INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE AR HIGH SPEED AUXILIARY RELAY

CAUTION: Before putting protection 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.

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 one faults.

An AR relay is available with a time delay dropout. It can be used in applications where a delayed dropout of 0.1 seconds is desired.

CONSTRUCTION AND OPERATION

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 Fig. 1 and 2.

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.

Operation Indicator (O.I.)

The d-c operation indicator is a small 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.

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

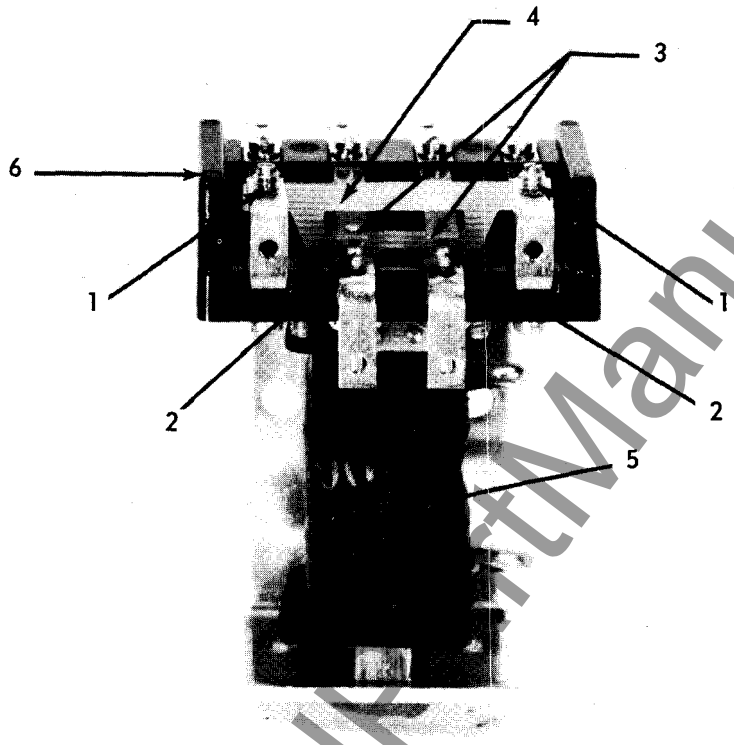
CHARACTERISTICS

The AR unit without a series resistor has a sensitivity of 50 milliwatts. By the proper combination of the AR unit and a series resistor, an optimum speed of 2 milliseconds can be obtained for an ener- input of 10 watts.

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 10% of rated voltage or higher.

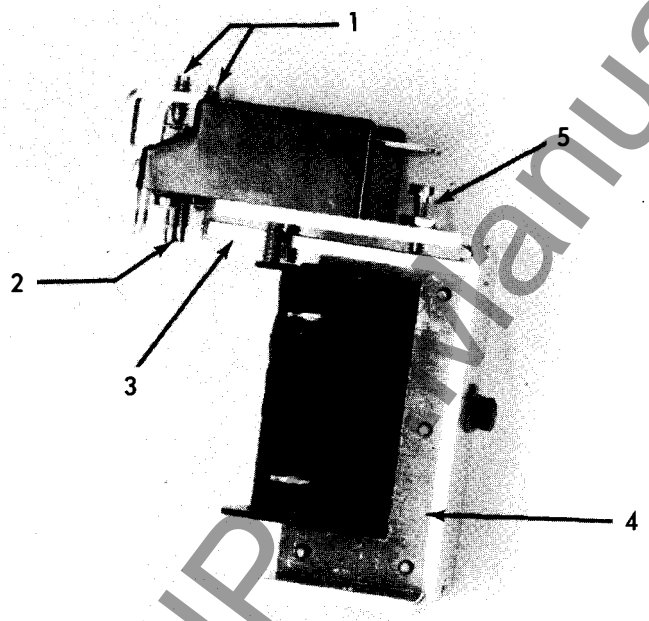
Typical operating times and effective contact bounce are outlined in the tables I and II.

The operate time of the relay with delayed dropout is about 6 milliseconds at rated voltage for a normally open contact. The relay will have a 0.1 second dropout time after being energized at least 0.015 seconds.



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – LEAF SPRING MOVING CONTACTS
4 – MOVING CARD ASSEMBLY
5 – RELAY COIL
6 – MOLDED INSULATION BLOCK

Fig. 1 Type AR Unit with two make and two break contacts (Front View).



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – MOVING ARMATURE.
4 – U-SHAPED LAMINATED CORE.
5 – ARMATURE GAP ADJUSTMENT SET SCREW.

Fig. 2 Type AR Unit with two make and two break contacts (Side View).

TABLE I
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

TABLE II
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	---

Contact Rating

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

SETTINGS

AR Unit

No settings are required.

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.

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 semi-flush mounting or by means of the rear mounting 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.

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 instructions below should be followed.

Acceptance Check

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

1. Contact gaps
   a. Normally open contacts should have a gap of .018 to .023 inch.
   b. Normally closed contact gap should be .013 minimum.
2. Contact pressure
   a. 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.
   b. On two normally open and two normally closed relays, the normally closed contacts should have approximately 8 grams contact pressure in the de-energized position. Each normally open contact spring should have approximately 8 grams pressure against the card.

3. Armature gap

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

4. Contact operate time

   Per Table 1

5. Operation Indicator (O.I.)

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

6. AR relay with time delay on dropout.

   Connect the relay as shown in Fig. 13. When the AR coil has been energized for 25-35 milliseconds its dropout time should be a minimum of 100 milliseconds. The R relay should be adjusted such that its contact break time is 25-35 milliseconds. Also the timer must be of the type which may be started and stopped by break contacts.

CALIBRATION

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs of 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")

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 0.0009-inch gap at the rear end of the armature air gap.

b. 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 spring for 8 grams to just move the contact away from the card.

c. Adjust each stationary contact screw to obtain a contact of 0.020 to 0.022 inches for the normally open contacts. Energize the relay and the normally open contacts should have 15 to 30 grams contact follow. 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 Table I and II.

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.

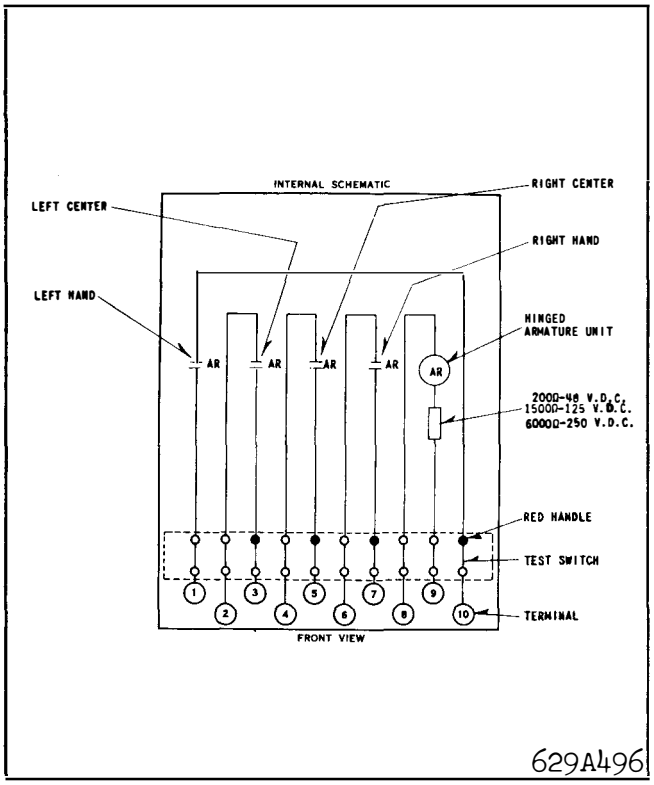


Fig. 3 Internal schematic of the Type AR Relay with 4 make contacts in FT-11 case.

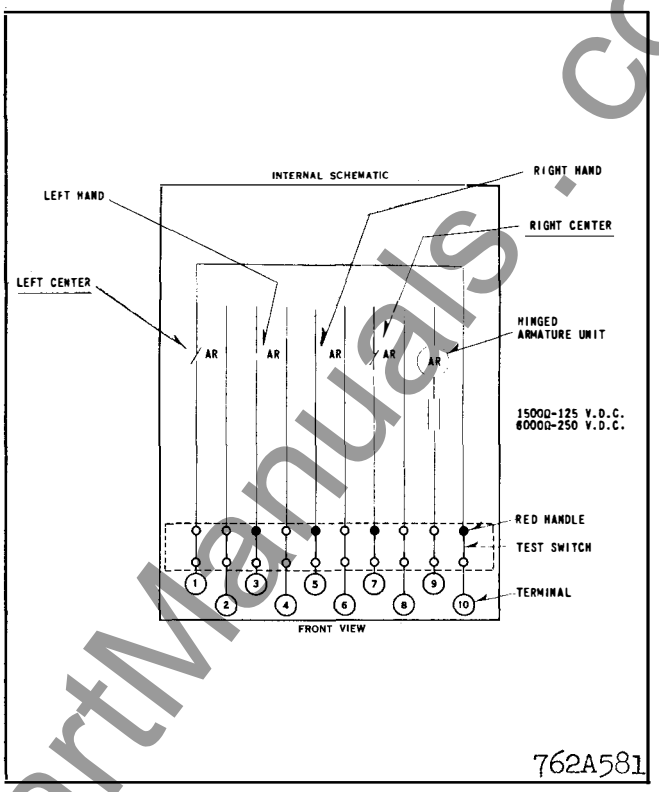


Fig. 4 Internal schematic of the Type AR Relay with 2 make - 2 break contacts in FT-11 case.

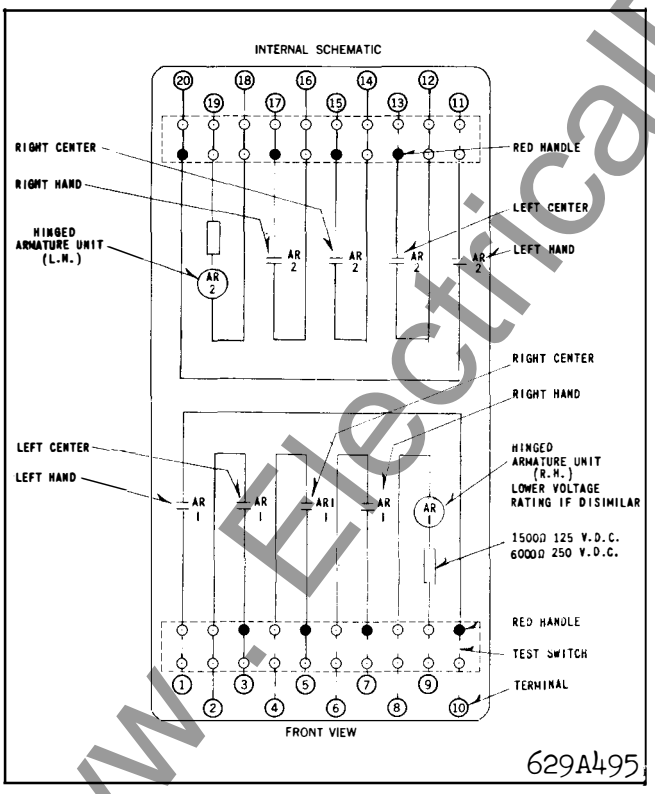


Fig. 5 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 8 make contacts.

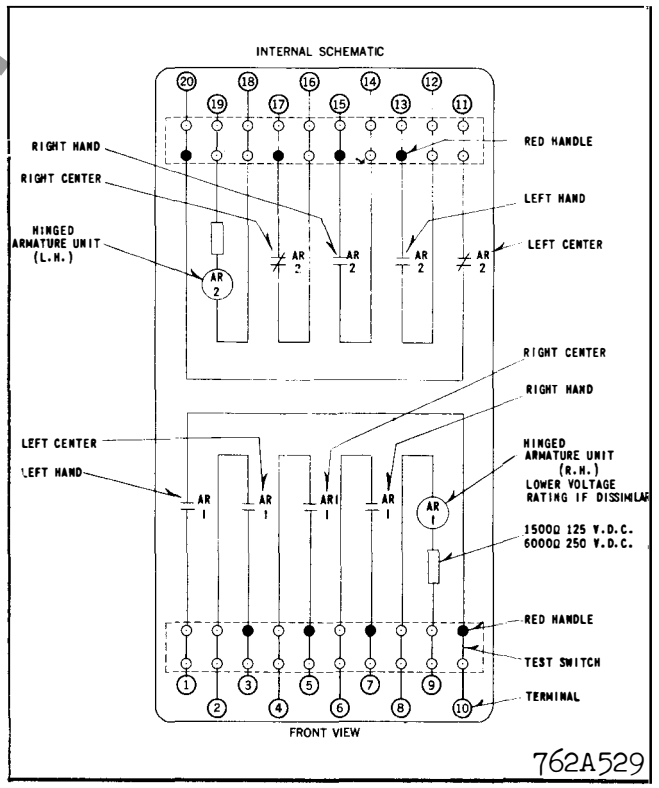


Fig. 6 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 6 make and 2B contacts.

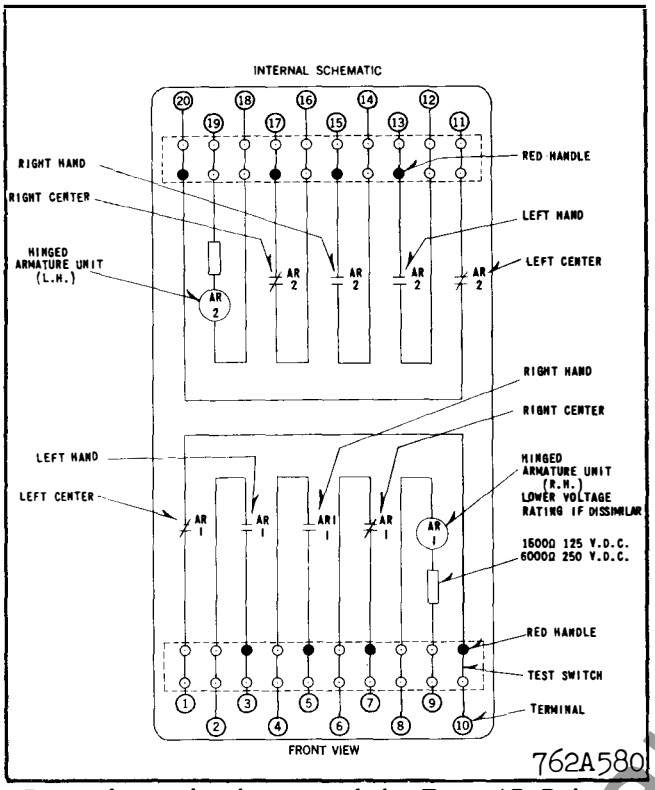


Fig. 7 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 4 make and 4 break contacts.

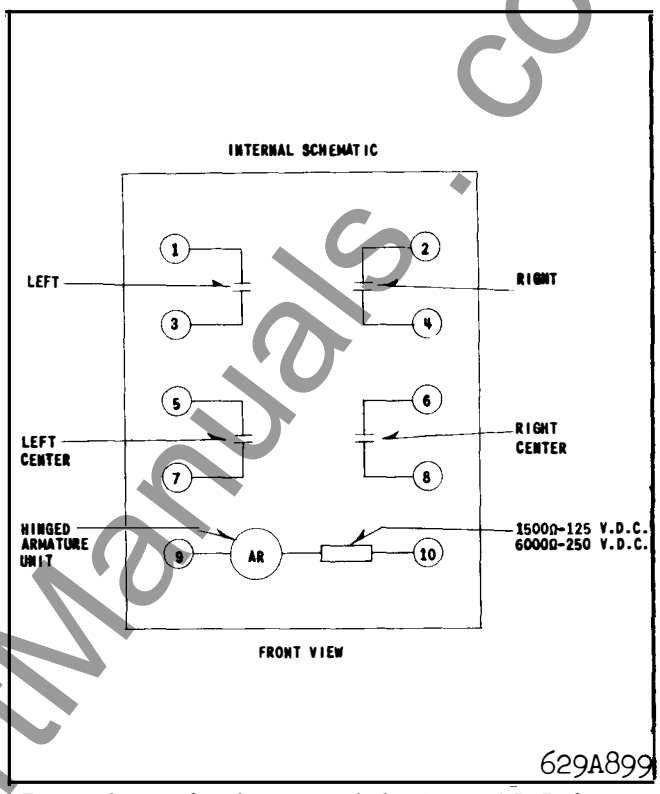


Fig. 8 Internal schematic of the Type AR Relay in front connected molded case with 4 make contacts.

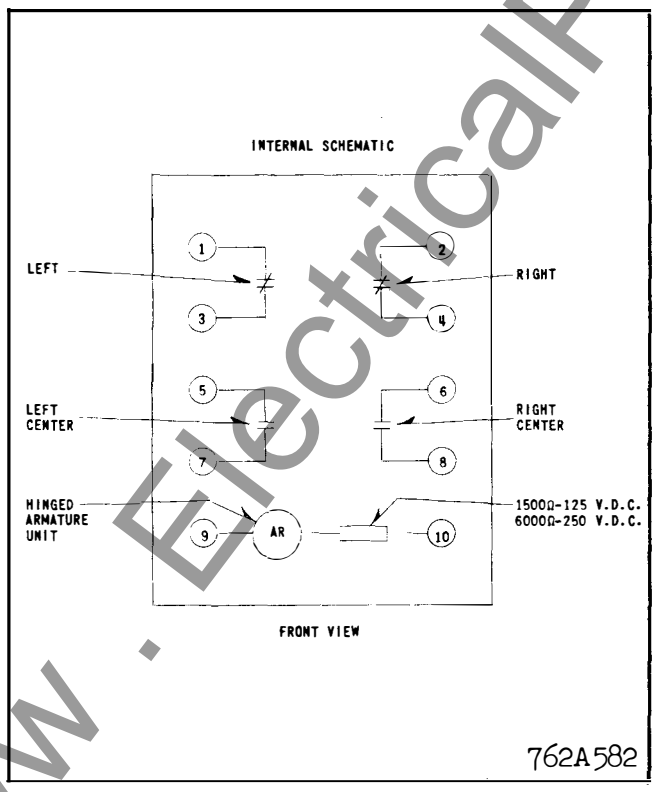


Fig. 9 Internal schematic of the Type AR Relay in front connected molded case with 2 make-2 break contacts.

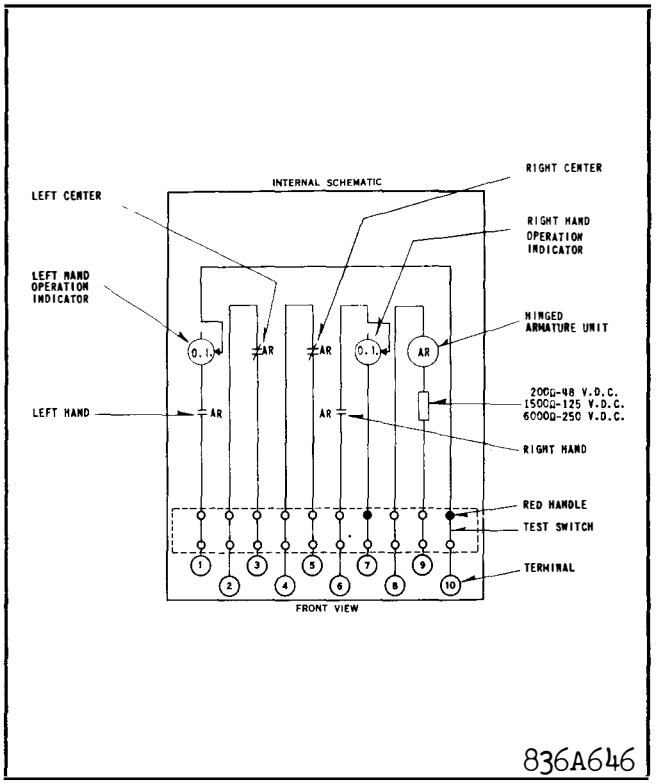


Fig. 10 Internal schematic of the Type AR Relay in the FT-11 case with 2 Operation Indicators.

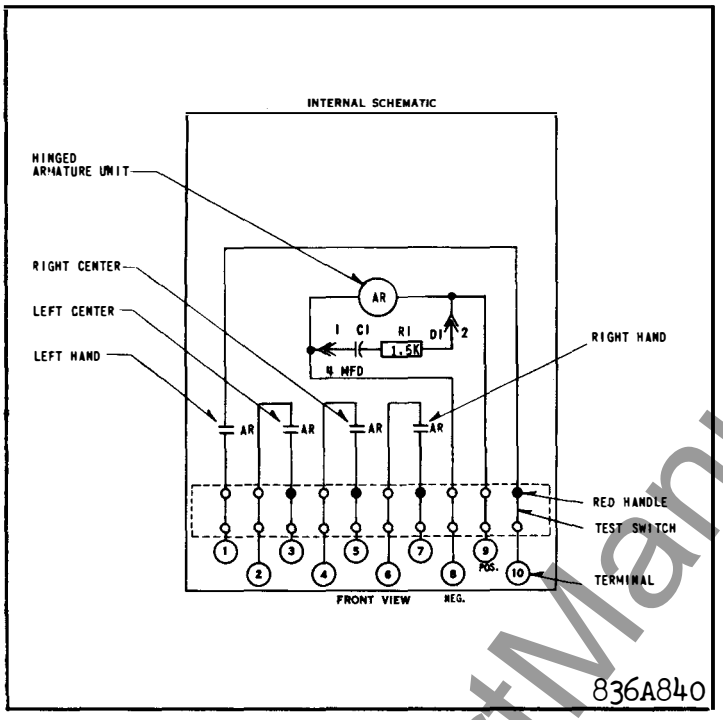


Fig. 11 Internal schematic of the Type AR Relay in the FT-11 case with time delay dropout.

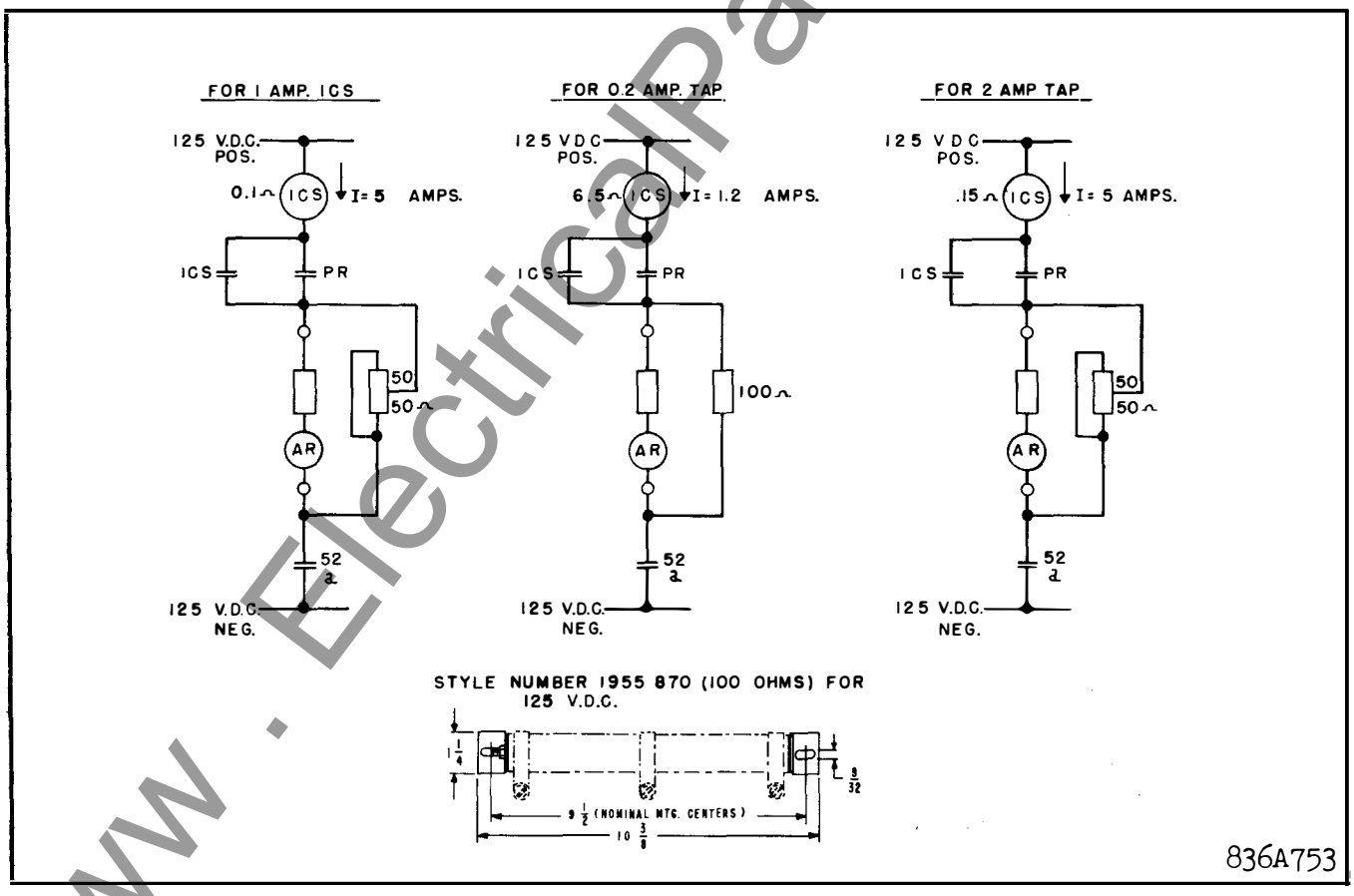


Fig. 12 External schematic for the Type AR Relay.

