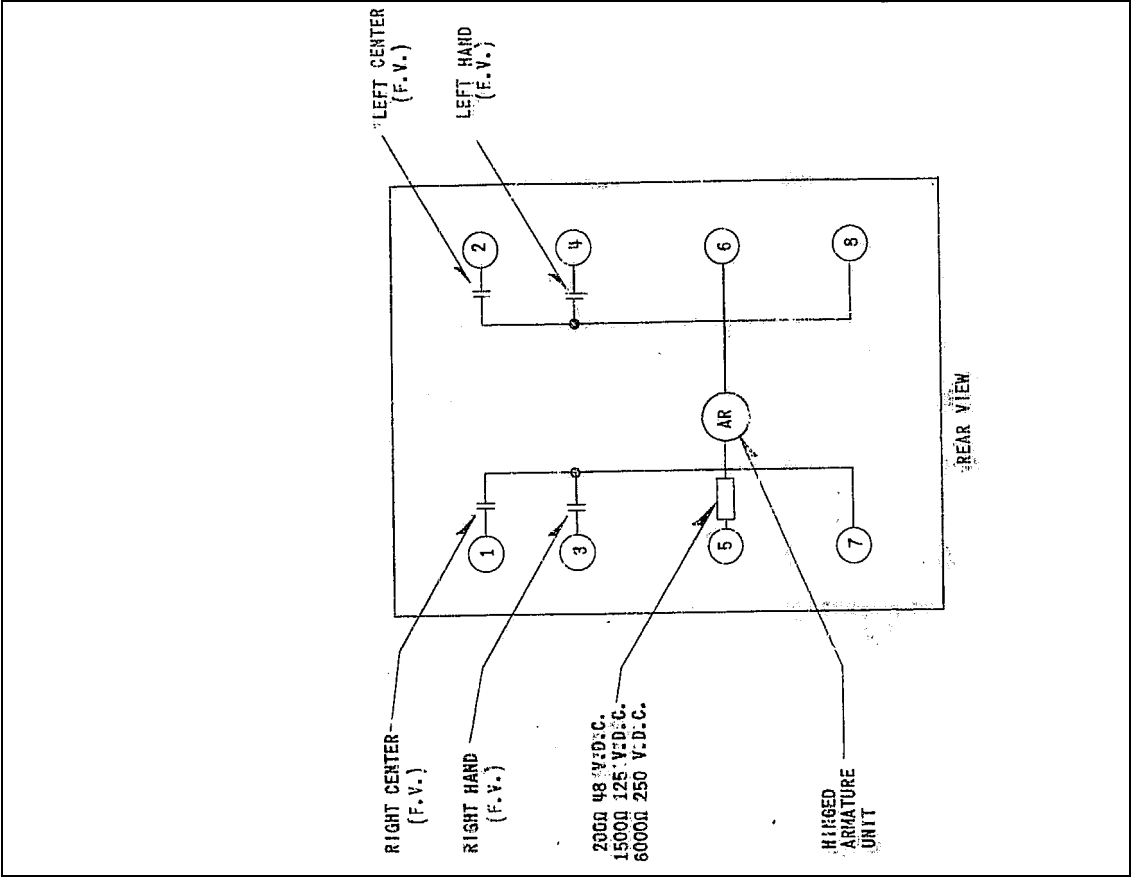
Sub 2
836A646

Figure 10. Internal Schematic of the Type AR Relay in the Ft-11 Case with 2 Operation Indicators.