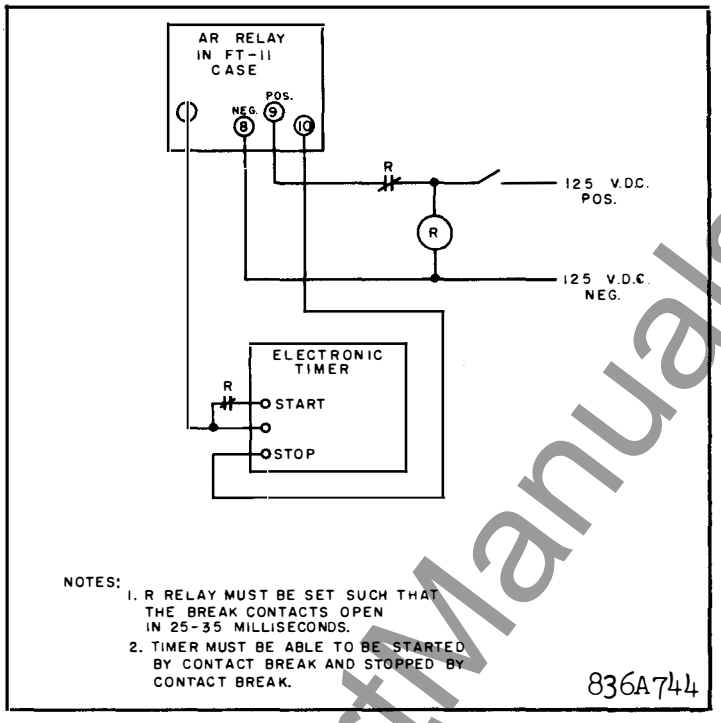


Fig. 13 Test connections for the Type AR Relay with time delay on dropout.

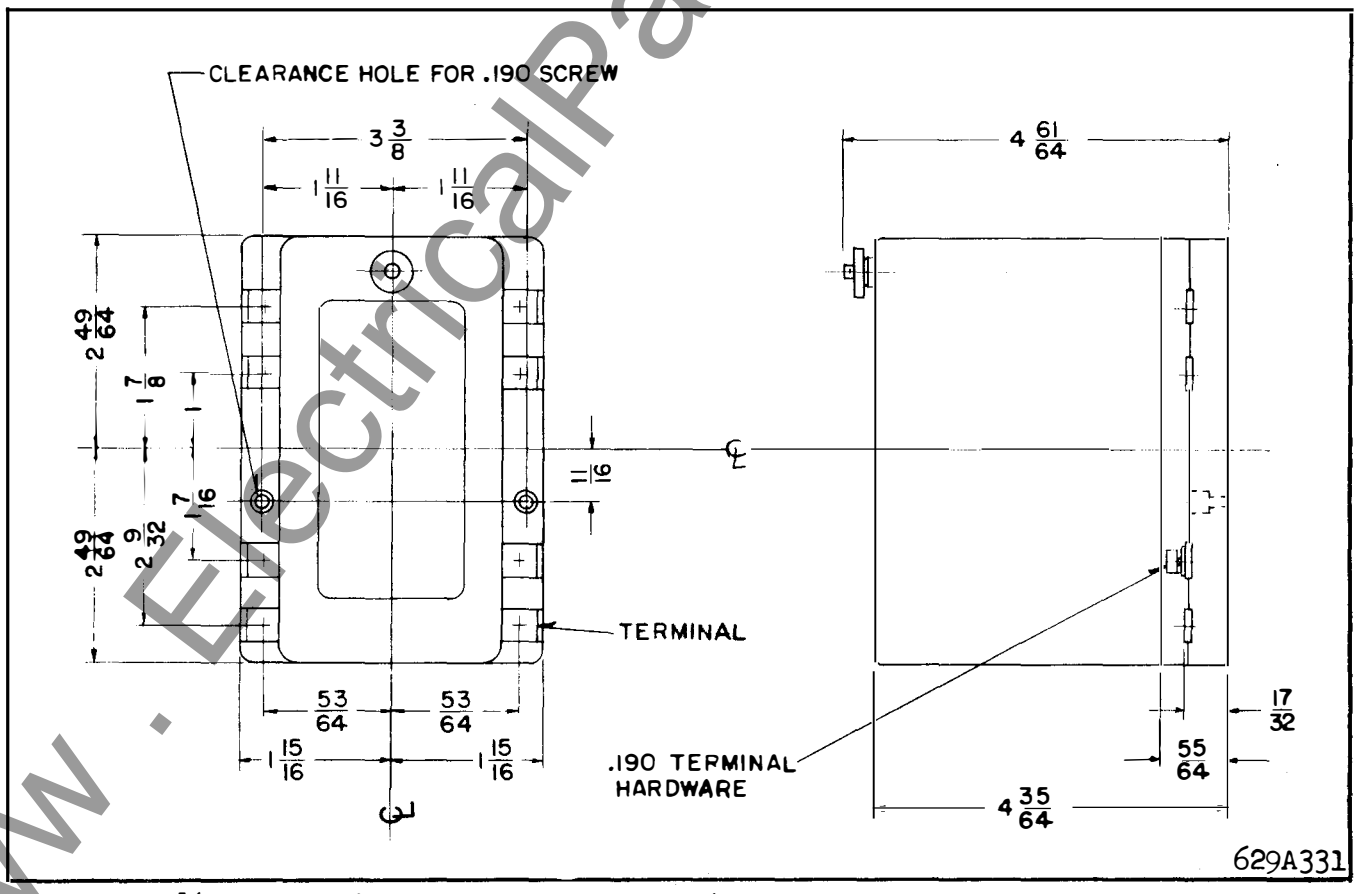


Fig. 14 Outline and drilling plan for the Type AR relay in the front connected molded case.

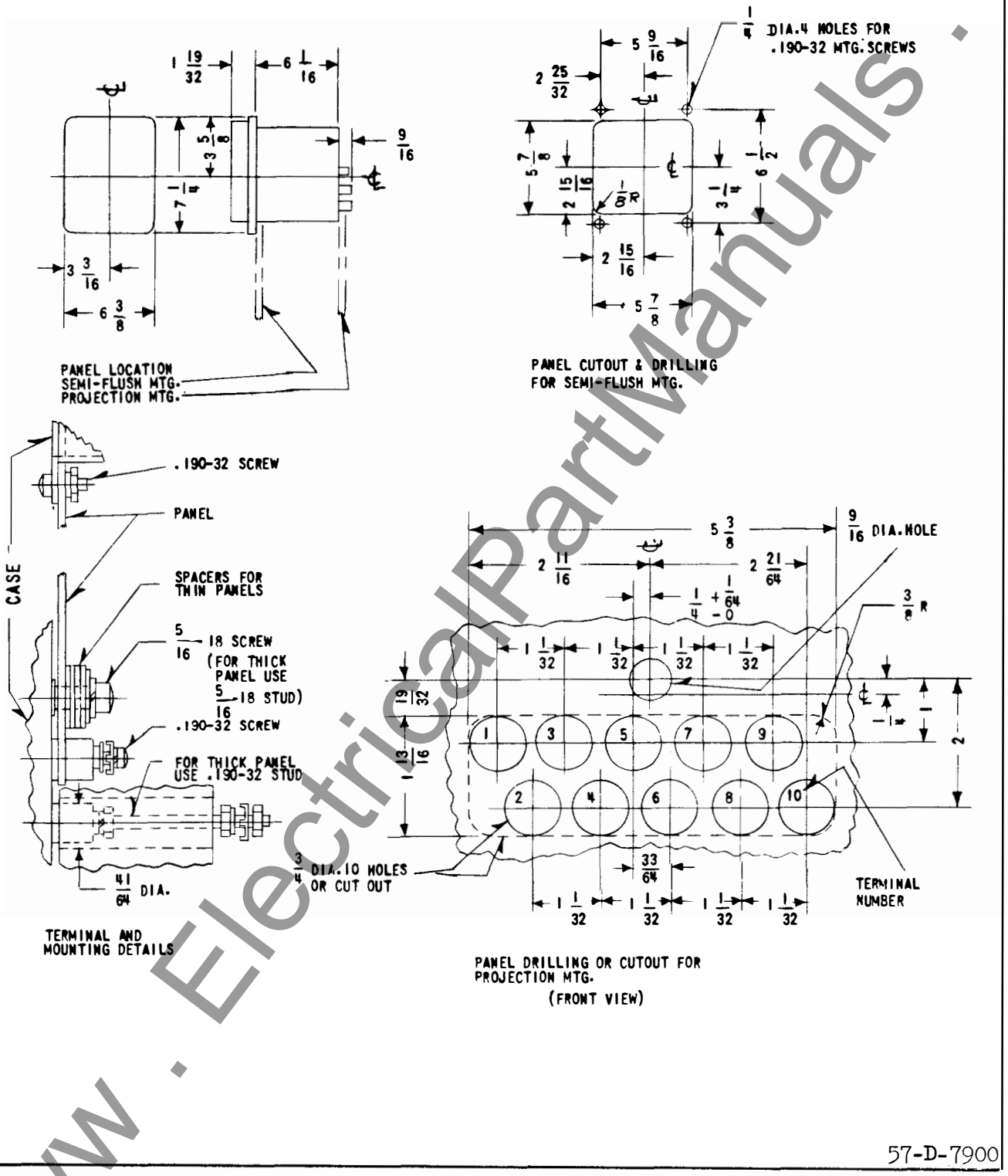


Fig. 15 Outline and drilling plan for the Type AR Relay in the FT-11 case.

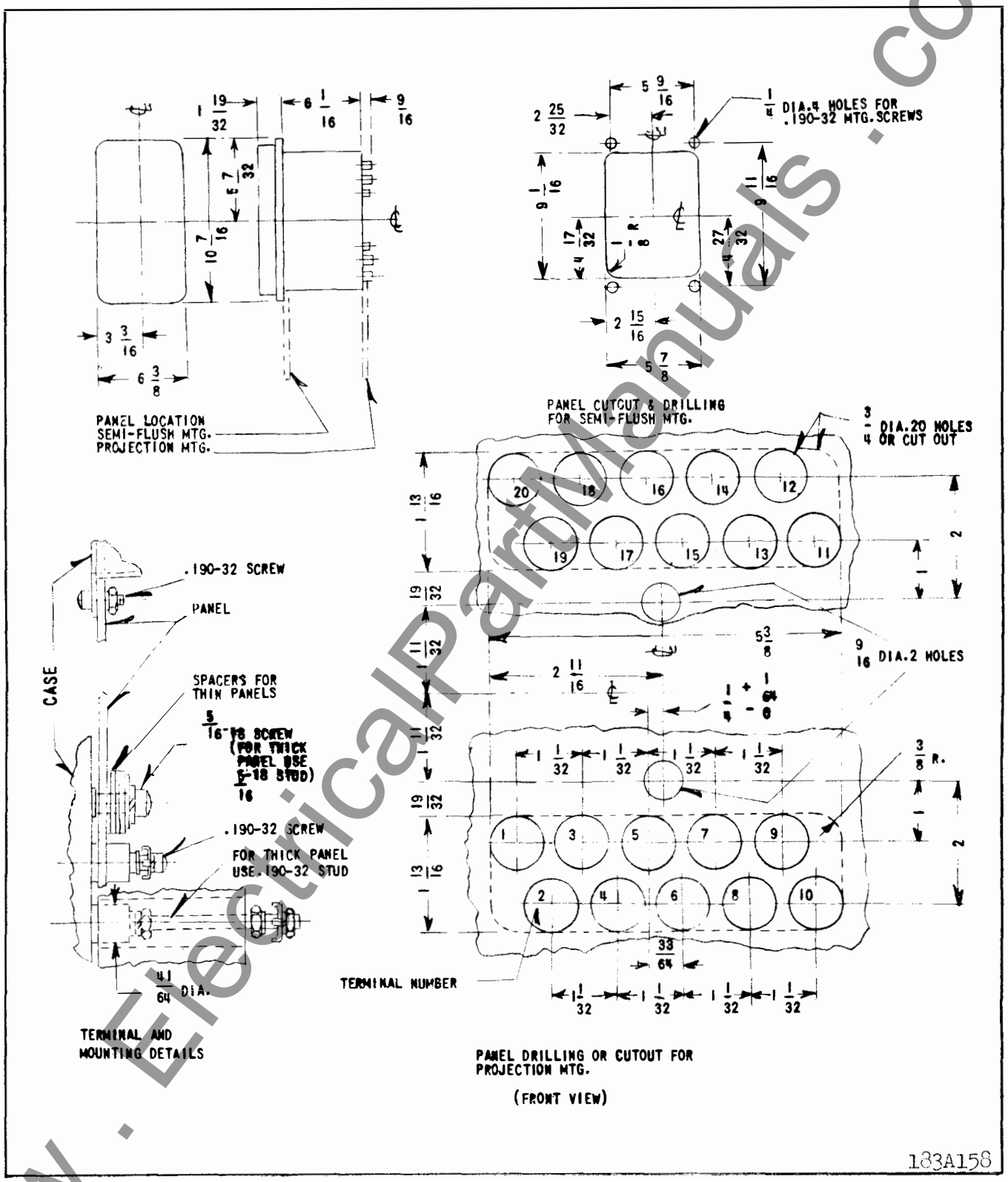


Fig. 16 Outline and drilling plan for the Type AR Relay in the FT-22 case.

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

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TYPE AR HIGH SPEED AUXILIARY RELAY

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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 one faults.

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CONSTRUCTION AND OPERATION

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 Fig. 1 and 2.

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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.

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The d-c operation indicator is a small 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.

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

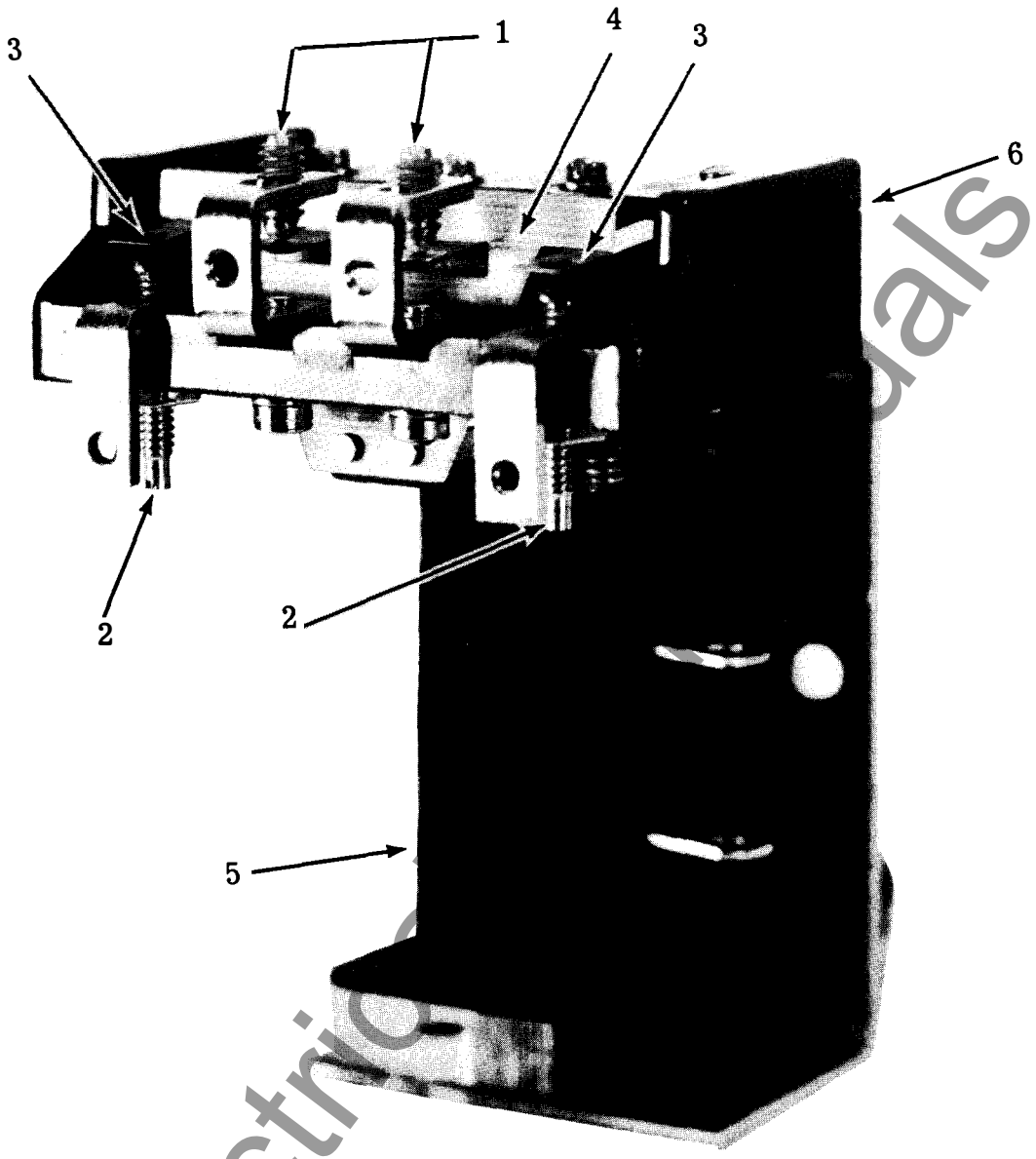
CHARACTERISTICS

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.

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 10% of rated voltage or higher.

Typical operating times and effective contact bounce are outlined in the tables I and II.

The operate time of the relay with delayed dropout is about 6 milliseconds at rated voltage for a normally open contact. The relay will have a 0.1 second dropout time after being energized at least 0.015 seconds.



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3 – LEAF SPRING MOVING CONTACTS
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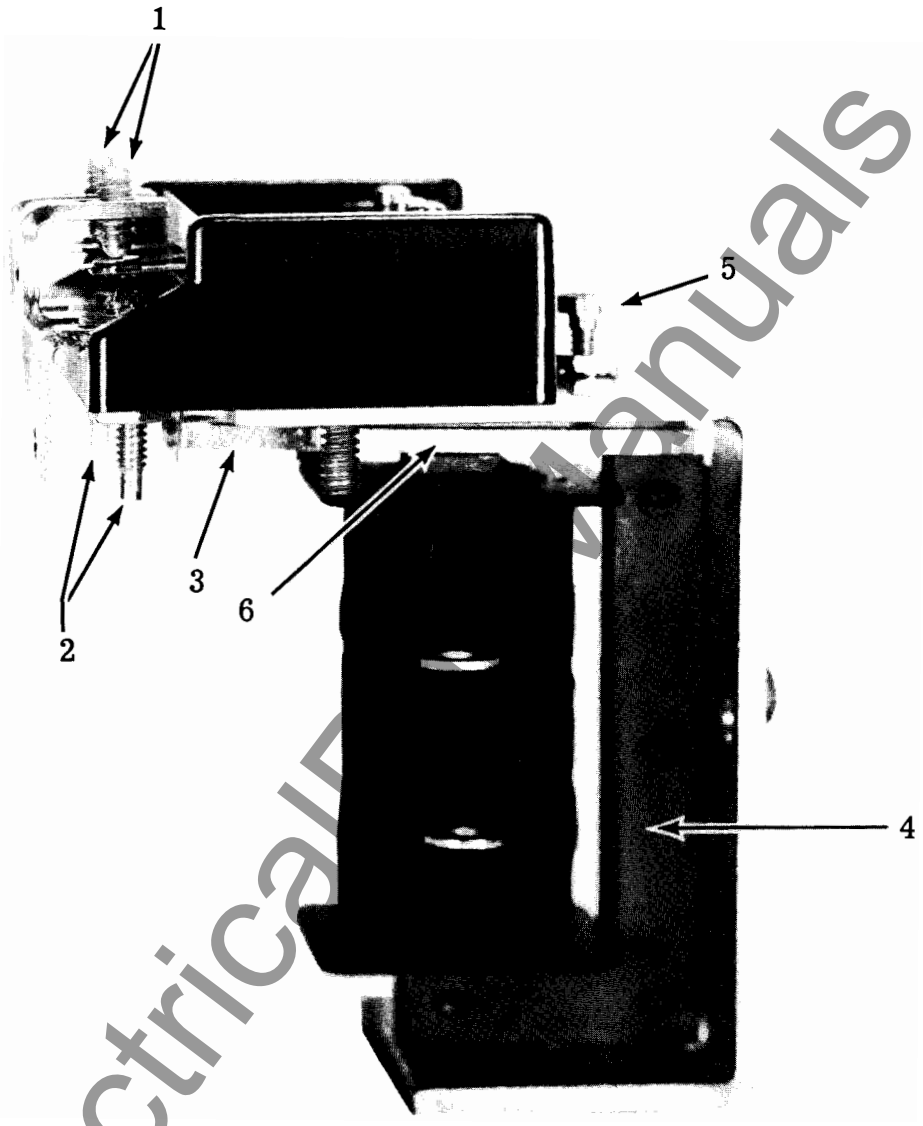
5 – RELAY COIL
6 – MOLDED INSULATION BLOCK

** Fig. 1 Type AR Unit with two make and two break contacts (Front View).*



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
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3 – MOVING ARMATURE.
4 – U-SHAPED LAMINATED CORE.
5 – ARMATURE GAP ADJUSTMENT SET SCREW.
6 – ARMATURE GAP

* *Fig. 2 Type AR Unit with two make and two break contacts (Side View).*

TABLE I
OPERATE AND RESET TIMES

Rated Operating Energy (WATTS)	Operate Time (Milliseconds)		Reset Time (Milliseconds)
	NO contact Closes	NC contact Opens	NC contact Closes
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TABLE II
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	---

Contact Rating

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

SETTINGS

AR Unit

No settings are required.

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.

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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 semi-flush mounting or by means of the rear mounting 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.

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 instructions below should be followed.

Acceptance Check

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

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   a. Normally open contacts should have a gap of .018 to .023 inch.
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3. Armature gap

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

4. Contact operate time

   Per Table 1

5. Operation Indicator (O.I.)

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

6. AR relay with time delay on dropout.

   Connect the relay as shown in Fig. 13. When the AR coil has been energized for 25-35 milliseconds its dropout time should be a minimum of 100 milliseconds. The R relay should be adjusted such that its contact break time is 25-35 milliseconds. Also the timer must be of the type which may be started and stopped by break contacts.

CALIBRATION

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs of 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")

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. 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 spring for 8 grams to just move the contact away from the card.

c. Adjust each stationary contact screw to obtain a contact of 0.020 to 0.022 inches for the normally open contacts. Energize the relay and the normally open contacts should have 15 to 30 grams contact follow. 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 Table I and II.

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.

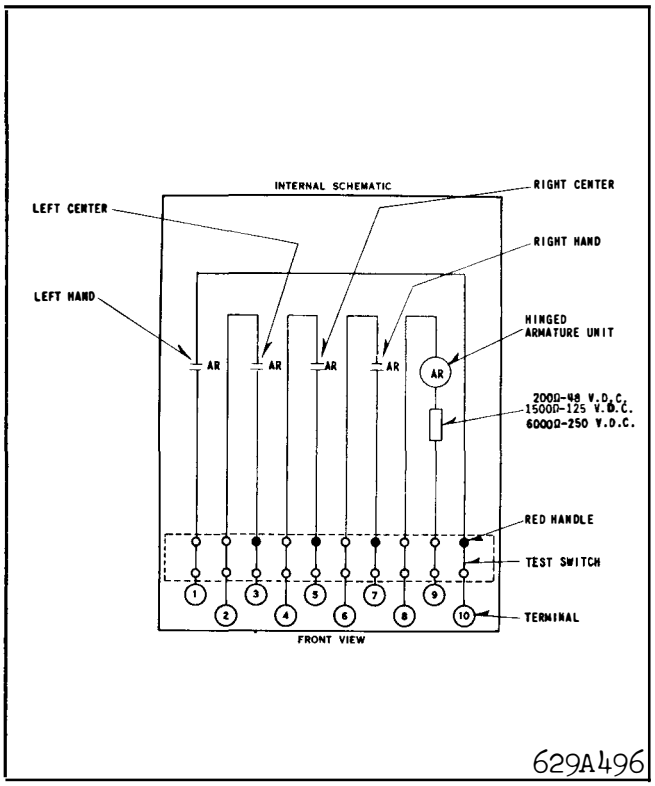
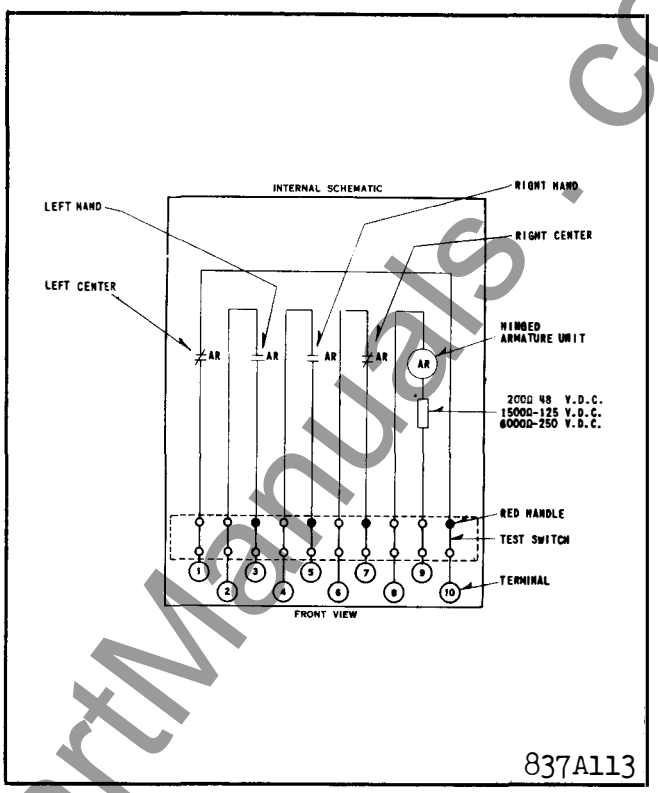


Fig. 3 Internal schematic of the Type AR Relay with 4 make contacts in FT-11 case.



** Fig. 4 Internal schematic of the Type AR Relay with 2 make - 2 break contacts in FT-11 case.*

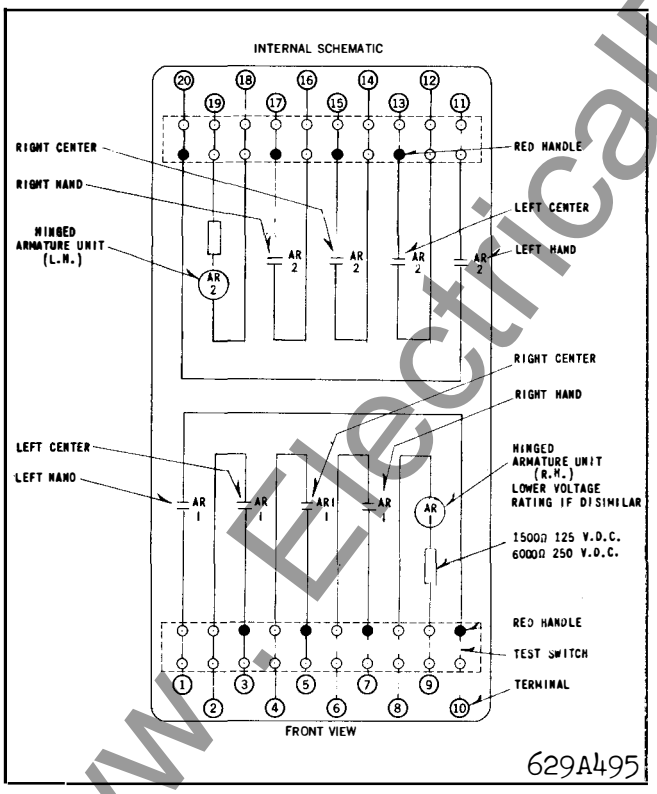


Fig. 5 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 8 make contacts.

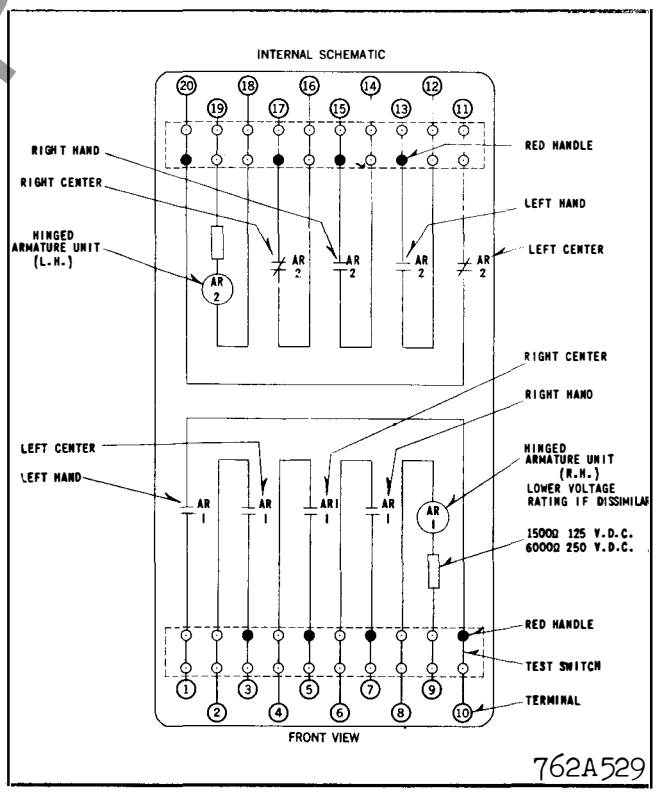


Fig. 6 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 6 make and 2B contacts.

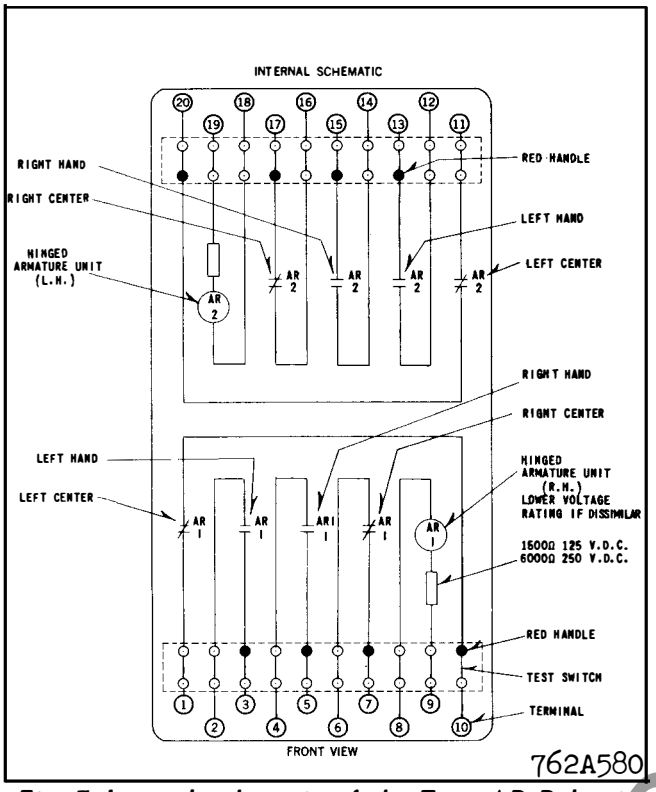


Fig. 7 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 4 make and 4 break contacts.

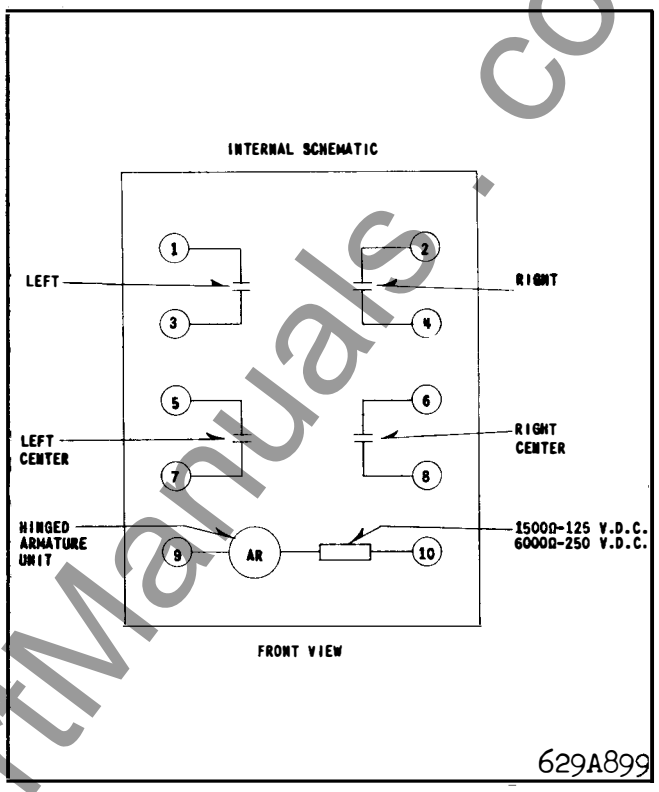
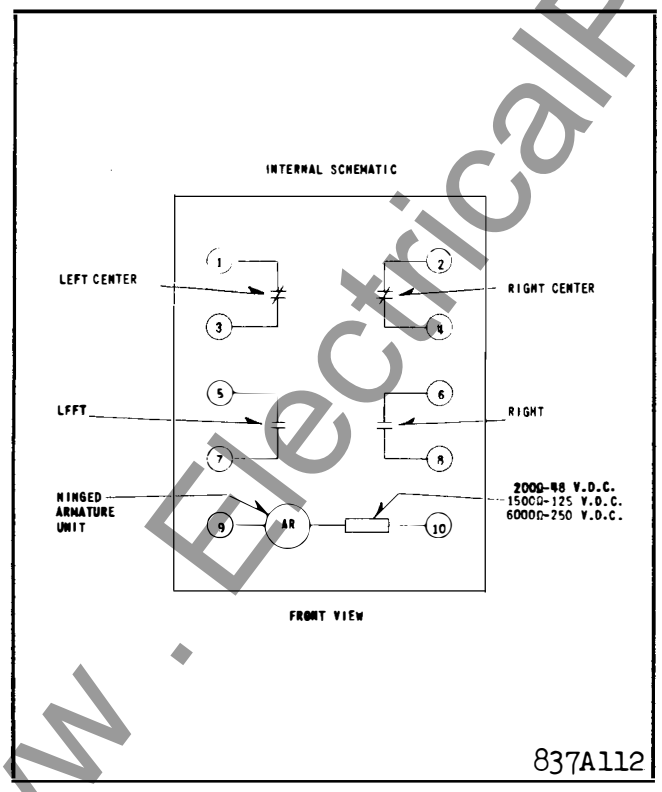


Fig. 8 Internal schematic of the Type AR Relay in front connected molded case with 4 make contacts.



* *Fig. 9 Internal schematic of the Type AR Relay in front connected molded case with 2 make-2 break contacts.*

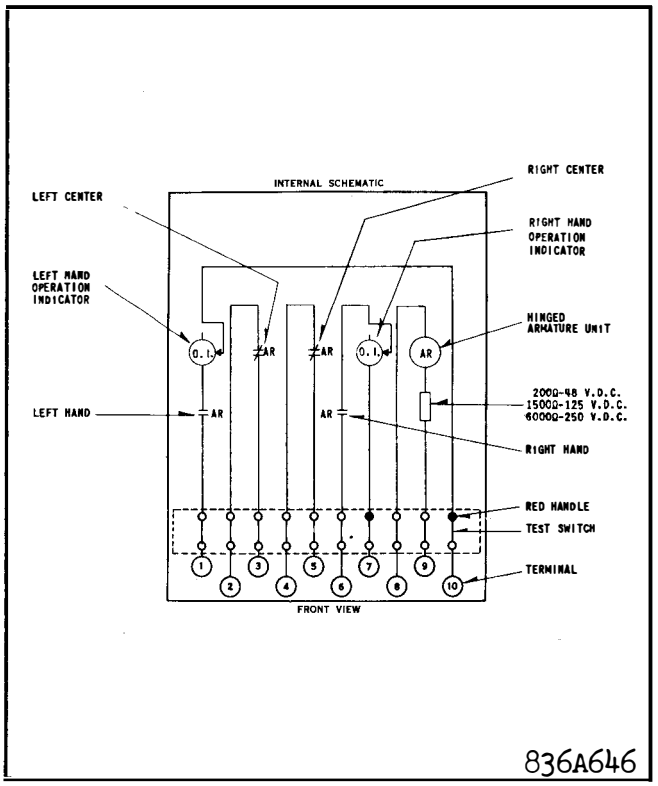


Fig. 10 Internal schematic of the Type AR Relay in the FT-11 case with 2 Operation Indicators.

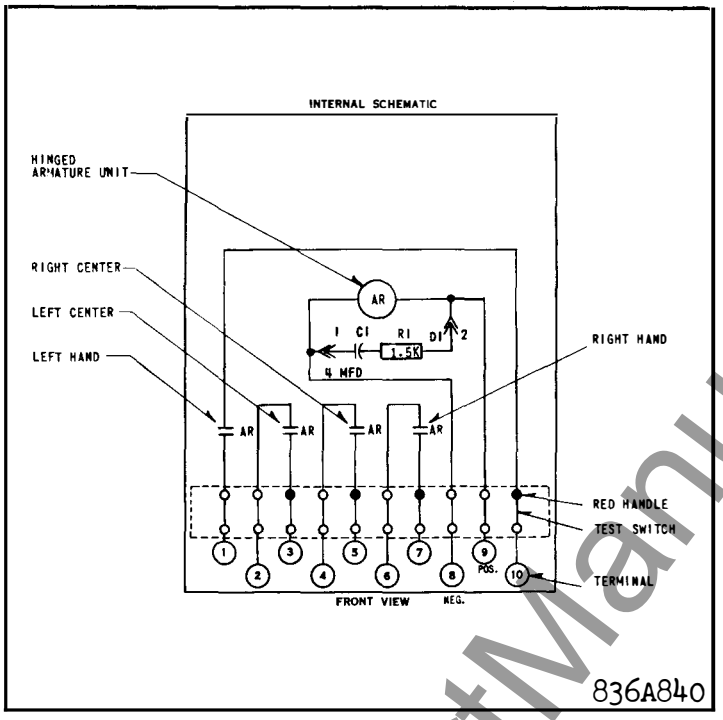
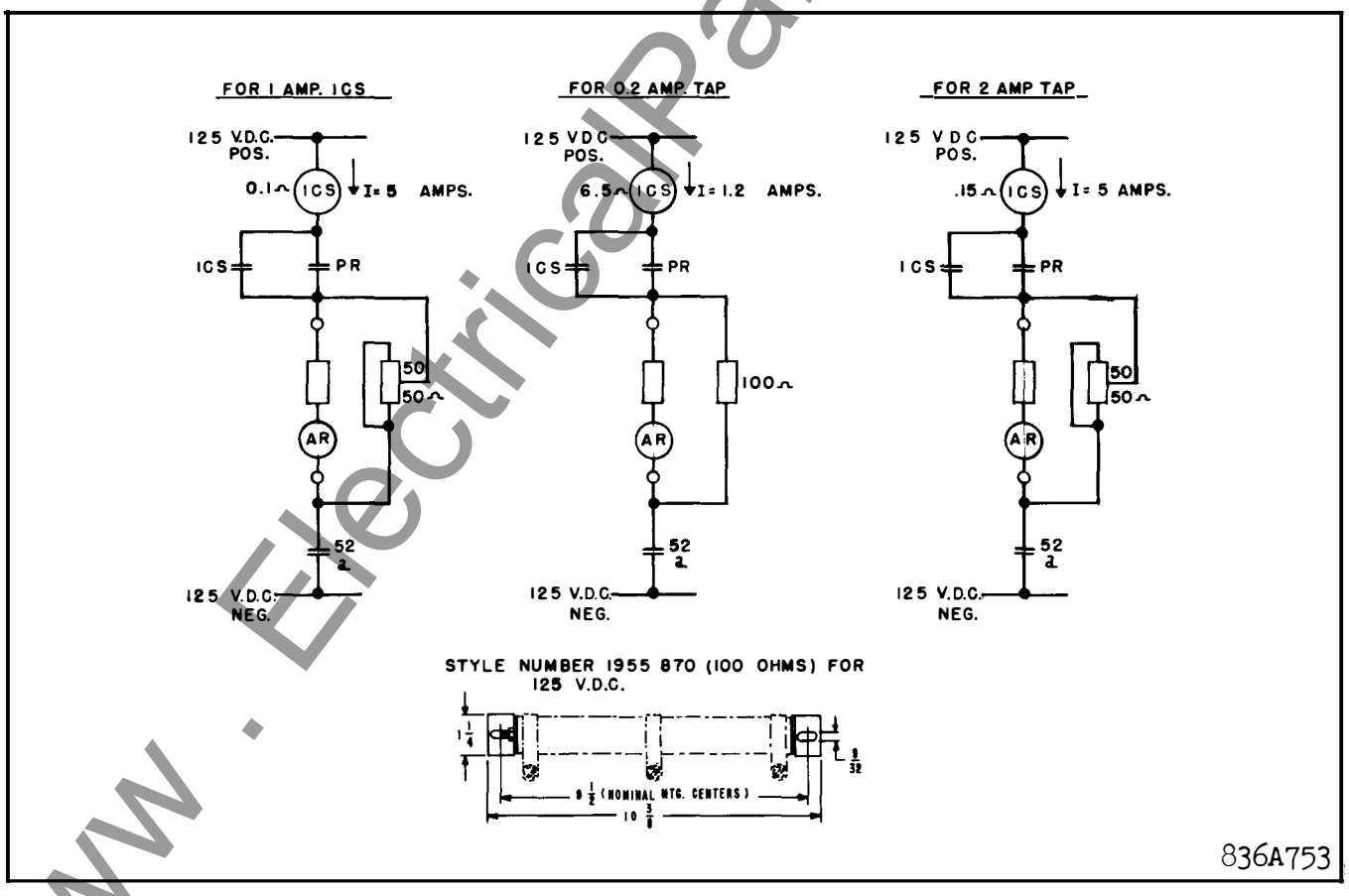


Fig. 11 Internal schematic of the Type AR Relay in the FT-11 case with time delay dropout.



** Fig. 12 External schematic for the Type AR Relay.*

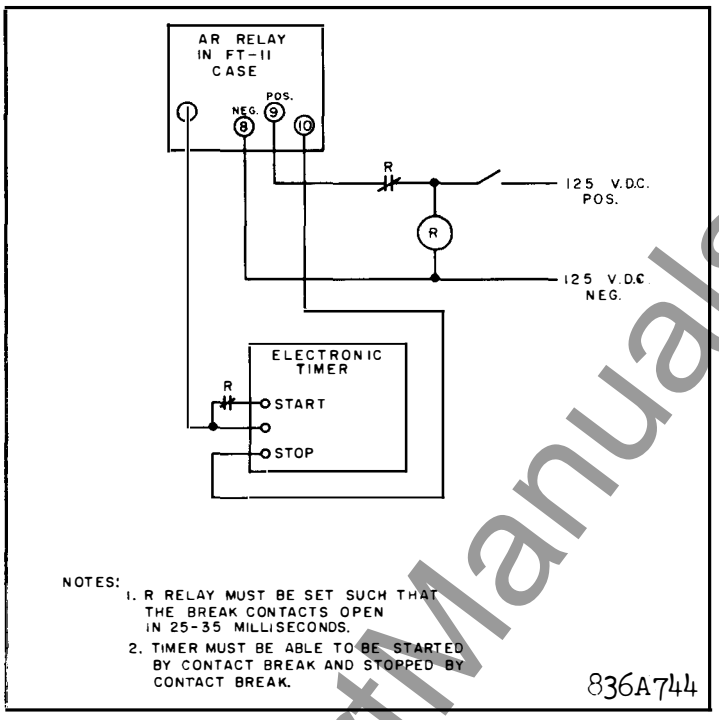
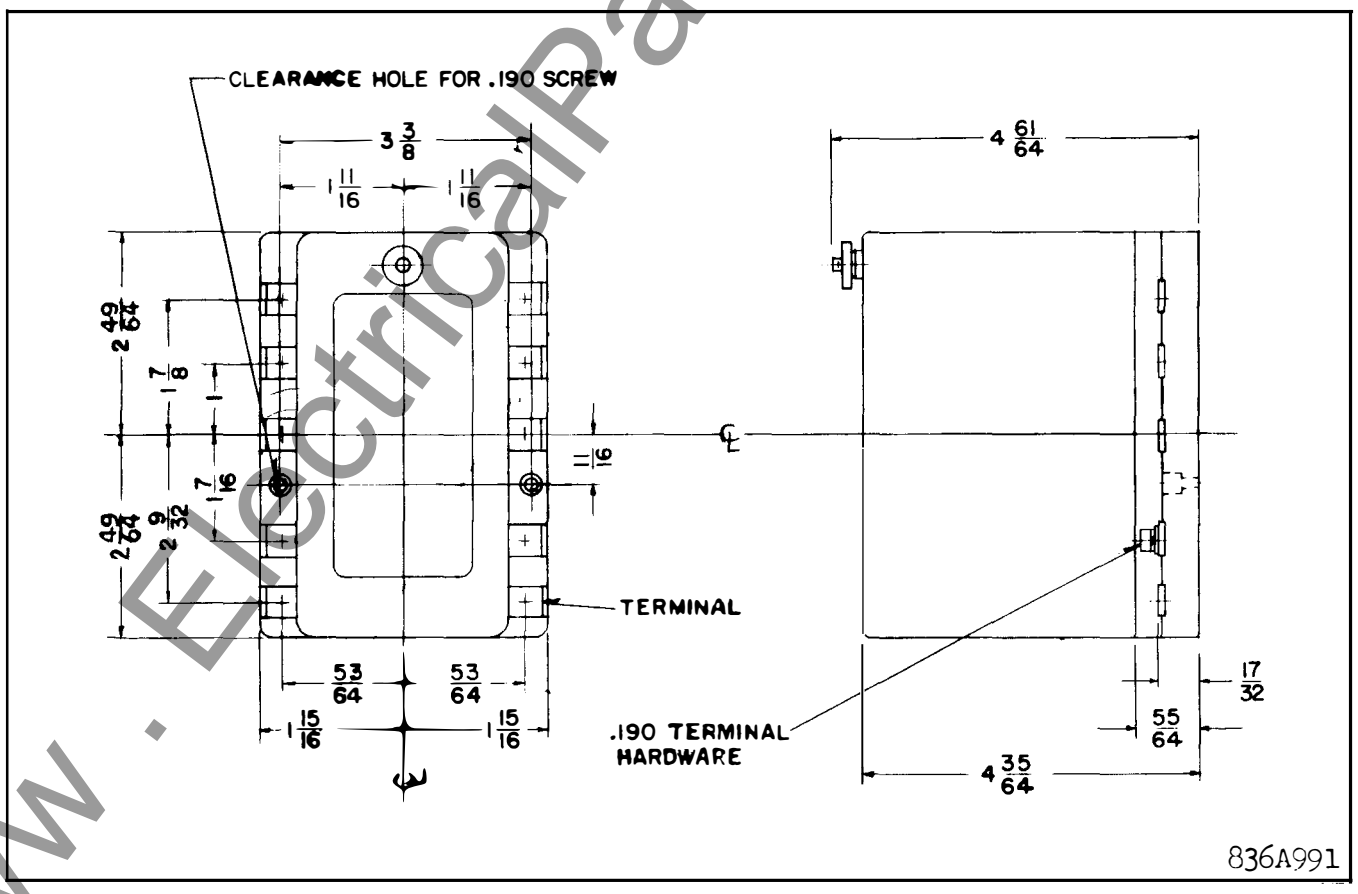


Fig. 13 Test connections for the Type AR Relay with time delay on dropout.