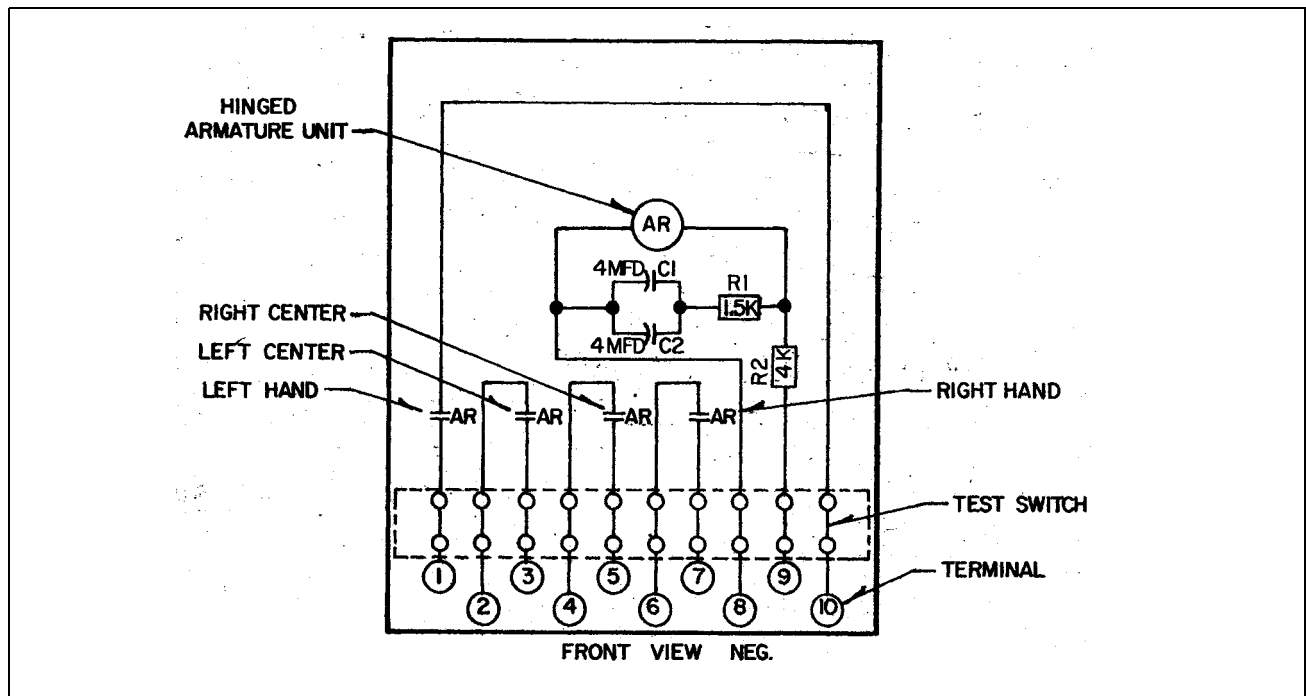
Sub 3
836A917

Figure 11. Internal Schematic of the Type AR Relay with 2 Make - 2 Break Contacts in Molded Case.



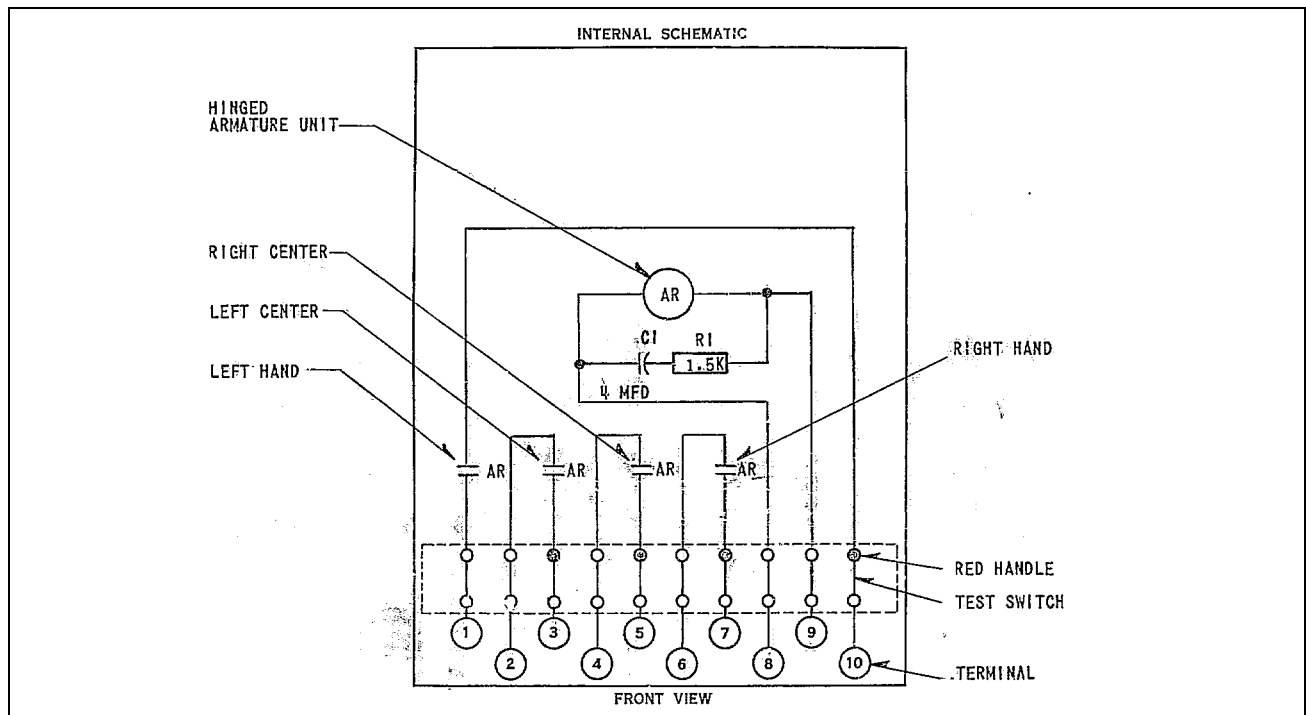
Sub 3
836A859

Figure 12. Internal Schematic of the Type AR Relay with 4 Make Contacts in Molded Case.