* *Fig. 14 Outline and drilling plan for the Type AR relay in the front connected molded case.*

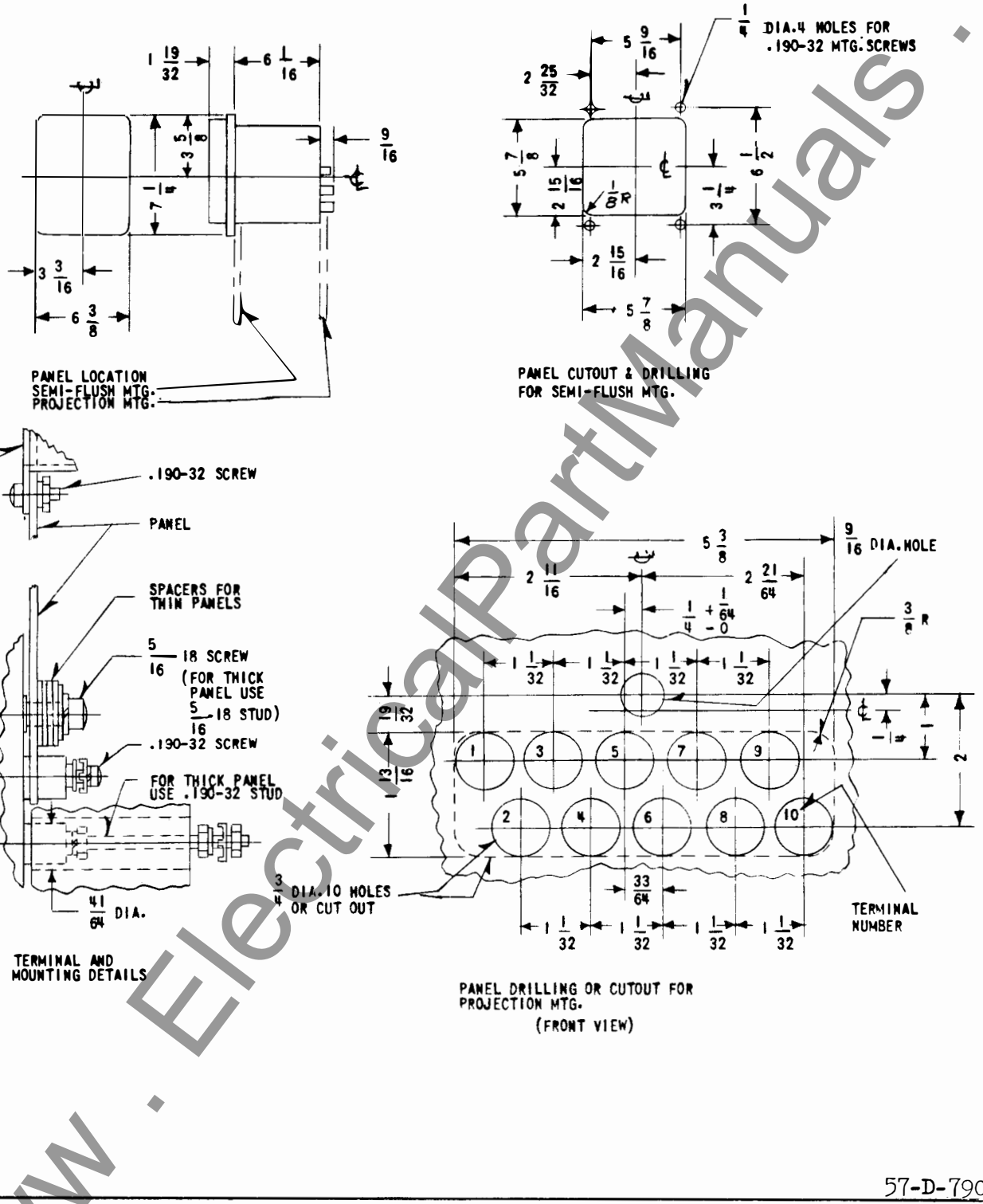


Fig. 15 Outline and drilling plan for the Type AR Relay in the FT-11 case.

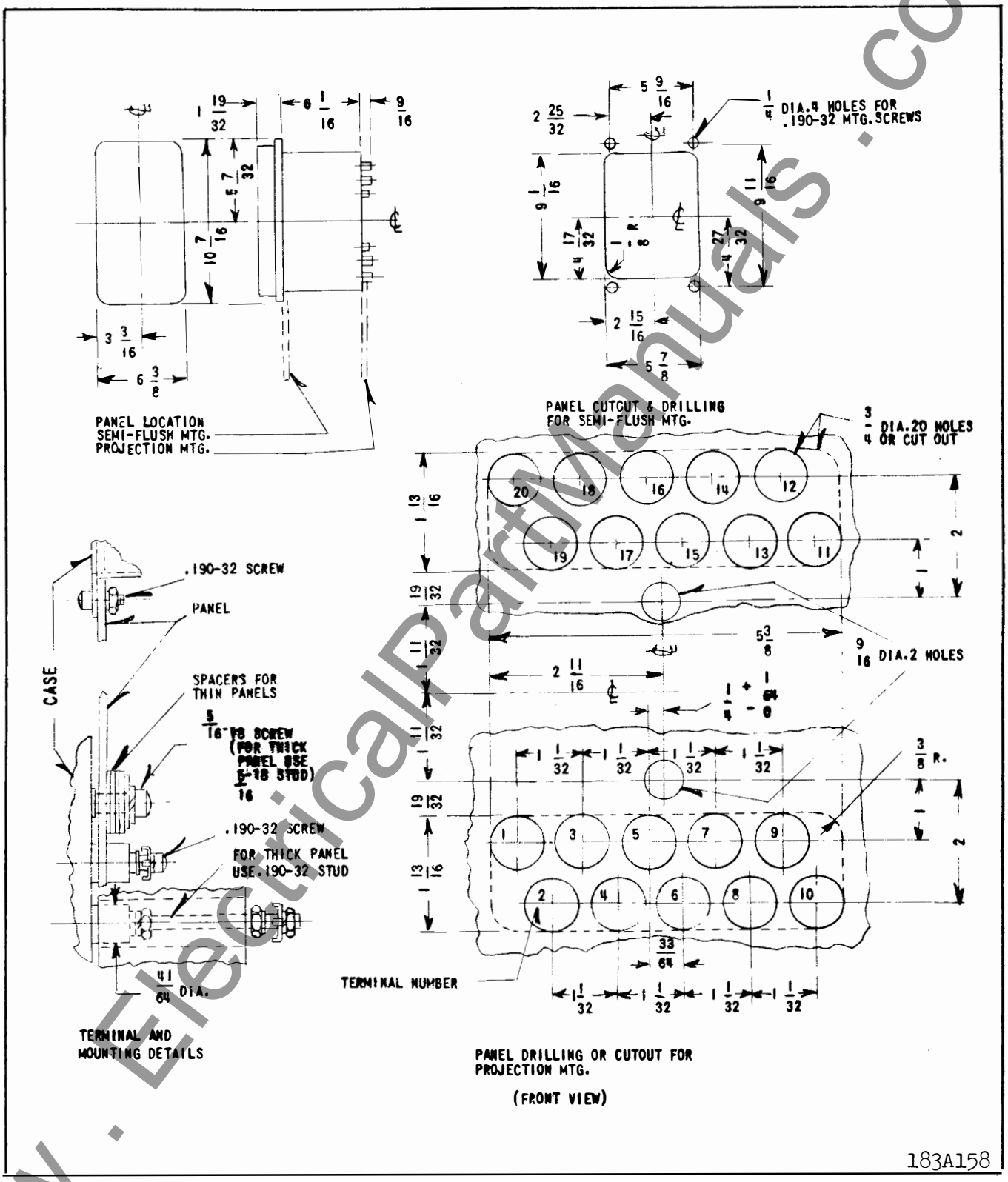


Fig. 16 Outline and drilling plan for the Type AR Relay in the FT-22 case.

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE AR HIGH SPEED AUXILIARY RELAY

CAUTION: Before putting protection 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.

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 one faults.

An AR relay is available with a time delay dropout. It can be used in applications where a delayed dropout of 0.1 seconds is desired.

CONSTRUCTION AND OPERATION

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 Fig. 1 and 2.

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.

Operation Indicator (O.I.)

The d-c operation indicator is a small 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.

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

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.

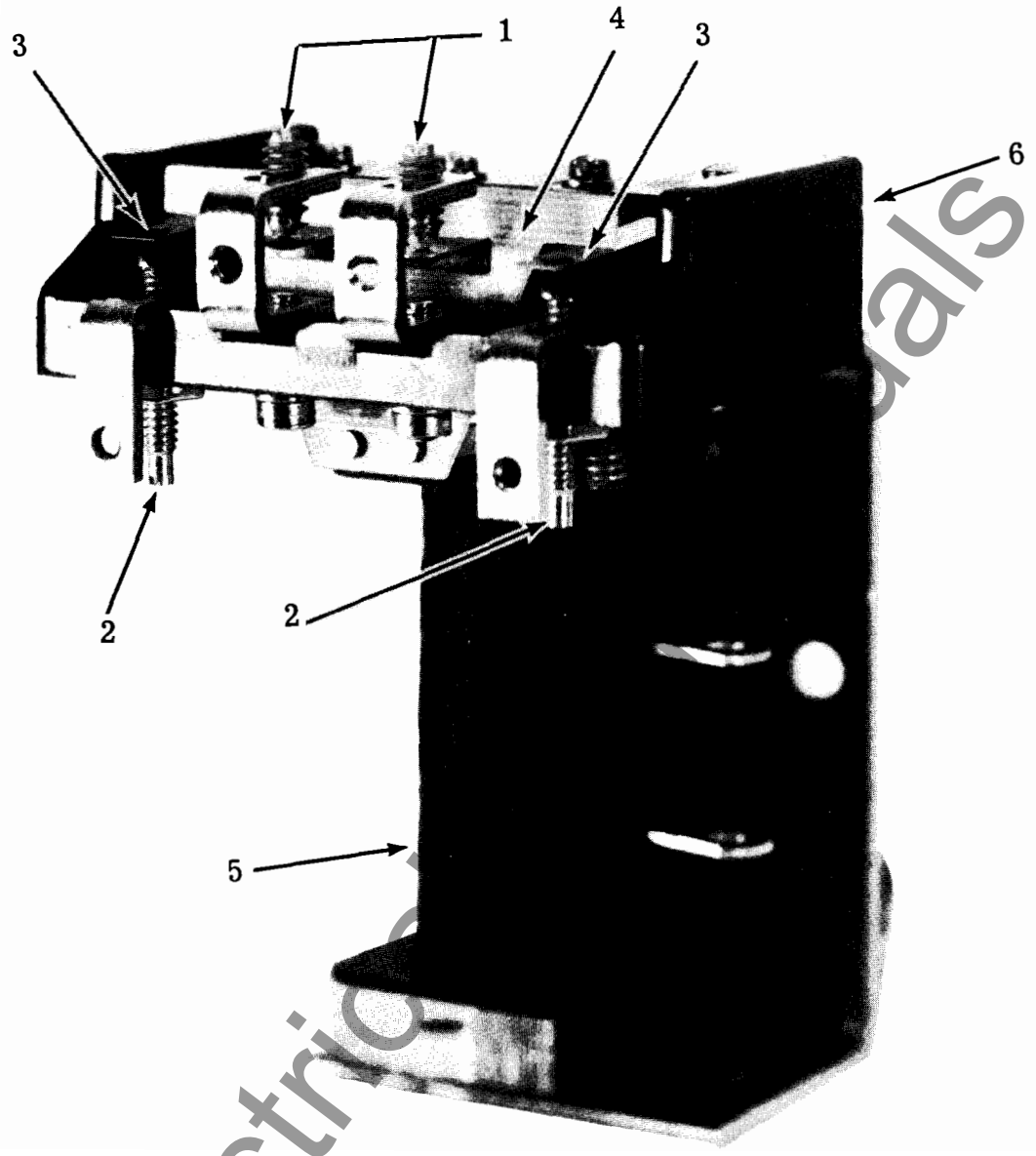
All relays are capable of being energized continuously. All high speed relays will pick up at 80% of rated voltage or less; and drop out at 10% of rated voltage or higher.

Typical operating times and effective contact bounce are outlined in the tables I and II.

The operate time of the relay with delayed dropout is about 6 milliseconds at rated voltage for a normally open contact. The relay will have a 0.1 second dropout time after being energized at least 0.015 seconds.

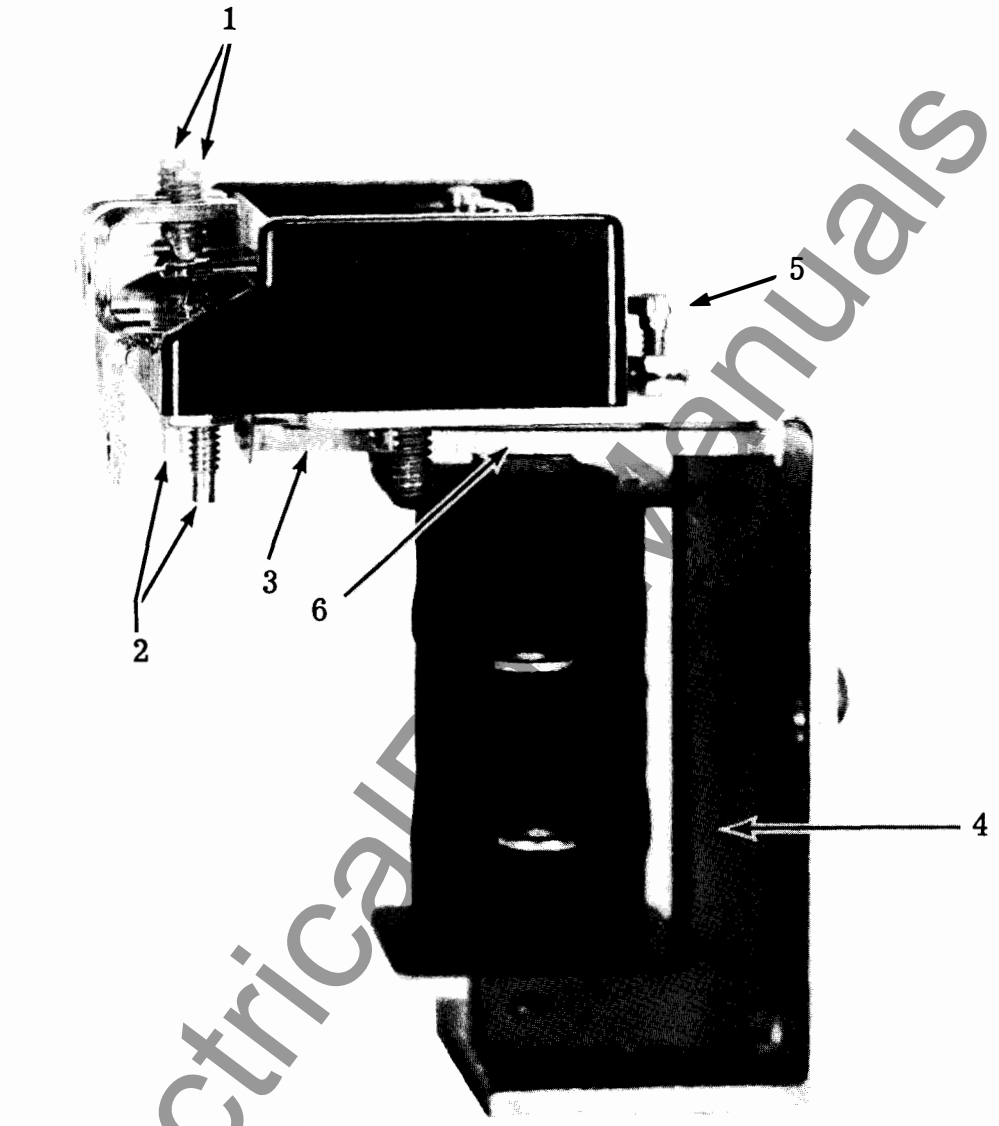
SUPERSEDES I.L. 41-759A
*Denotes change from superseded issue

EFFECTIVE JULY 1967



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – LEAF SPRING MOVING CONTACTS
4 – MOVING CARD ASSEMBLY
5 – RELAY COIL
6 – MOLDED INSULATION BLOCK

Fig. 1 Type AR Unit with two make and two break contacts (Front View).



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – MOVING ARMATURE.
4 – U-SHAPED LAMINATED CORE.
5 – ARMATURE GAP ADJUSTMENT SET SCREW.
6 – ARMATURE GAP

Fig. 2 Type AR Unit with two make and two break contacts (Side View).

TABLE I
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

TABLE II
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	---

Contact Rating

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

SETTINGS

AR Unit

No settings are required.

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.

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 semi-flush mounting or by means of the rear mounting 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.

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 instructions below should be followed.

Acceptance Check

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

1. Contact gaps
   a. Normally open contacts should have a gap of .018 to .023 inch.
   b. Normally closed contact gap should be .013 minimum.
2. Contact pressure
   a. 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.
   b. On two normally open and two normally closed relays, the normally closed contacts should have approximately 8 grams contact pressure in the de-energized position. Each normally open contact spring should have approximately 8 grams pressure against the card.

3. Armature gap

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

4. Contact operate time

   Per Table 1

5. Operation Indicator (O.I.)

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

6. AR relay with time delay on dropout.

   Connect the relay as shown in Fig. 13. When the AR coil has been energized for 25-35 milliseconds its dropout time should be a minimum of 100 milliseconds. The R relay should be adjusted such that its contact break time is 25-35 milliseconds. Also the timer must be of the type which may be started and stopped by break contacts.

CALIBRATION

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs of 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")

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. 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 spring for 8 grams to just move the contact away from the card.

c. Adjust each stationary contact screw to obtain * a contact gap of 0.020 to 0.022 inches for the normally open contacts. Energize the relay and the normally open contacts should have 15 to 30 grams contact follow. 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 Table I and II.

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.

*** TABLE III**

CONTACT INTERRUPTING CAPABILITY (AMPERES)

D.C. VOLTAGE	RESISTIVE LOAD	INDUCTIVE LOAD
	WILL INTERRUPT	WILL INTERRUPT
250	0.2	0.1
125	0.5	0.25
48	1.5	1.0

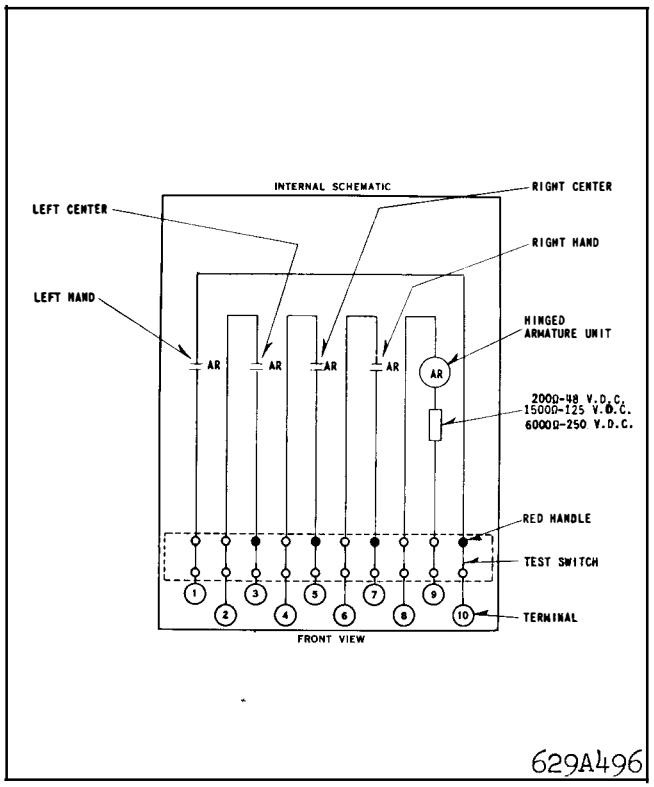


Fig. 3 Internal schematic of the Type AR Relay with 4 make contacts in FT-11 case.

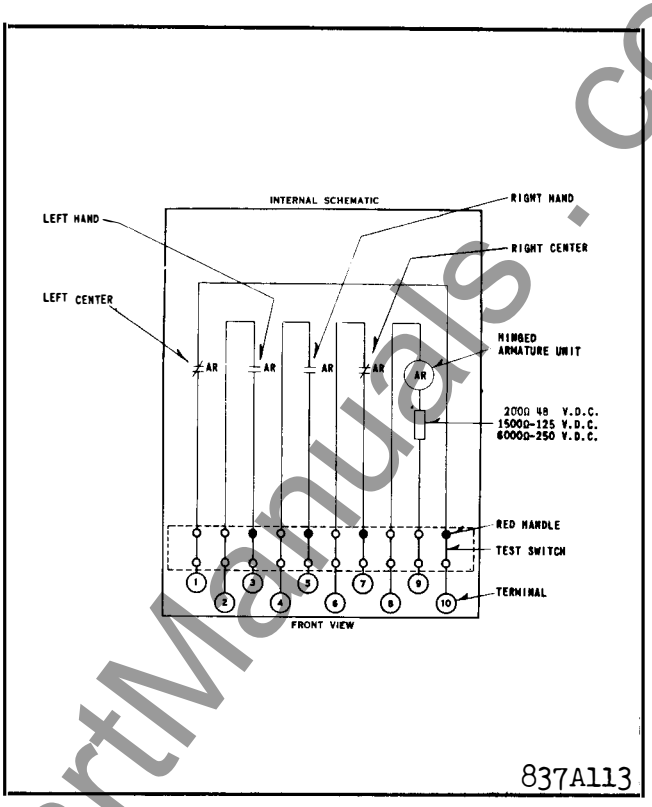


Fig. 4 Internal schematic of the Type AR Relay with 2 make-2 break contacts in FT-11 case.

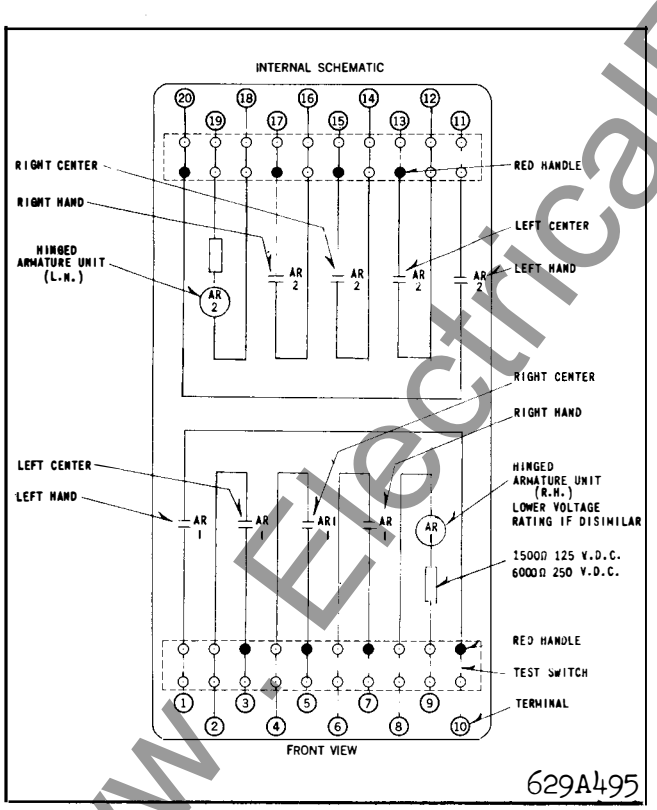


Fig. 5 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 8 make contacts.

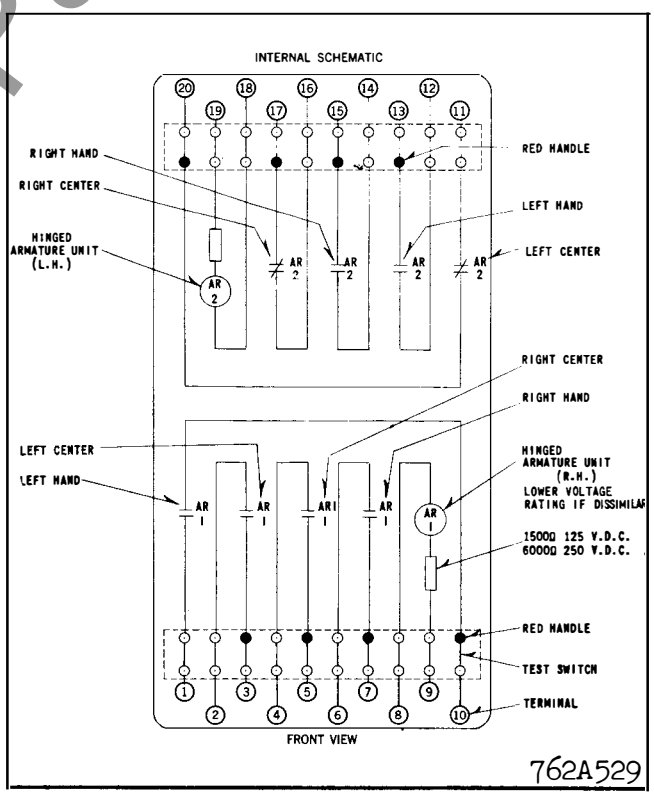


Fig. 6 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 6 make and 2B contacts.

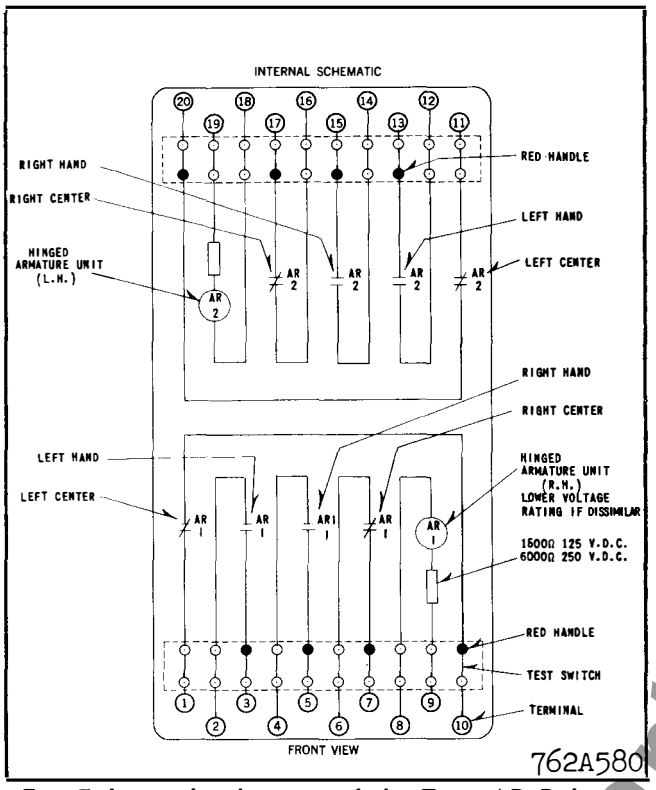


Fig. 7 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 4 make and 4 break contacts.

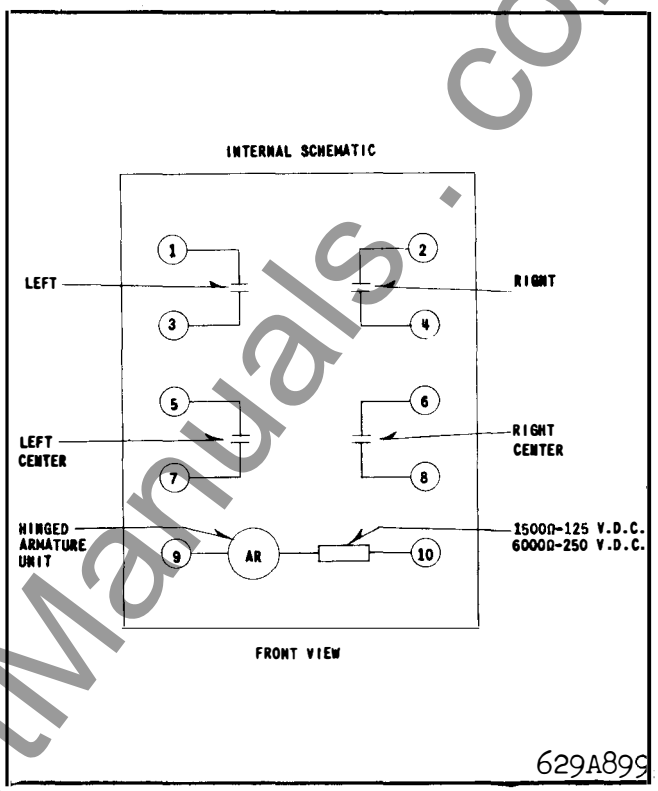


Fig. 8 Internal schematic of the Type AR Relay in front connected molded case with 4 make contacts.

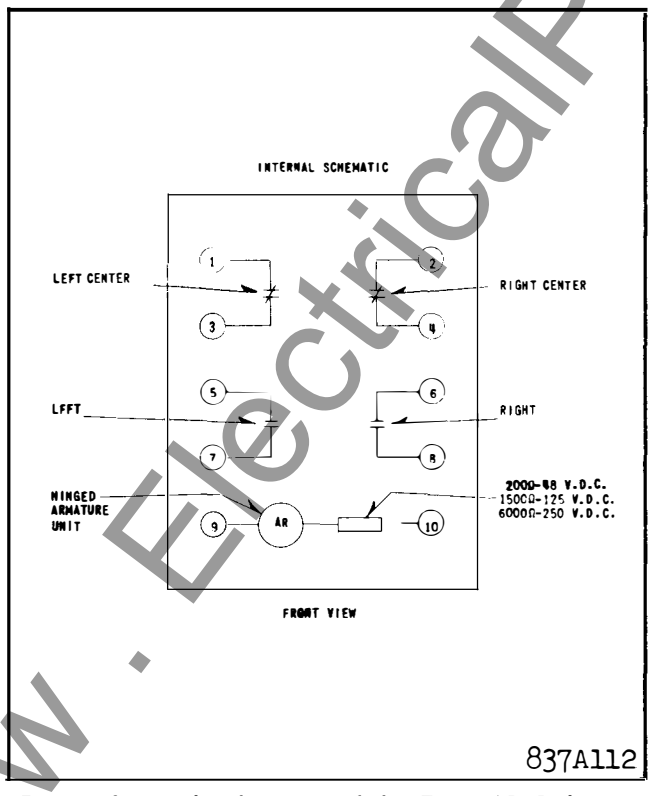


Fig. 9 Internal schematic of the Type AR Relay in front connected molded case with 2 make-2 break contacts.

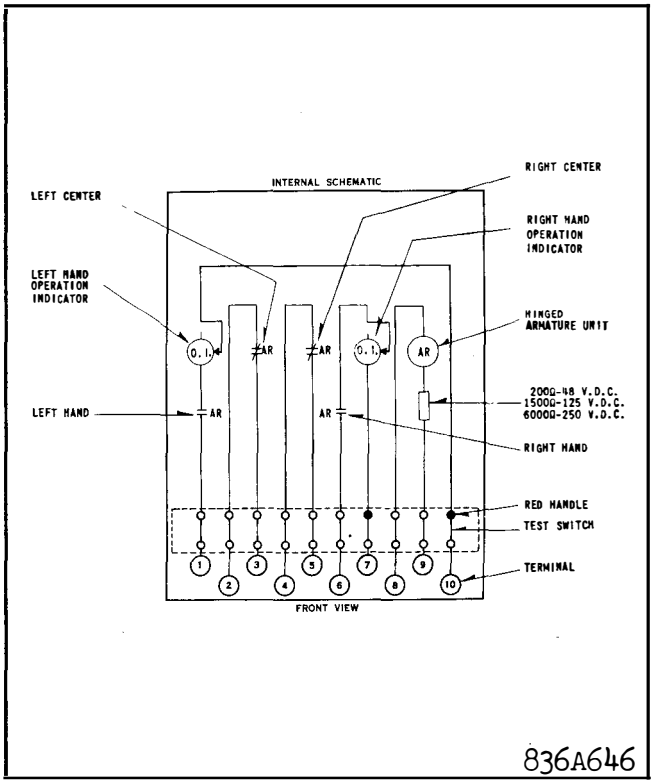


Fig. 10 Internal schematic of the Type AR Relay in the FT-11 case with 2 Operation Indicators.

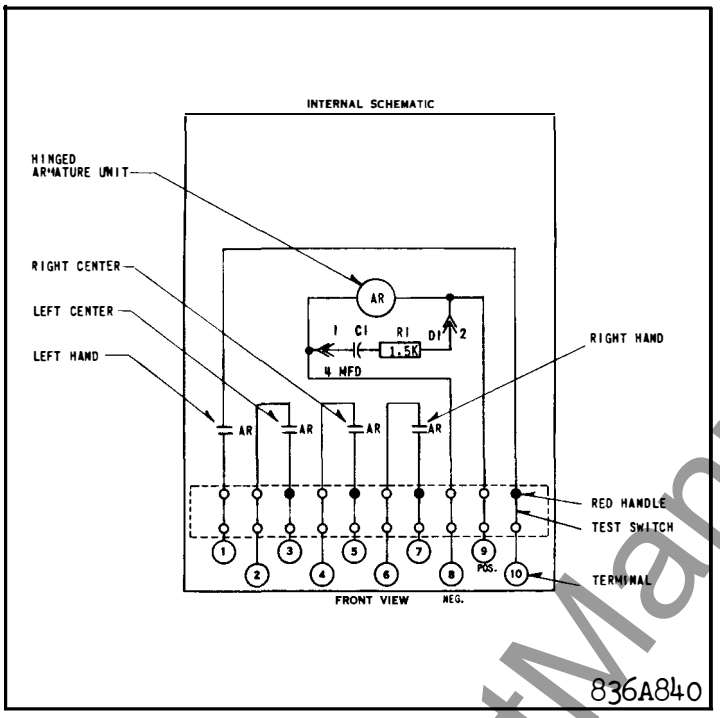
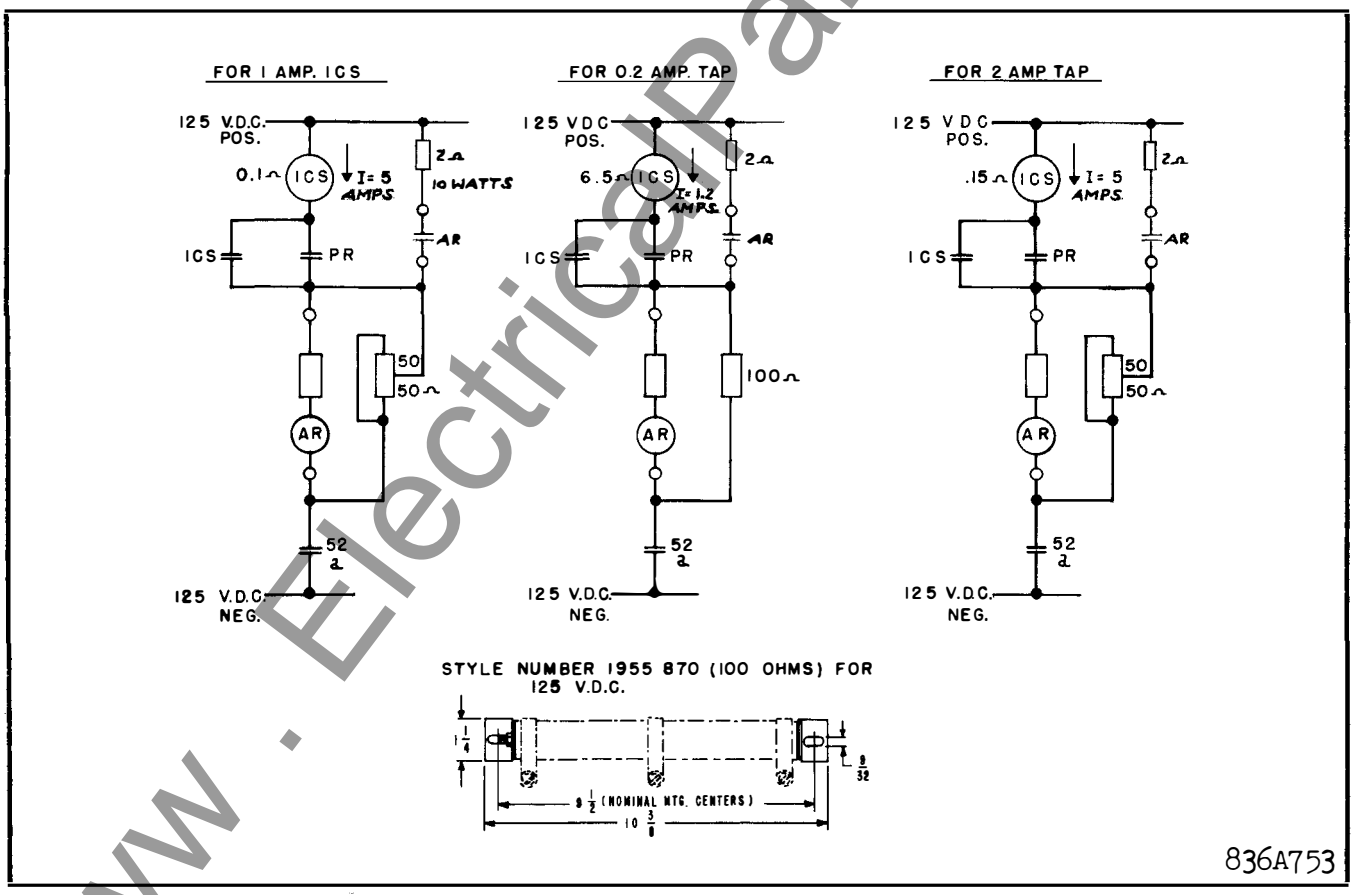


Fig. 11 Internal schematic of the Type AR Relay in the FT-11 case with time delay dropout.



** Fig. 12 External schematic for the Type AR Relay.*

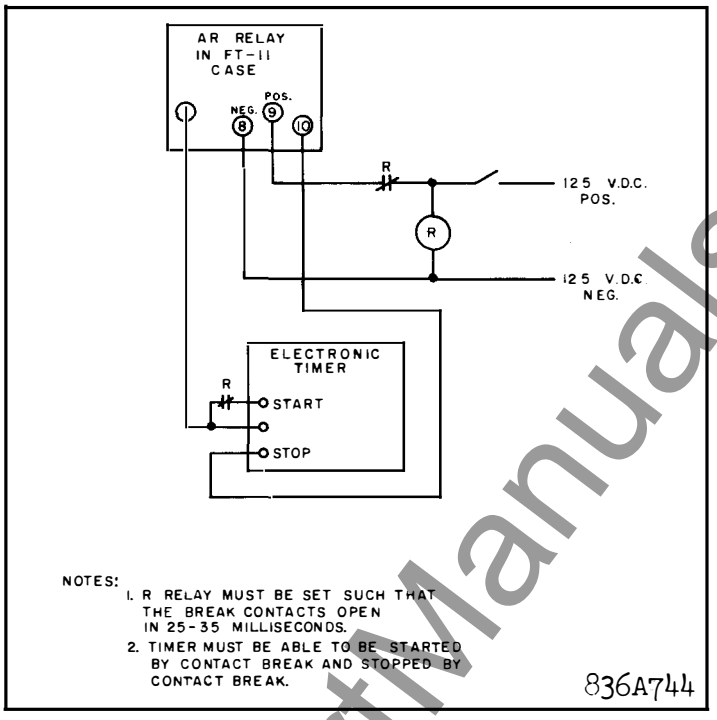


Fig. 13 Test connections for the Type AR Relay with time delay on dropout.

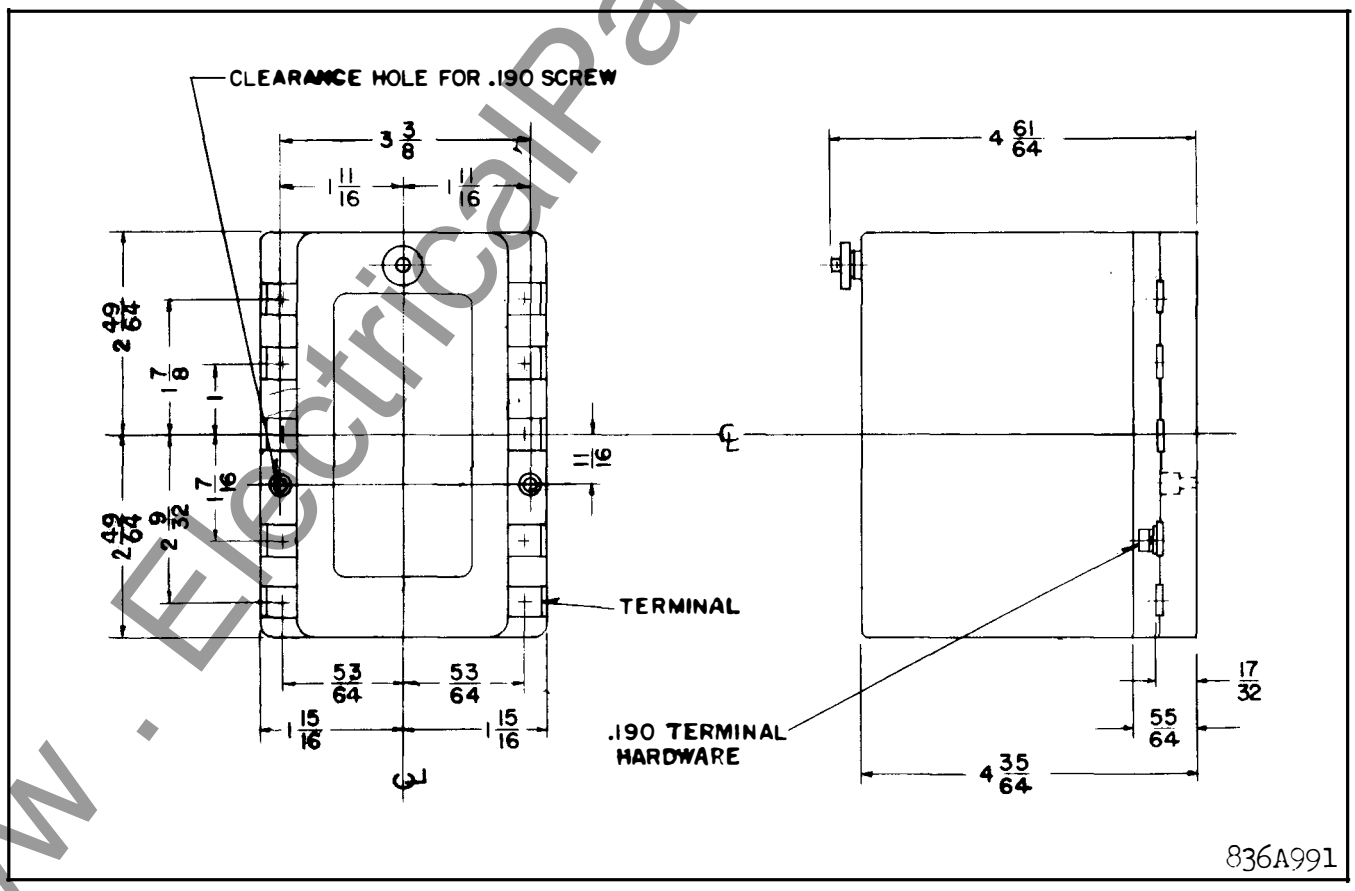


Fig. 14 Outline and drilling plan for the Type AR relay in the front connected molded case.