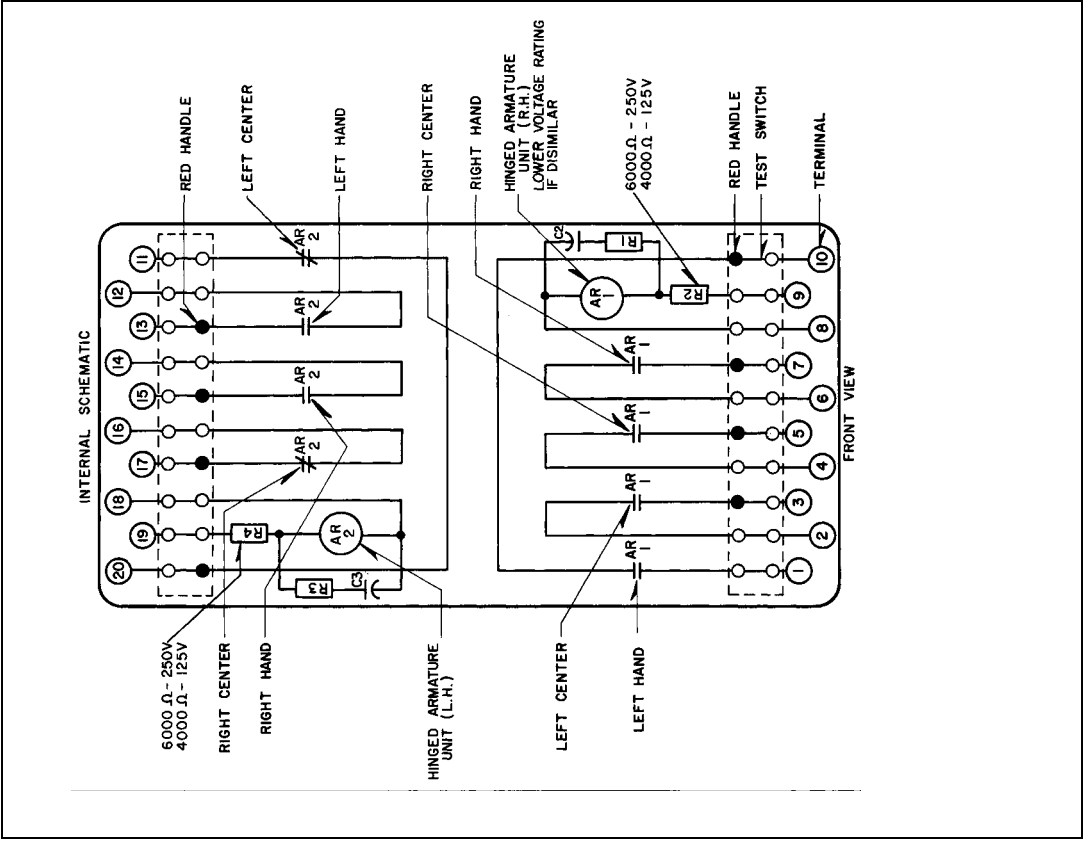
Sub 4
836A840

Figure 13. Internal Schematic of the Type AR Relay in the FT-11 Case with Time Delay Dropout.



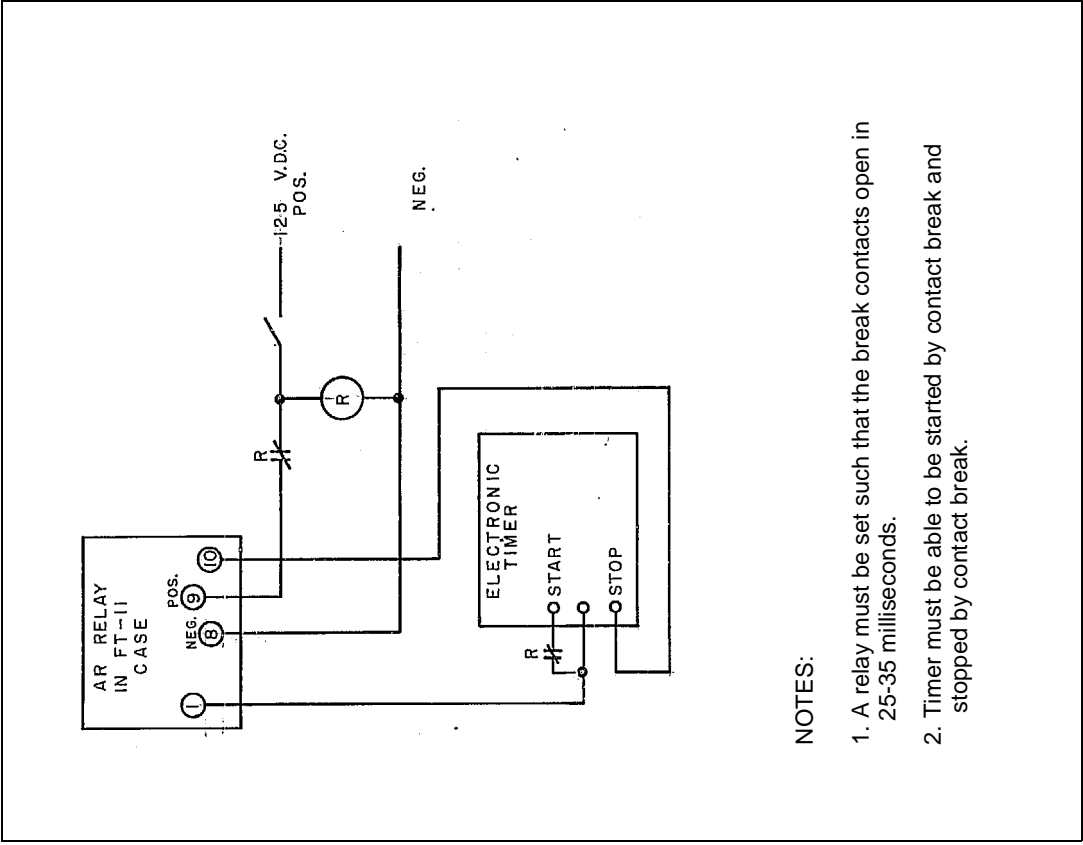
Sub 1
3500A06

Figure 14. Internal Schematic of the Type AR Auxiliary Tripping Relay with Time Delay on Dropout in FT-11 Case, 125 Vdc.



*Sub 3
3530A29

Figure 15. Internal Schematic of the Type AR Relay in Type FT-22 Case with Time Delay on Release, 6 make - 2 Break Contacts.



NOTES:

1. A relay must be set such that the break contacts open in 25-35 milliseconds.
2. Timer must be able to be started by contact break and stopped by contact break.

Sub 2
836A744

Figure 16. Test Connections for the Special Type AR Relay with Time Delay on Dropout.

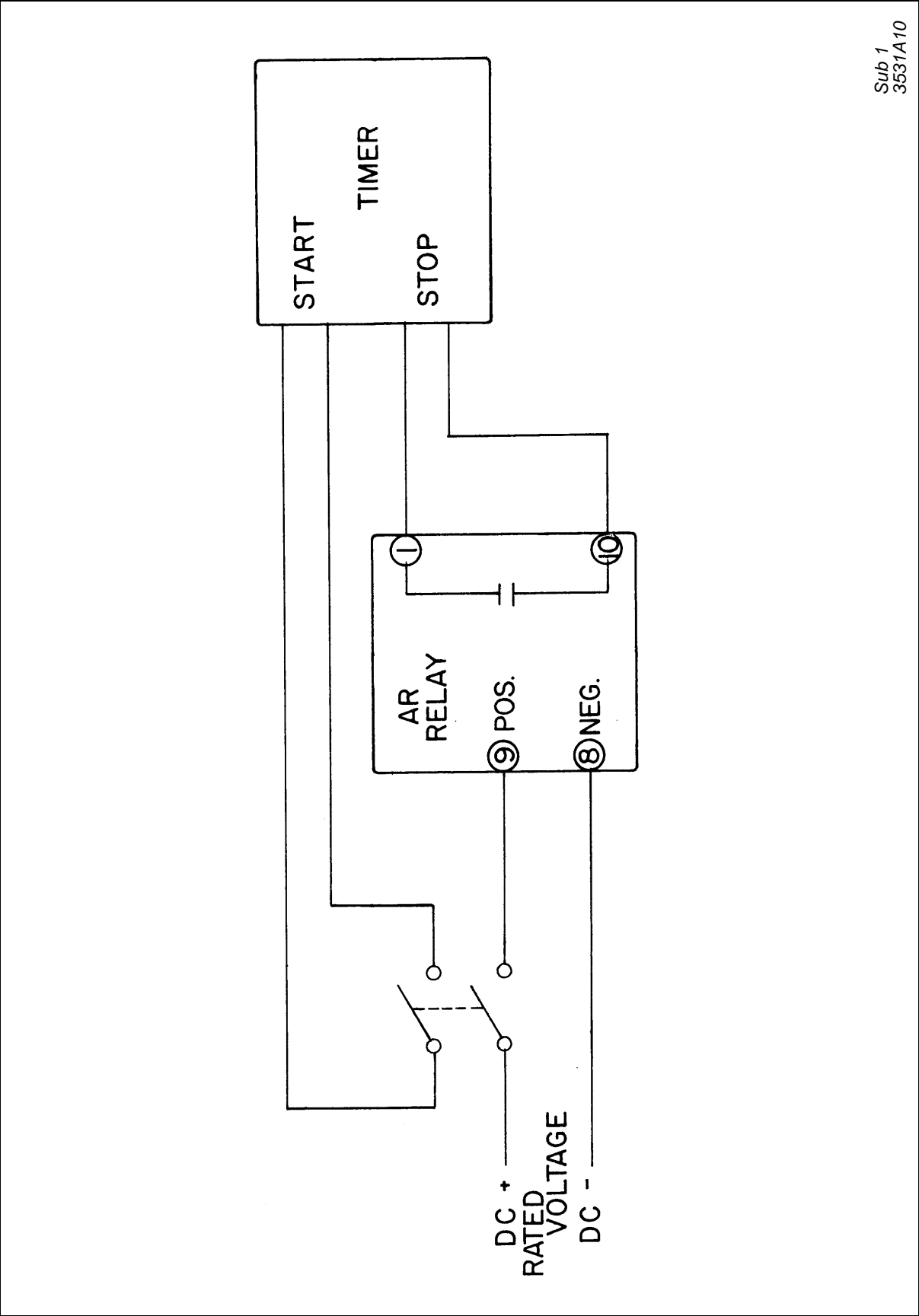


Figure 17. Test Connections for the Special Type AR Relay with Time Delay on Dropout