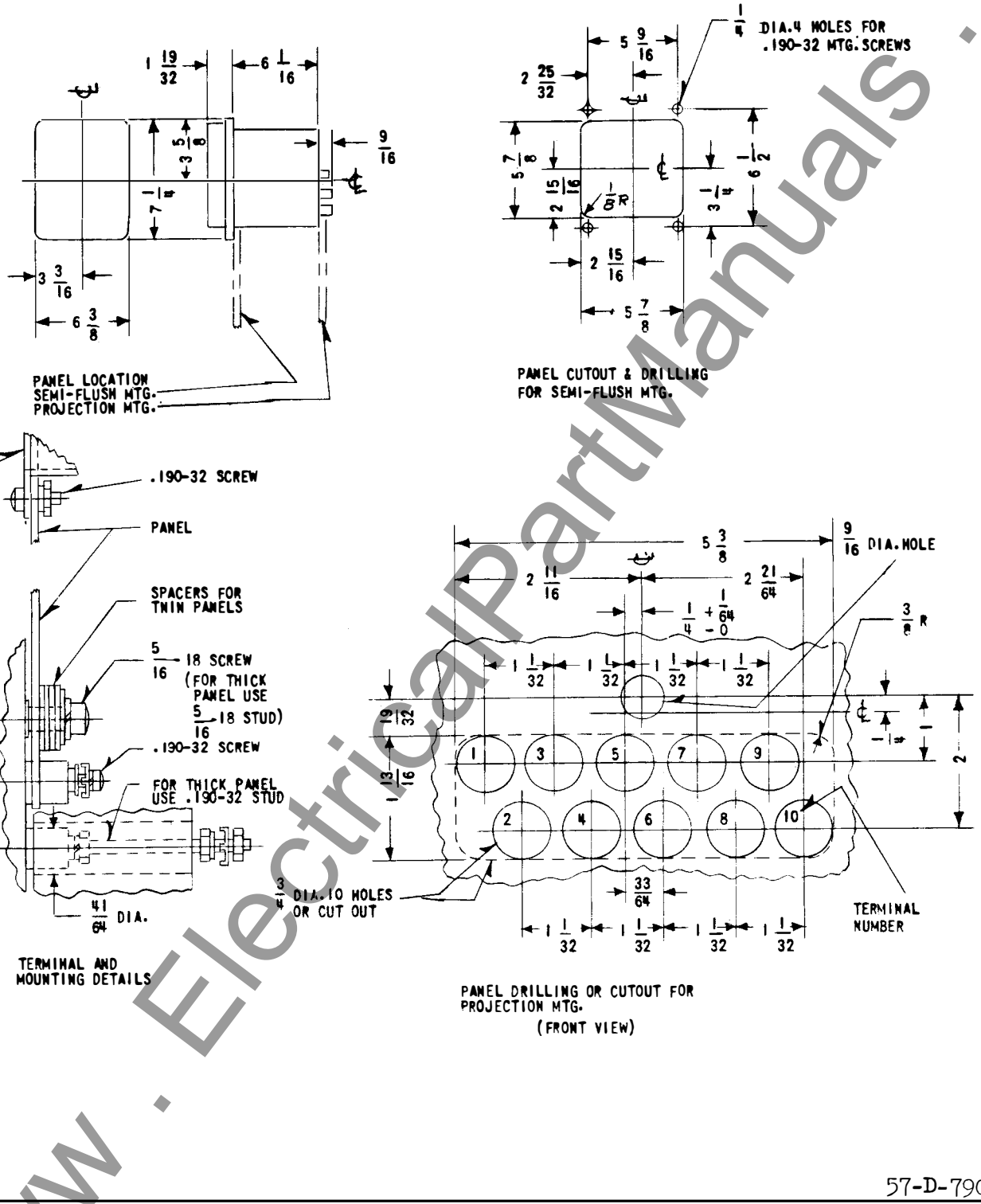


Fig. 15 Outline and drilling plan for the Type AR Relay in the FT-11 case.

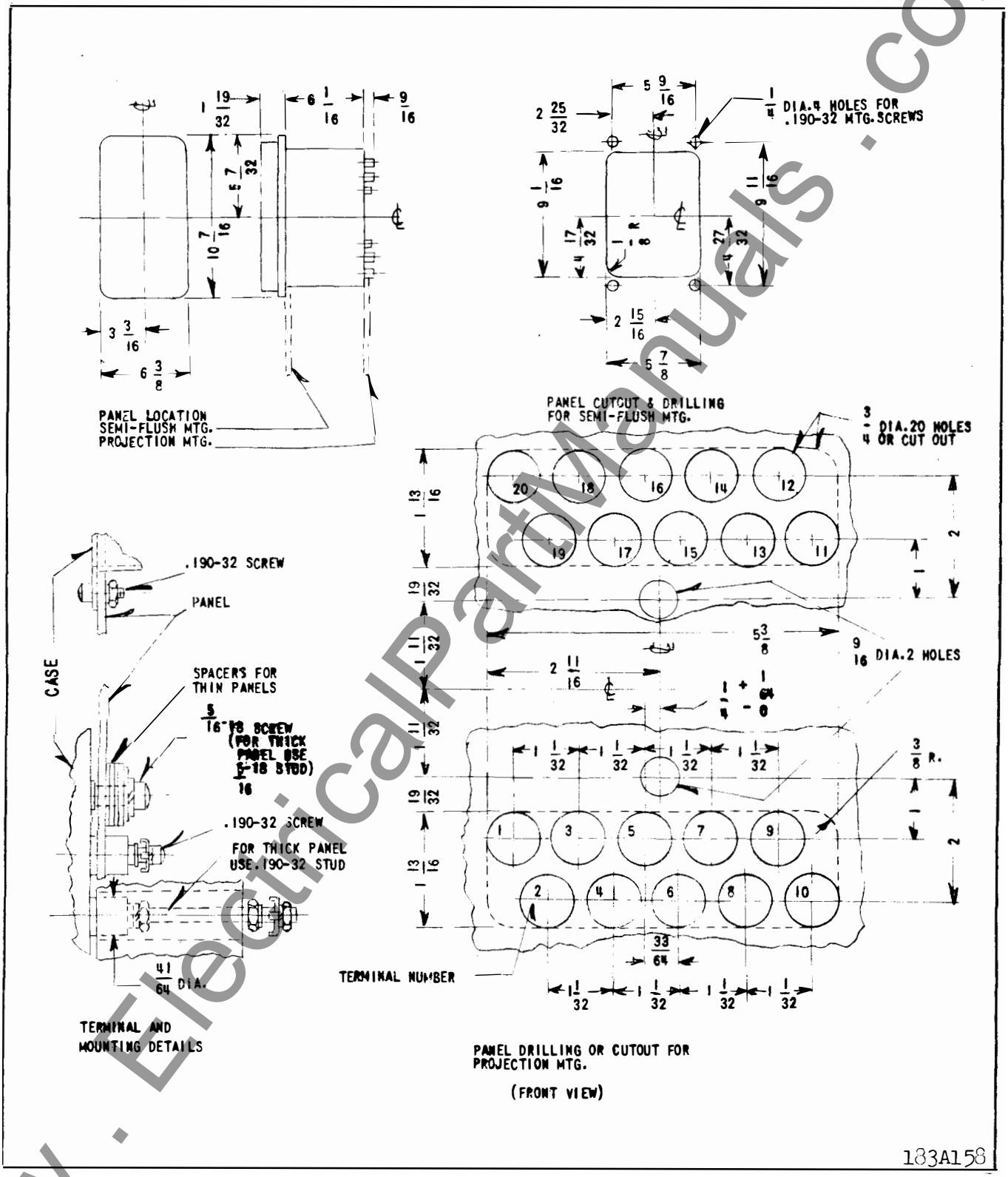


Fig. 16 Outline and drilling plan for the Type AR Relay in the FT-22 case.

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE AR HIGH SPEED AUXILIARY RELAY

CAUTION: Before putting protection 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.

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 one faults.

An AR relay is available with a time delay dropout. It can be used in applications where a delayed dropout of 0.1 seconds is desired.

CONSTRUCTION AND OPERATION

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 Fig. 1 and 2.

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.

Operation Indicator (O.I.)

The d-c operation indicator is a small 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.

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

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.

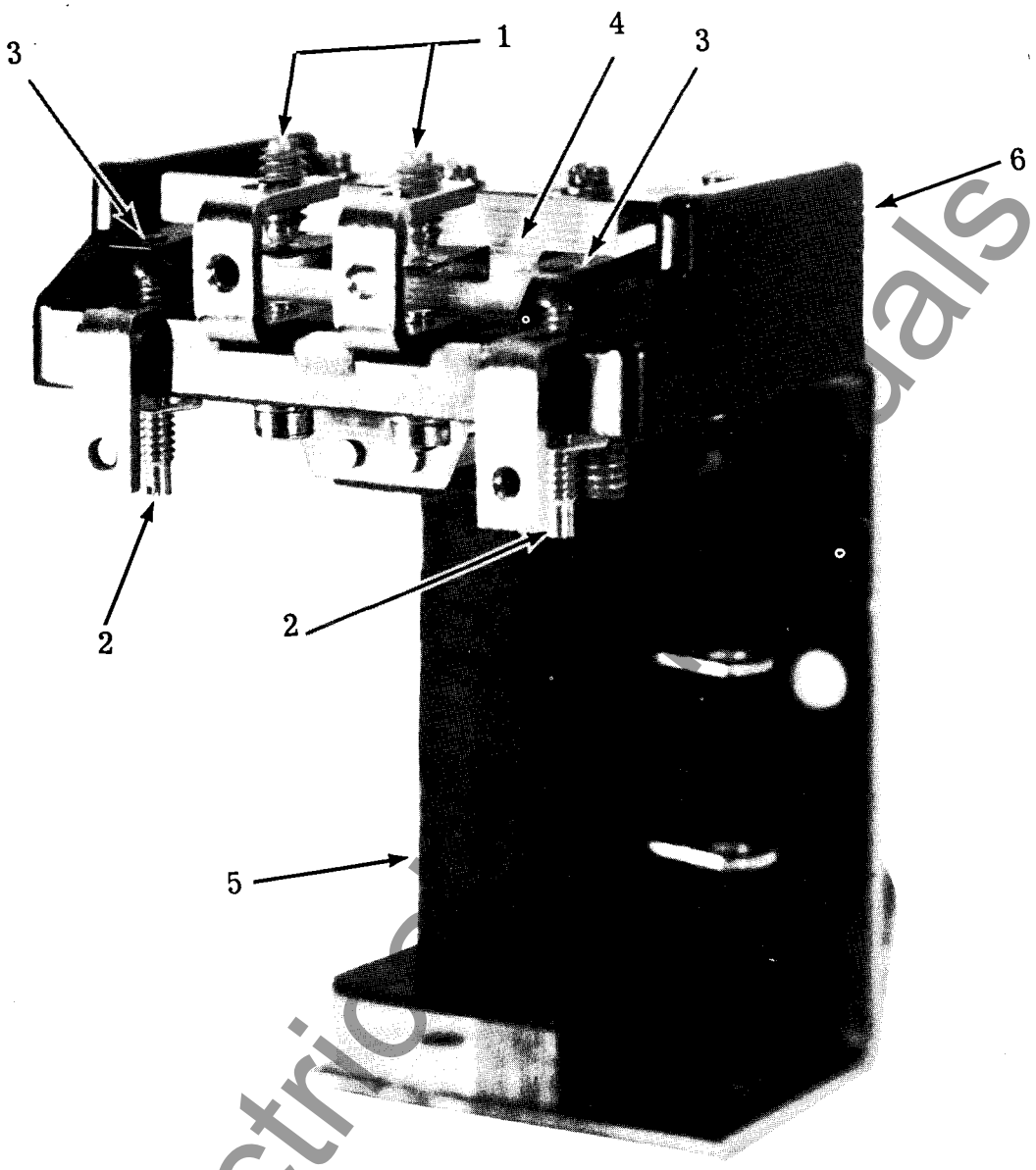
All relays are capable of being energized continuously. All high speed relays will pick up at 80% of rated voltage or less; and drop out at 10% of rated voltage or higher.

Typical operating times and effective contact bounce are outlined in the tables I and II.

The operate time of the relay with delayed dropout is about 6 milliseconds at rated voltage for a normally open contact. The relay will have a 0.1 second dropout time after being energized at least 0.015 seconds.

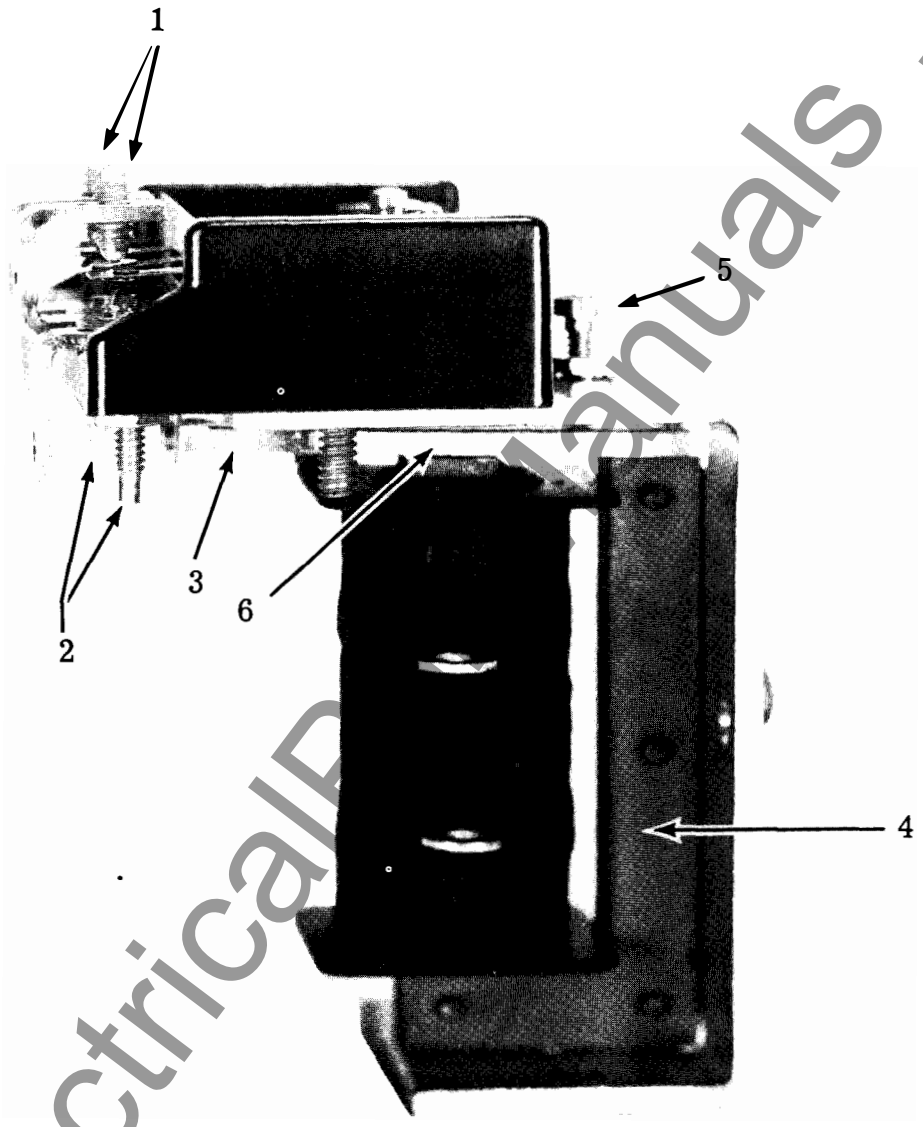
SUPERSEDES I.L. 41-759B
*Denotes change from superseded issue.

EFFECTIVE JULY 1968



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – LEAF SPRING MOVING CONTACTS
4 – MOVING CARD ASSEMBLY
5 – RELAY COIL
6 – MOLDED INSULATION BLOCK

Fig. 1 Type AR Unit with two make and two break contacts (Front View).



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – MOVING ARMATURE.
4 – U-SHAPED LAMINATED CORE.
5 – ARMATURE GAP ADJUSTMENT SET SCREW.
6 – ARMATURE GAP

Fig. 2 Type AR Unit with two make and two break contacts (Side View).

TABLE I
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

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

TABLE II
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	---

Contact Rating

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

SETTINGS

AR Unit

No settings are required.

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.

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 semi-flush mounting or by means of the rear mounting 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.

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 instructions below should be followed.

Acceptance Check

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

1. Contact gaps
   a. Normally open contacts should have a gap of .018 to .023 inch.
   b. Normally closed contact gap should be .013 minimum.
2. Contact pressure
   a. 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.
   b. On two normally open and two normally closed relays, the normally closed contacts should have approximately 8 grams contact pressure in the de-energized position. Each normally open contact spring should have approximately 8 grams pressure against the card.

3. Armature gap

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

4. Contact operate time

   Per Table 1

5. Operation Indicator (O.I.)

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

6. AR relay with time delay on dropout.

   Connect the relay as shown in Fig. 13. When the AR coil has been energized for 25-35 milliseconds its dropout time should be a minimum of 100 milliseconds. The R relay should be adjusted such that its contact break time is 25-35 milliseconds. Also the timer must be of the type which may be started and stopped by break contacts.

CALIBRATION

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs of 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")

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. 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 spring for 8 grams to just move the contact away from the card.

   Adjust each stationary contact screw to obtain a contact gap of 0.020 to 0.022 inches for the normally open contacts. Energize the relay and the normally open contacts should have 15 to 30 grams contact follow. 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 Table I and II.

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.

TABLE III

CONTACT INTERRUPTING CAPABILITY (AMPERES)

D.C. VOLTAGE	RESISTIVE LOAD	INDUCTIVE LOAD
	WILL INTERRUPT	WILL INTERRUPT
250	0.2	0.1
125	0.5	0.25
48	1.5	1.0

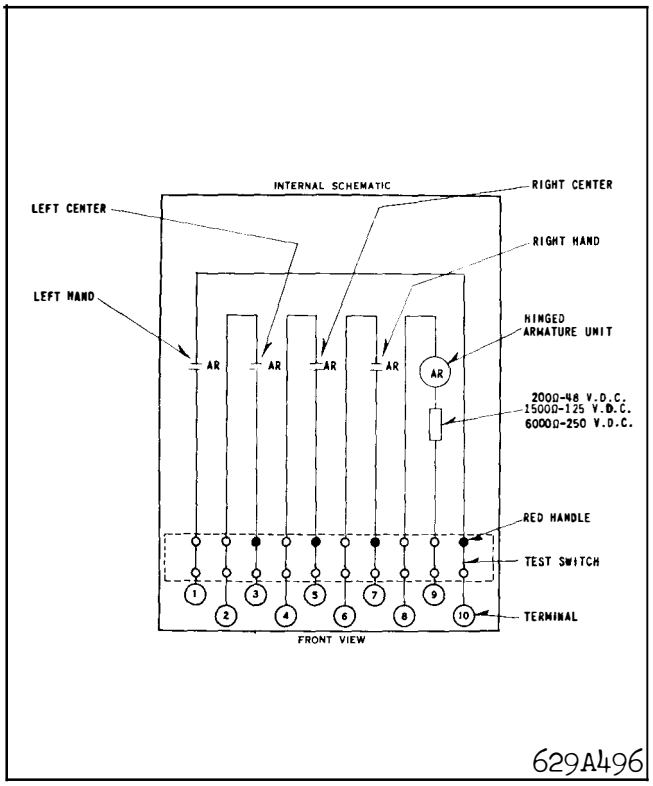


Fig. 3 Internal schematic of the Type AR Relay with 4 make contacts in FT-11 case.

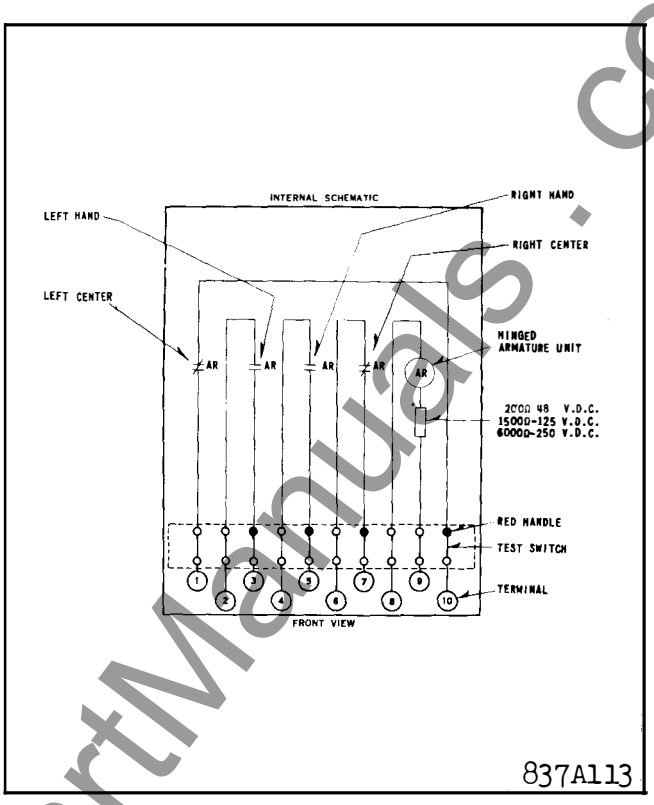


Fig. 4 Internal schematic of the Type AR Relay with 2 make - 2 break contacts in FT-11 case.

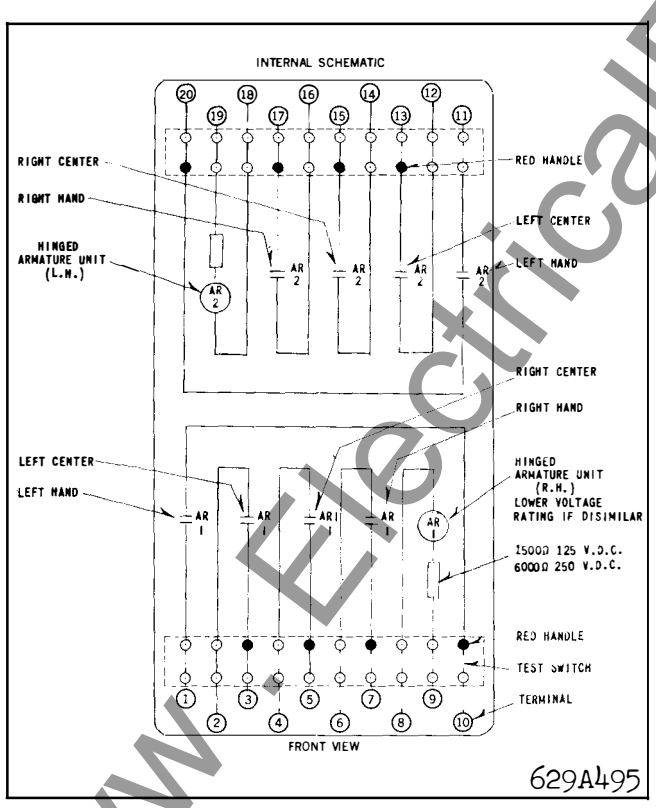


Fig. 5 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 8 make contacts.

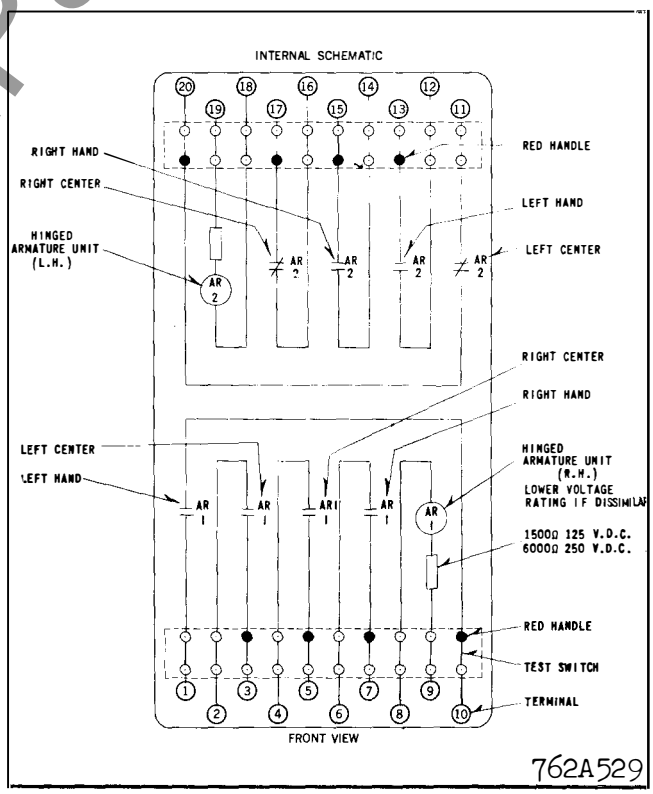


Fig. 6 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 6 make and 2B contacts.

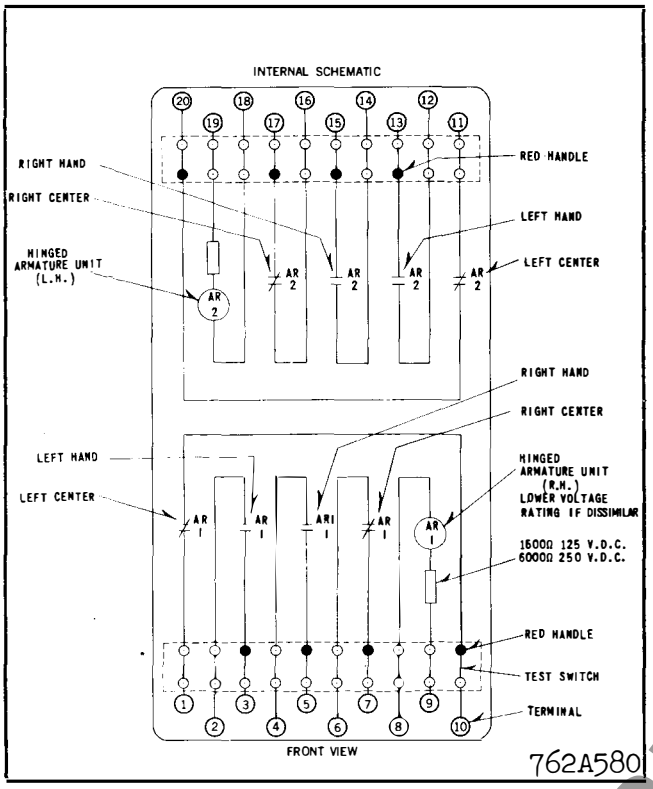


Fig. 7 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 4 make and 4 break contacts.

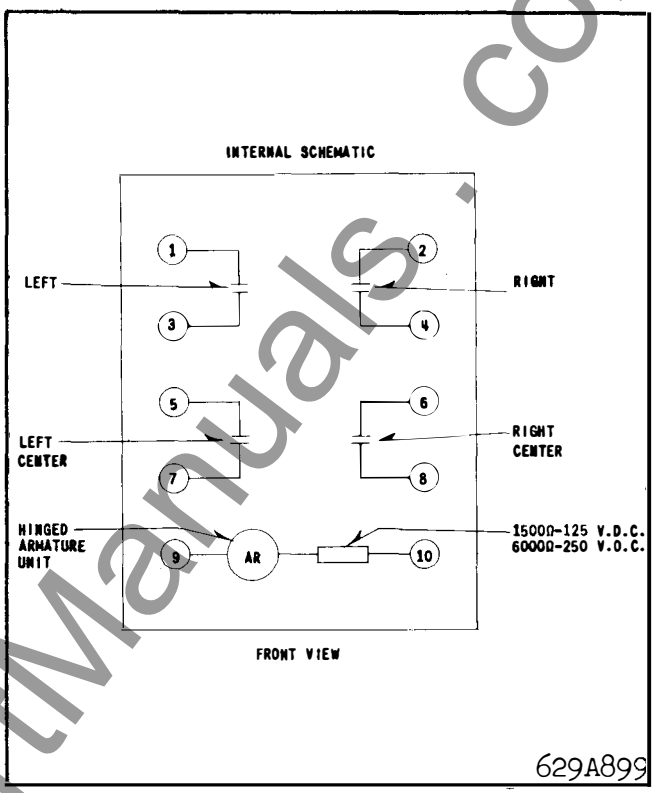


Fig. 8 Internal schematic of the Type AR Relay in front connected molded case with 4 make contacts.

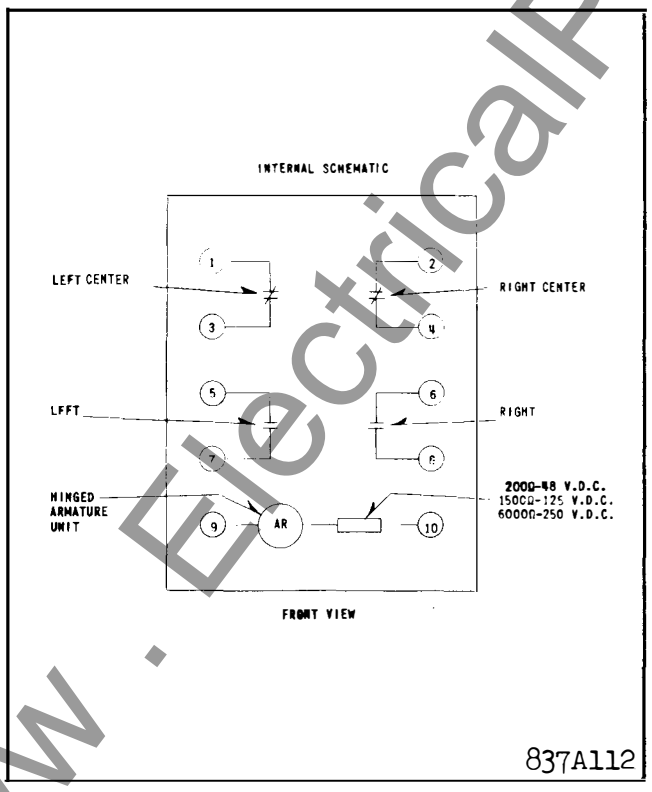


Fig. 9 Internal schematic of the Type AR Relay in front connected molded case with 2 make-2 break contacts.

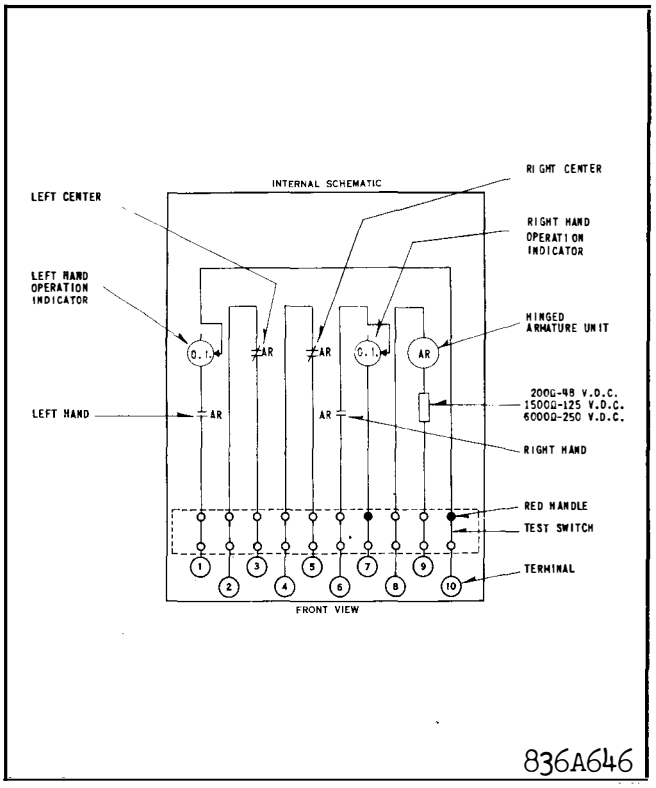
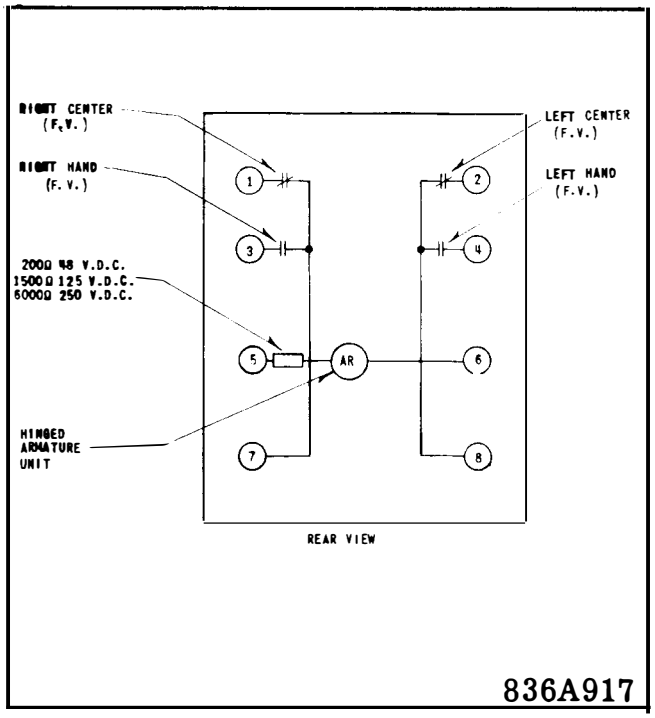
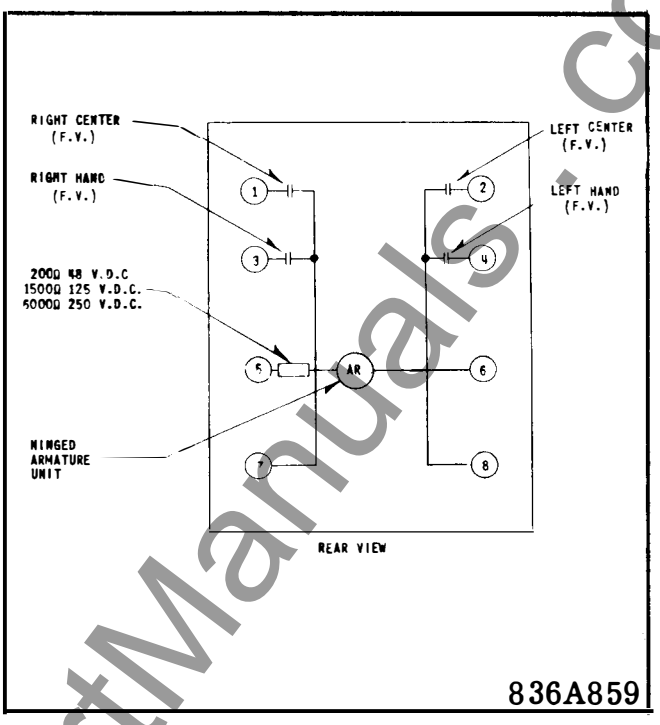


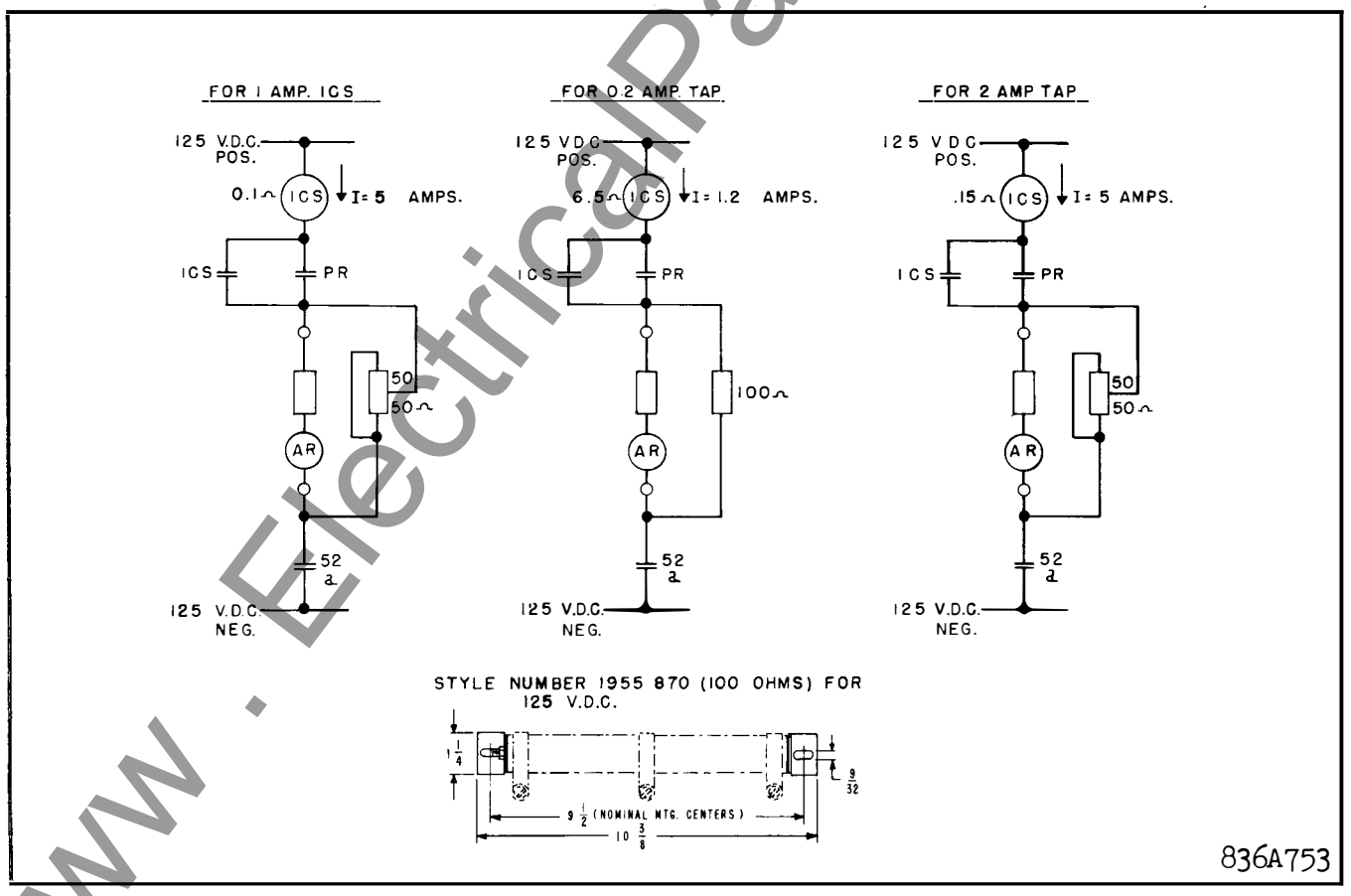
Fig. 10 Internal schematic of the Type AR Relay in the FT-11 case with 2 Operation Indicators.



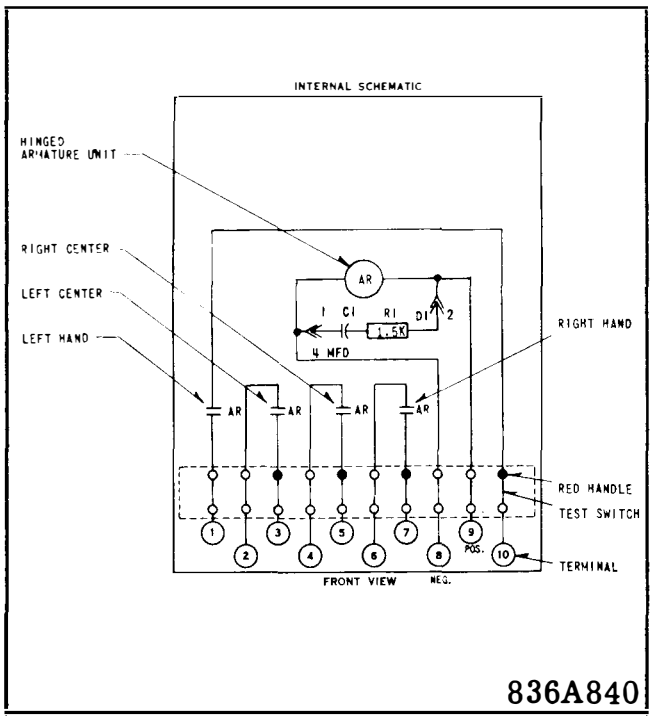
* *Fig. 11 Internal schematic of the AR Relay with 2 make and 2 brake contacts in molded case.*



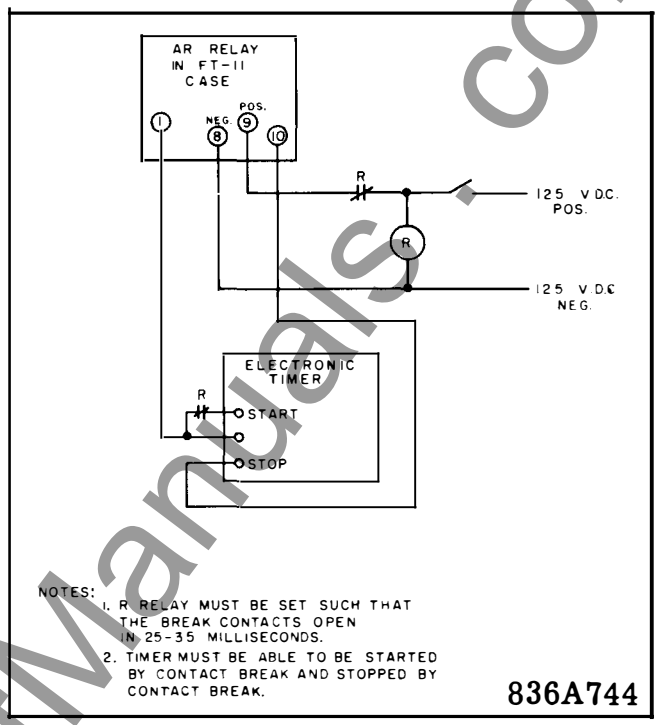
* *Fig. 12 Internal schematic of the AR with 4 make contacts in molded case.*



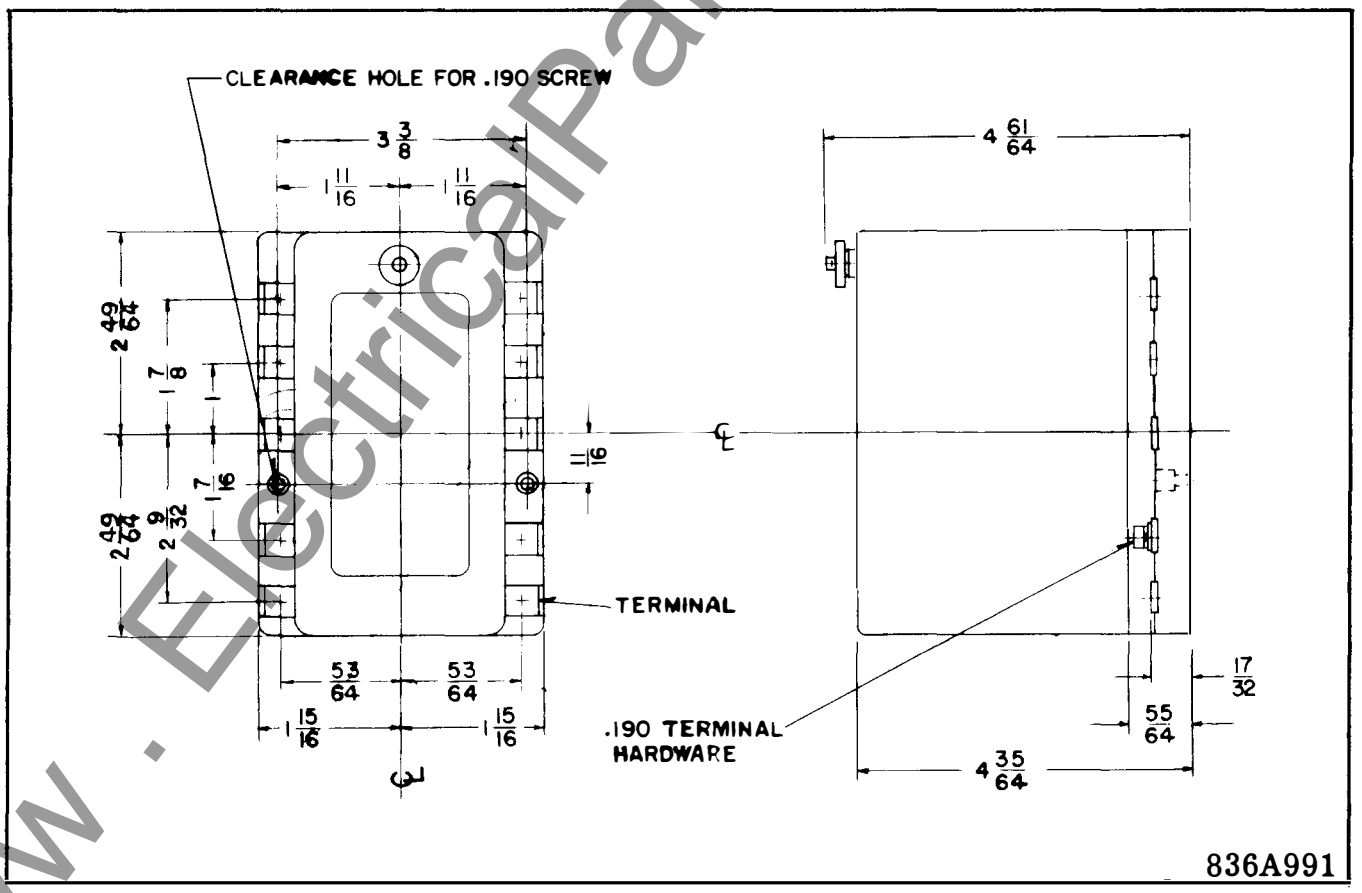
* *Fig. 13 External schematic for the Type AR Relay.*



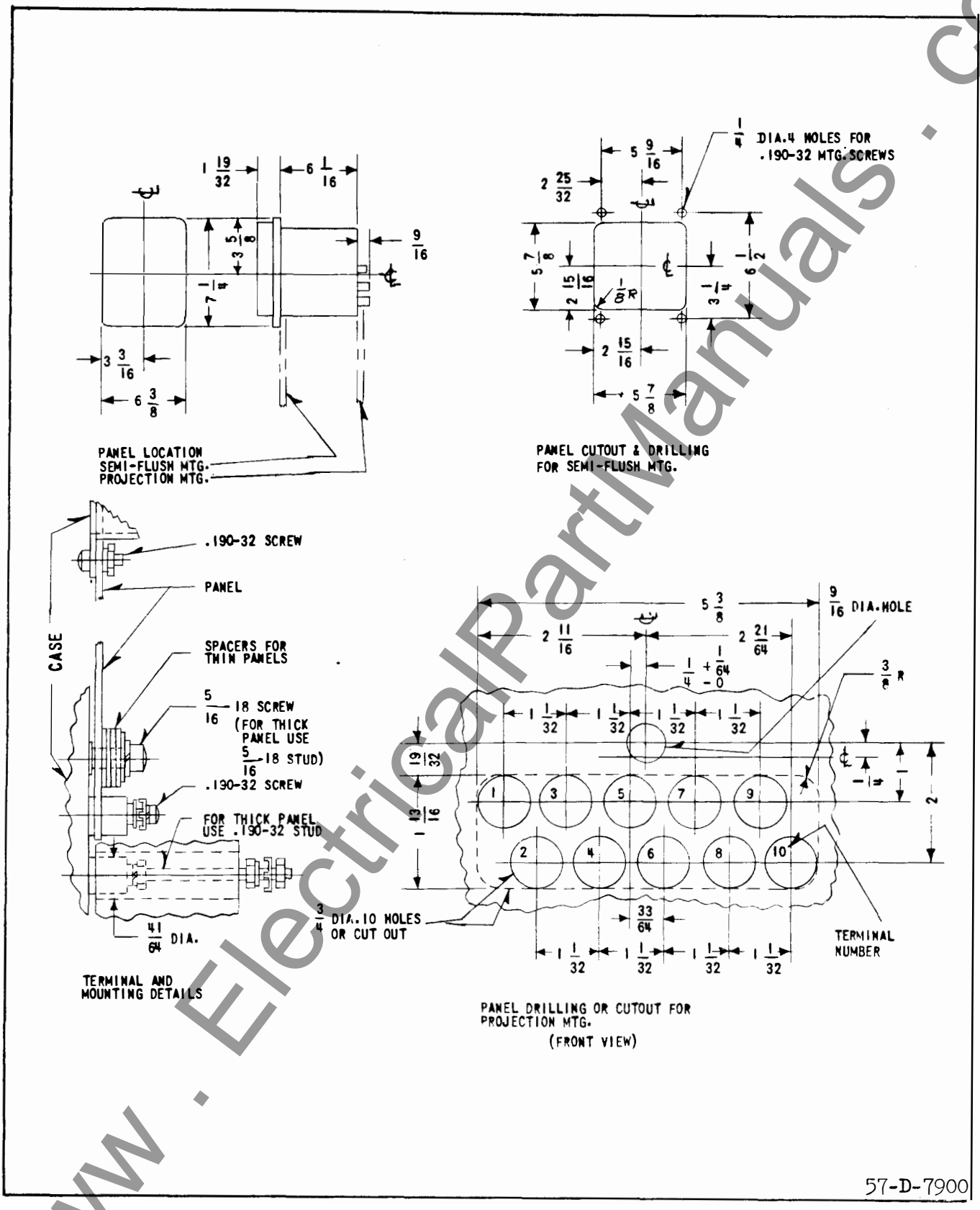
* *Fig. 14 Internal schematic of the Type AR Relay in the FT-11 case with time delay dropout.*