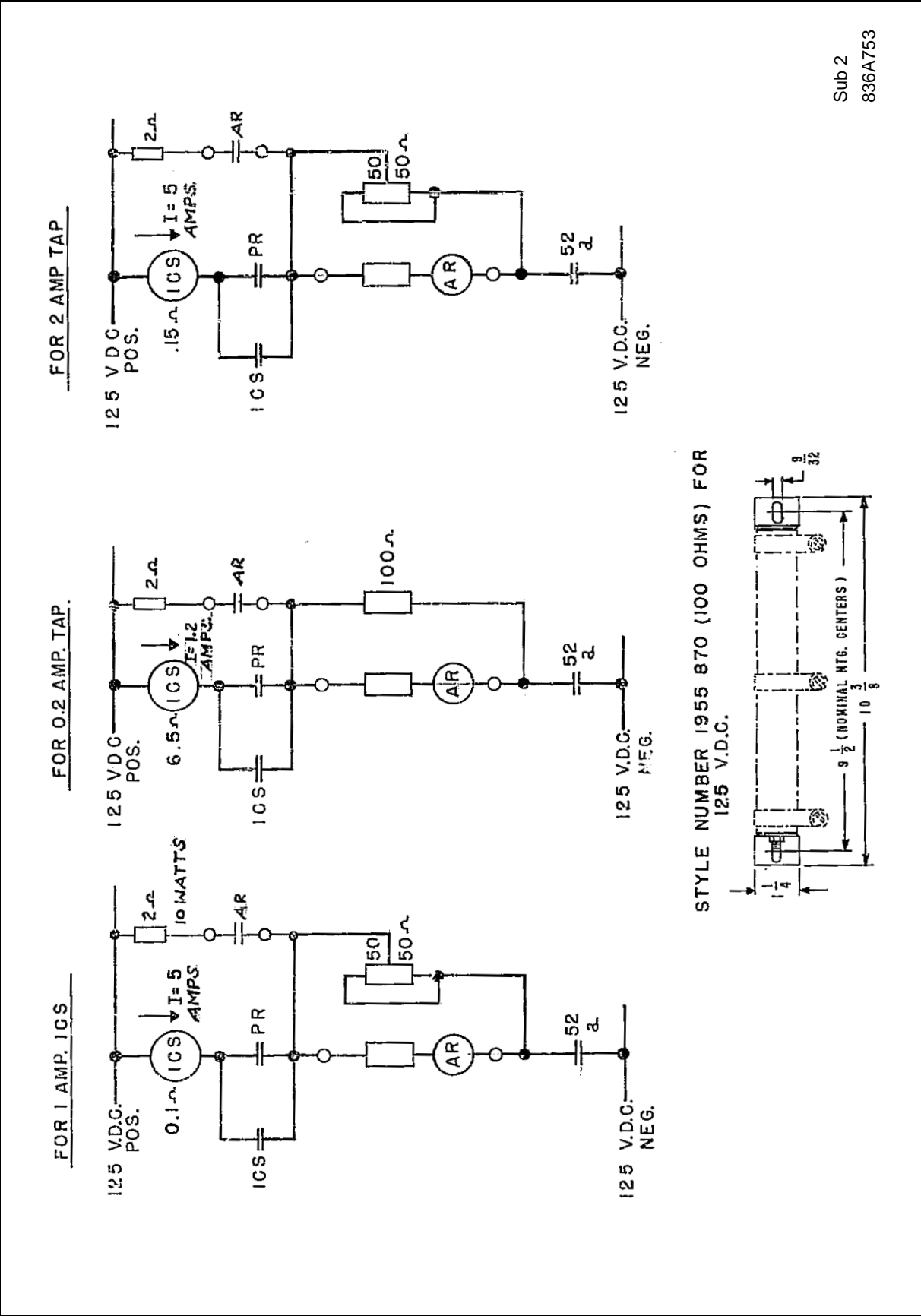


Figure 18. External Schematic of the Type AR Relay

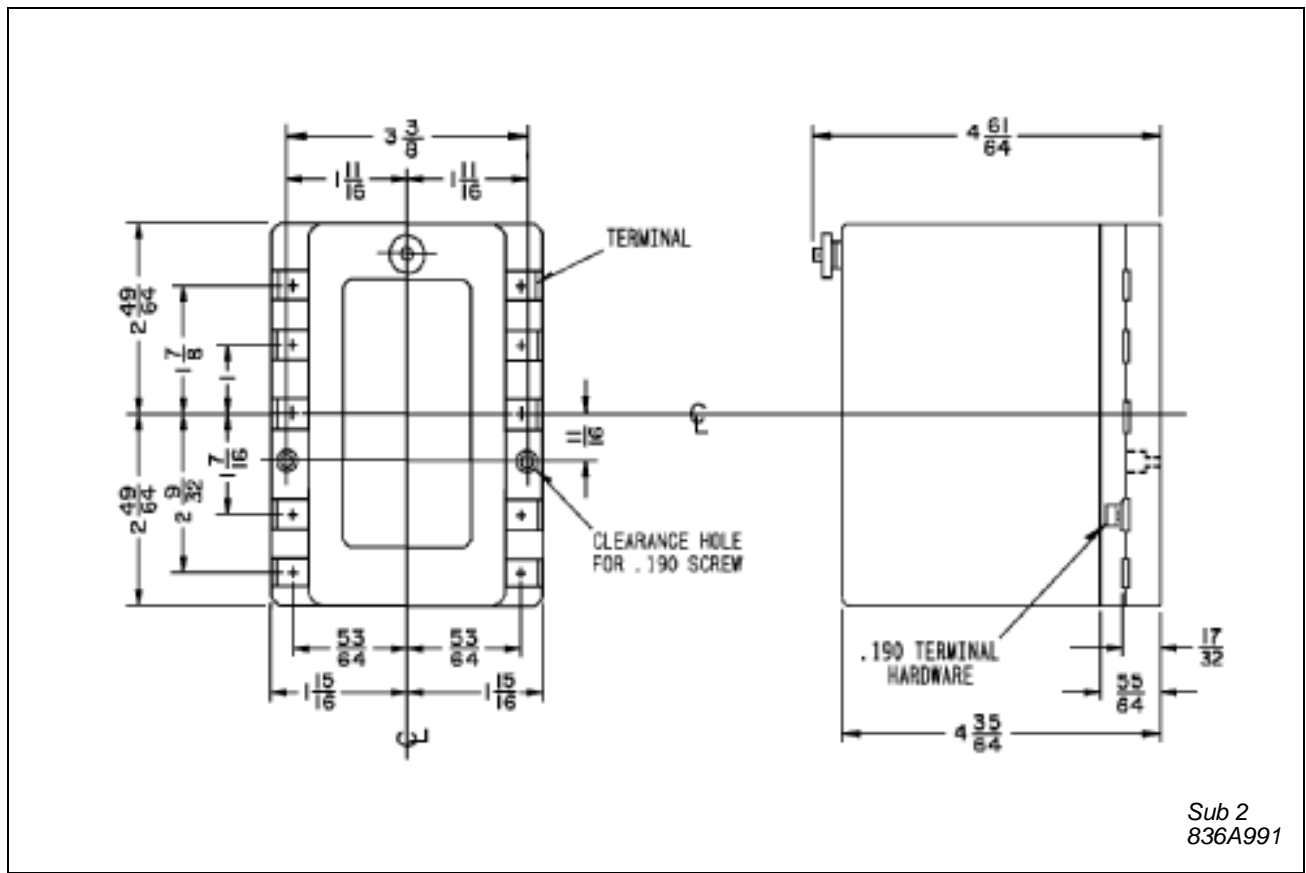


Figure 19 .Outline and Drilling Plan for the Type AR Relay in the Front Connected Molded Case.

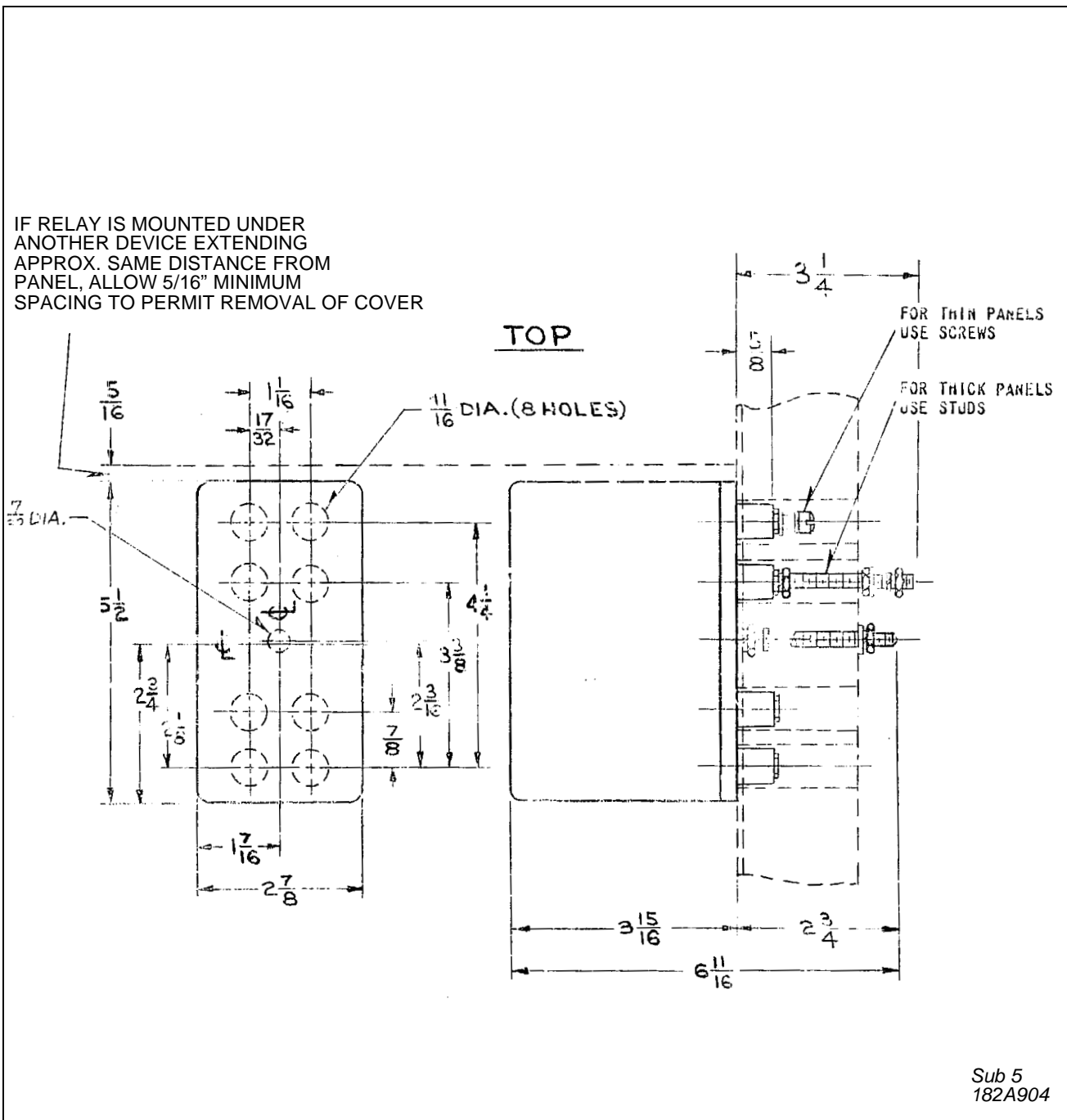
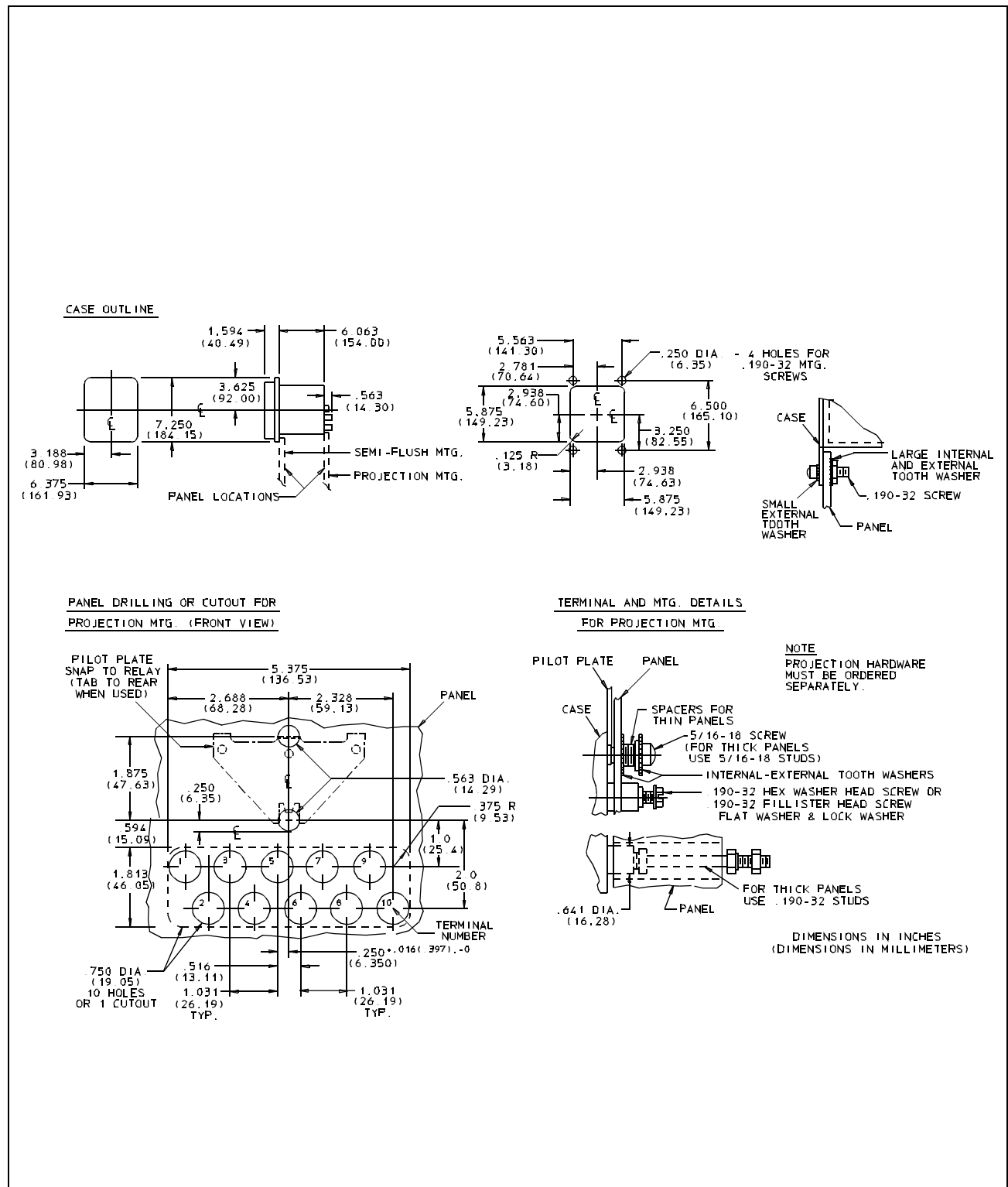
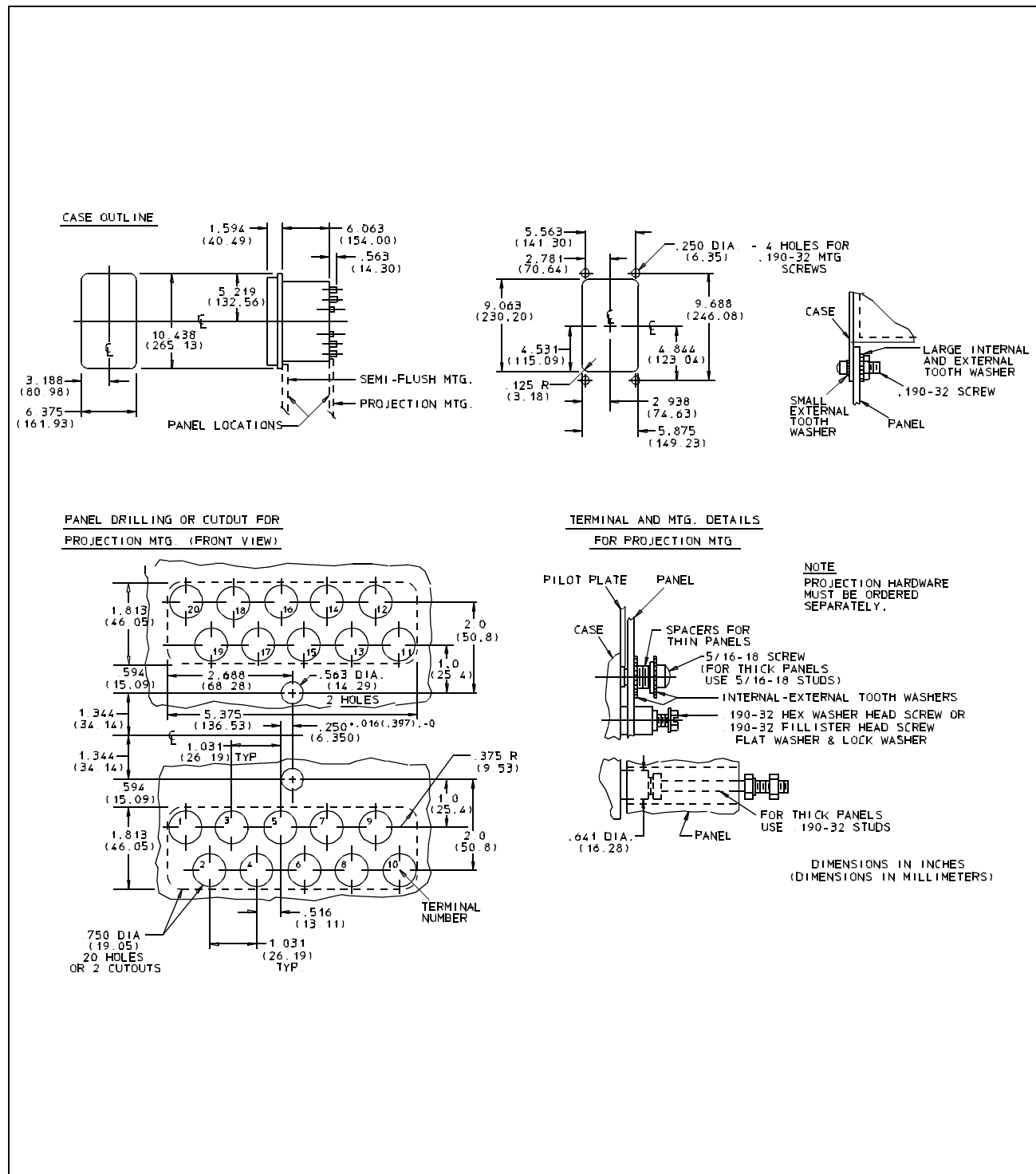


Figure 2 0 Type AR Relay – Molded Base, Rear Connected Outline and Drilling Plan



*Sub 20
57D7900

Figure 21. Outline and Drilling Plan for the Type AR Relay in the Ft-11 Case.



*Sub 14
183A158

Figure 22. Outline and Drilling Plan for the Type AR Relay in the FT-22 Case.

NOTES



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