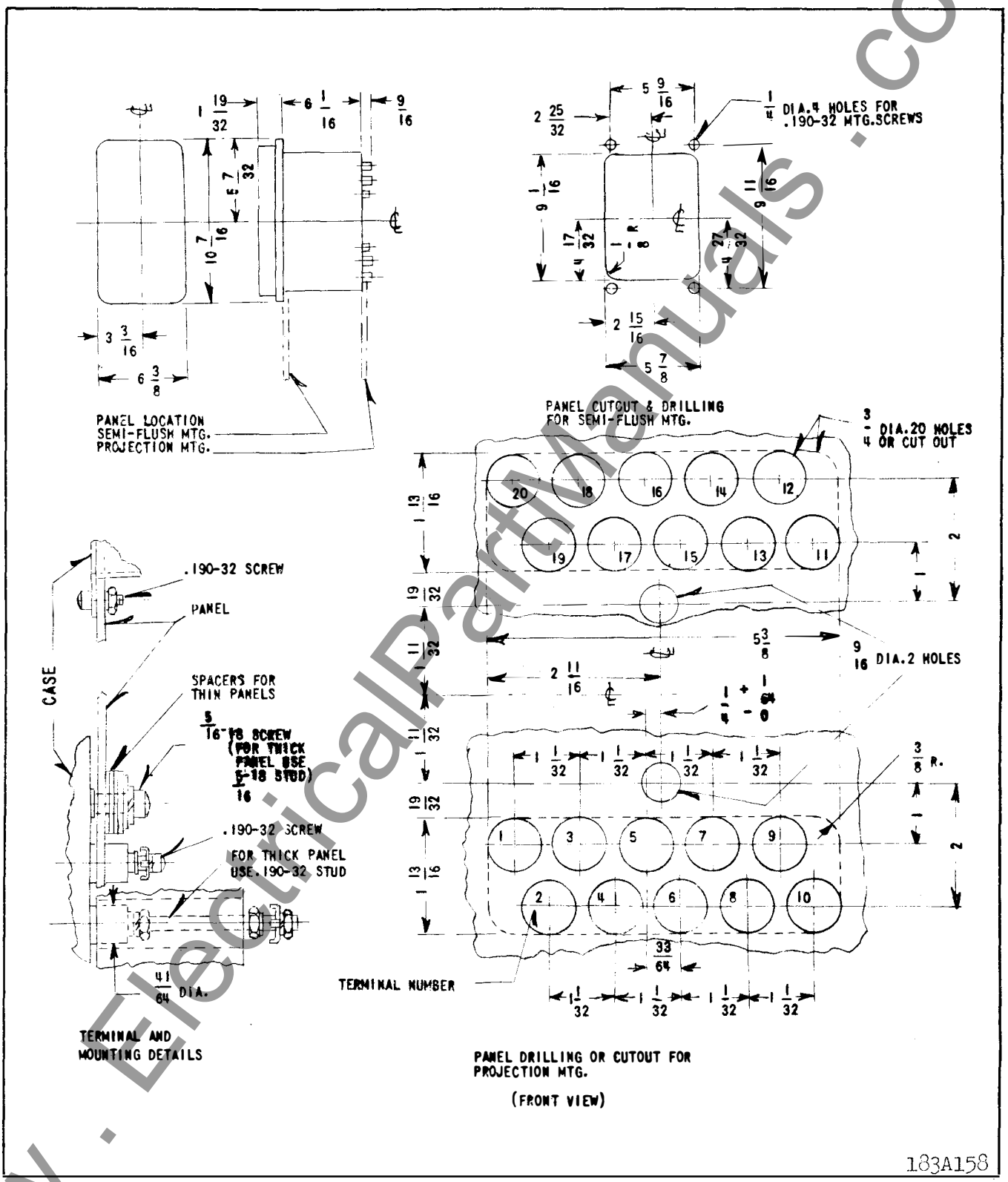
* *Fig. 15 Test connections for the Type AR Relay with time delay on dropout.*



* *Fig. 16 Outline and drilling plan for the Type AR relay in the front connected molded case.*



* *Fig. 17 Outline and drilling plan for the Type AR Relay in the FT-11 case.*



** Fig. 18 Outline and drilling plan for the Type AR Relay in the FT-22 case.*

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE AR HIGH SPEED AUXILIARY RELAY

CAUTION: Before putting protection 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.

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 one faults.

An AR relay is available with a time delay dropout. It can be used in applications where a delayed dropout of 0.1 seconds is desired.

CONSTRUCTION AND OPERATION

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 Fig. 1 and 2.

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.

Operation Indicator (O.I.)

The d-c operation indicator is a small 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.

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

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.

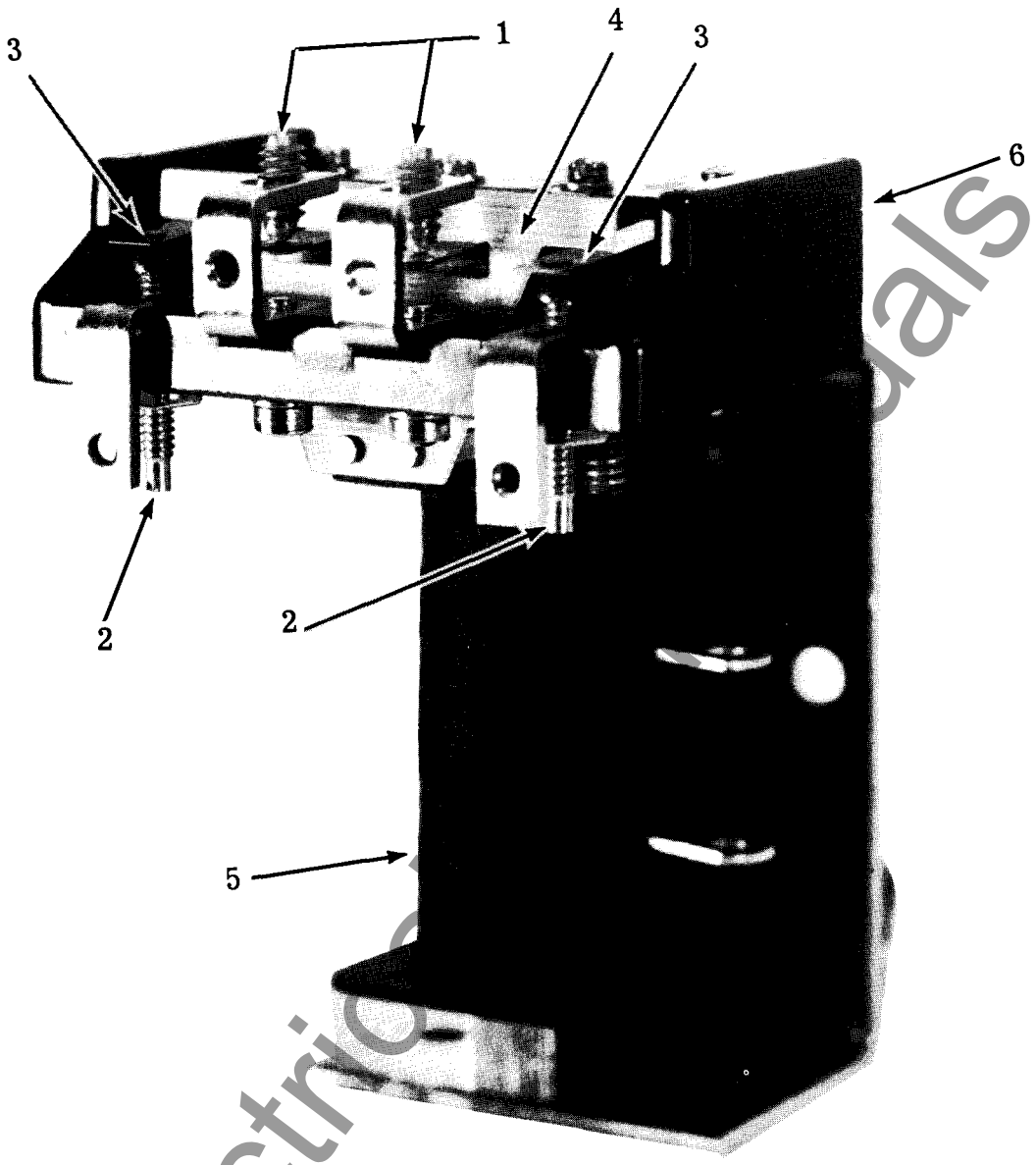
All relays are capable of being energized continuously. All high speed relays will pick up at 80% of rated voltage or less; and drop out at 10% of rated voltage or higher.

Typical operating times and effective contact bounce are outlined in the tables I and II.

The operate time of the relay with delayed dropout is about 6 milliseconds at rated voltage for a normally open contact. The relay will have a 0.1 second dropout time after being energized at least 0.015 seconds.

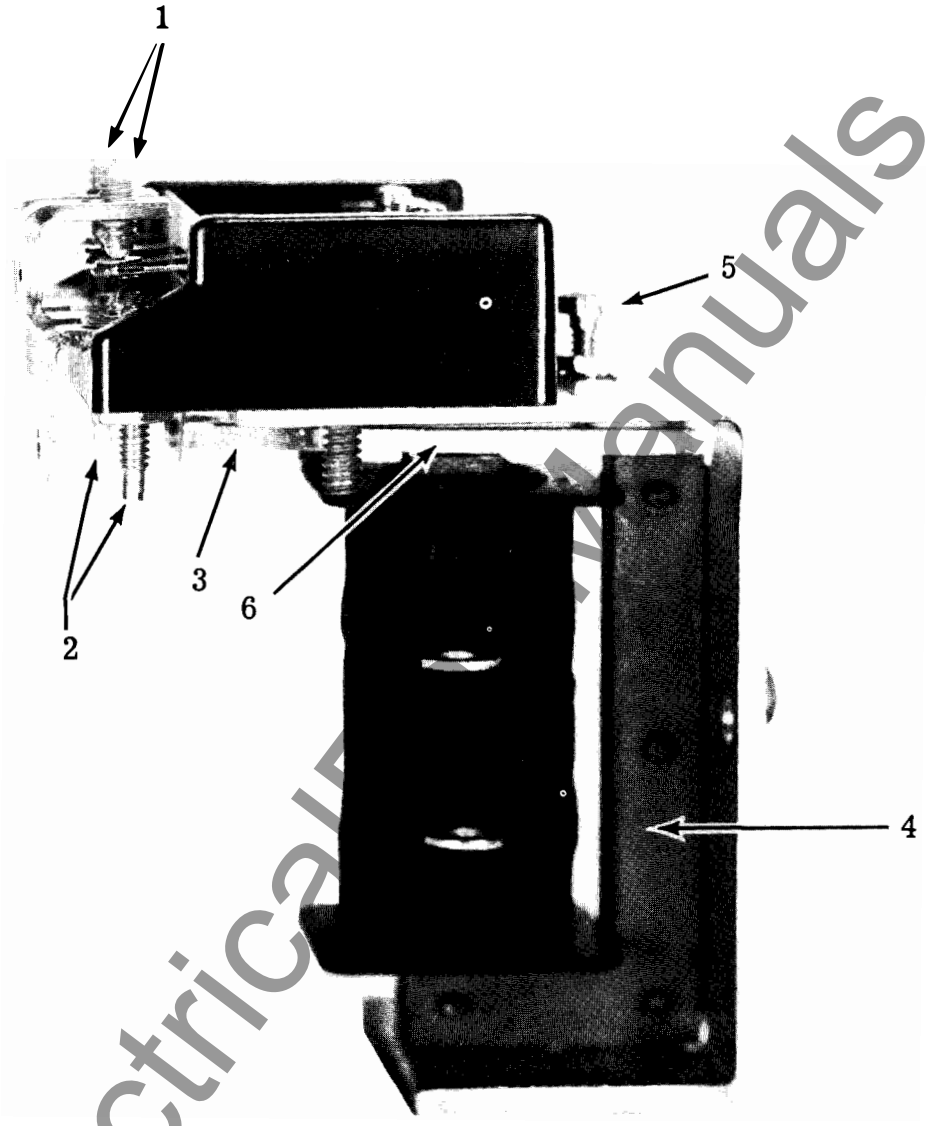
SUPERSEDES I.L. 41-759C
*Denotes change from superseded issue.

EFFECTIVE JANUARY 1969



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – LEAF SPRING MOVING CONTACTS
4 – MOVING CARD ASSEMBLY
5 – RELAY COIL
6 – MOLDED INSULATION BLOCK

Fig. 1 Type AR Unit with two make and two break contacts (Front View).



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – MOVING ARMATURE.
4 – U-SHAPED LAMINATED CORE.
5 – ARMATURE GAP ADJUSTMENT SET SCREW.
6 – ARMATURE GAP

Fig. 2 Type AR Unit with two make and two break contacts (Side View).

TABLE I
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

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

TABLE II
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	---

Contact Rating

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

SETTINGS

AR Unit

No settings are required.

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.

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 semi-flush mounting or by means of the rear mounting 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.

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 instructions below should be followed.

Acceptance Check

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

1. Contact gaps
   a. Normally open contacts should have a gap of .018 to .023 inch.
   b. Normally closed contact gap should be .013 minimum.
2. Contact pressure
   a. 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.
   b. On two normally open and two normally closed relays, the normally closed contacts should have approximately 8 grams contact pressure in the de-energized position. Each normally open contact spring should have approximately 8 grams pressure against the card.

3. Armature gap

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

4. Contact operate time

   Per Table 1

5. Operation Indicator (O.I.)

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

6. AR relay with time delay on dropout.

* Connect the relay as shown in Fig. 15. When the AR coil has been energized for 25-35 milliseconds its dropout time should be a minimum of 100 milliseconds. The R relay should be adjusted such that its contact break time is 25-35 milliseconds. Also the timer must be of the type which may be started and stopped by break contacts.

CALIBRATION

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs of 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")

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. 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 spring for 8 grams to just move the contact away from the card.

c. Adjust each stationary contact screw to obtain a contact gap of 0.020 to 0.022 inches for the normally open contacts. Energize the relay and the normally open contacts should have 15 to 30 grams contact follow. 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 Table I and II.

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.

TABLE III

CONTACT INTERRUPTING CAPABILITY (AMPERES)

D.C. VOLTAGE	RESISTIVE LOAD	INDUCTIVE LOAD
	WILL INTERRUPT	WILL INTERRUPT
250	0.2	0.1
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48	1.5	1.0

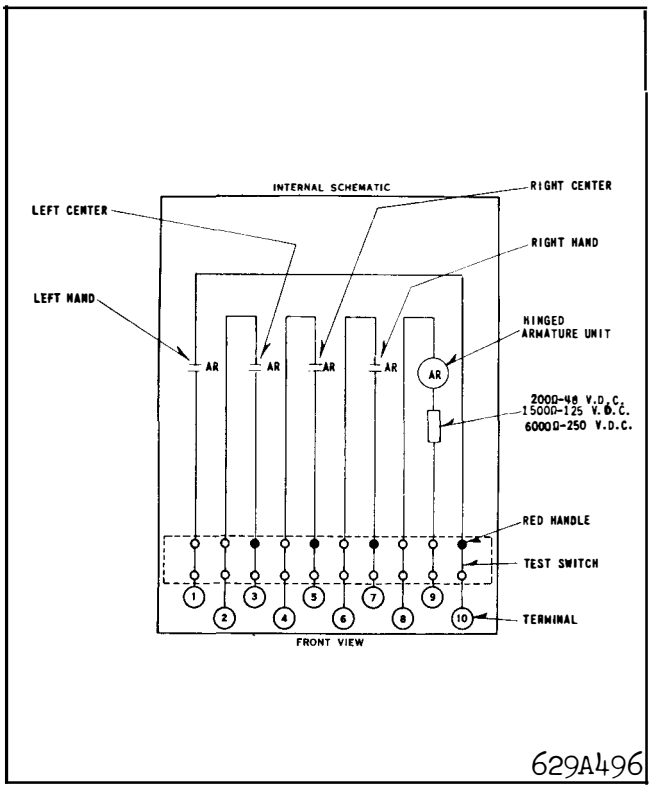


Fig. 3 Internal schematic of the Type AR Relay with 4 make contacts in FT-11 case.

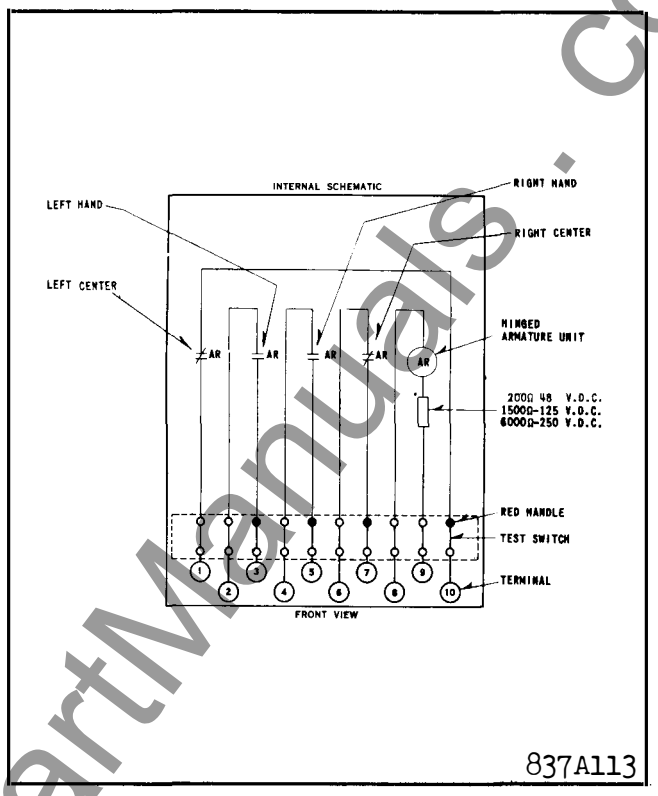


Fig. 4 Internal schematic of the Type AR Relay with 2 make-2 break contacts in FT-11 case.

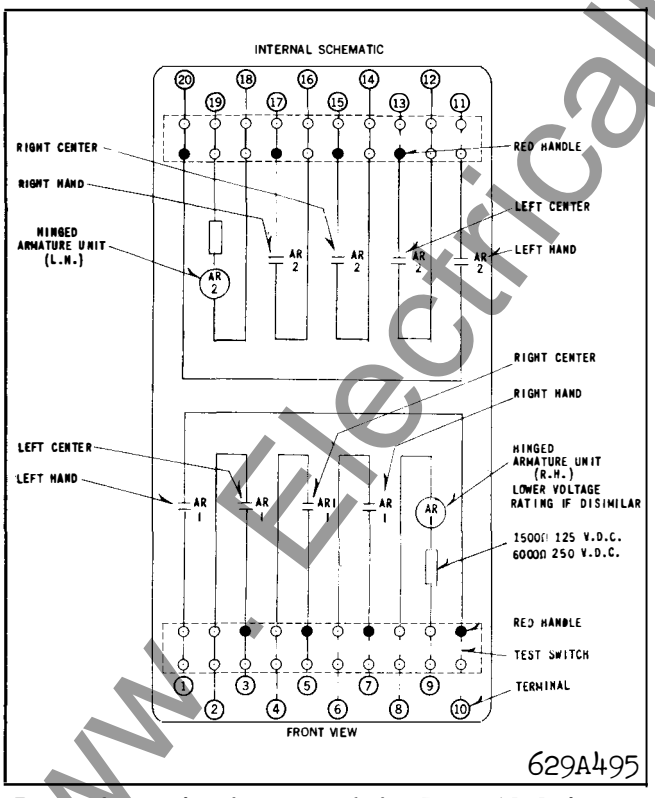


Fig. 5 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 8 make contacts.

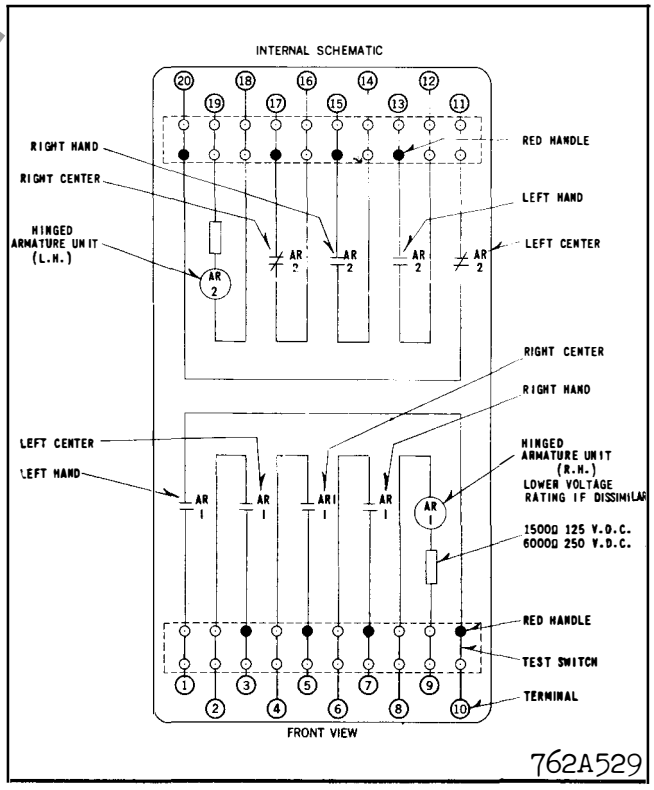


Fig. 6 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 6 make and 2B contacts.

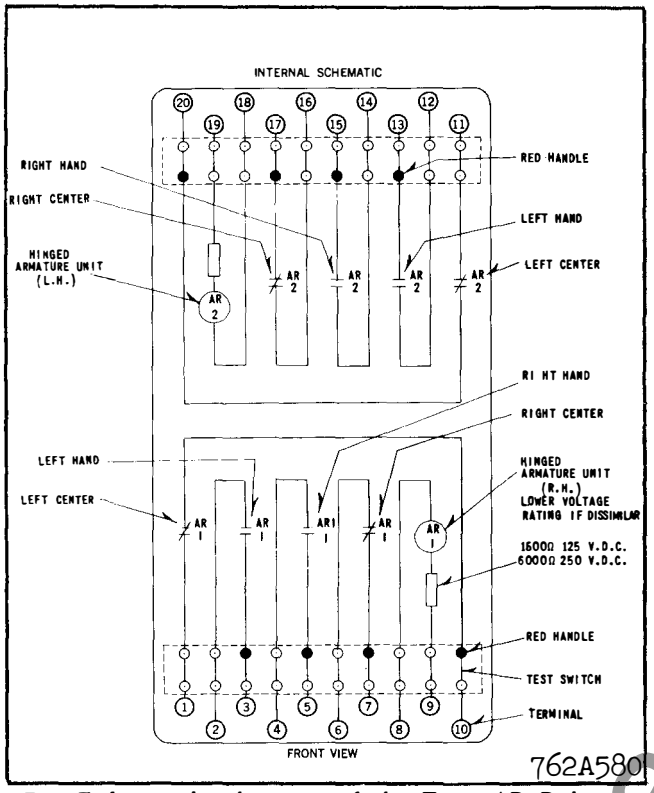


Fig. 7 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 4 make and 4 break contacts.

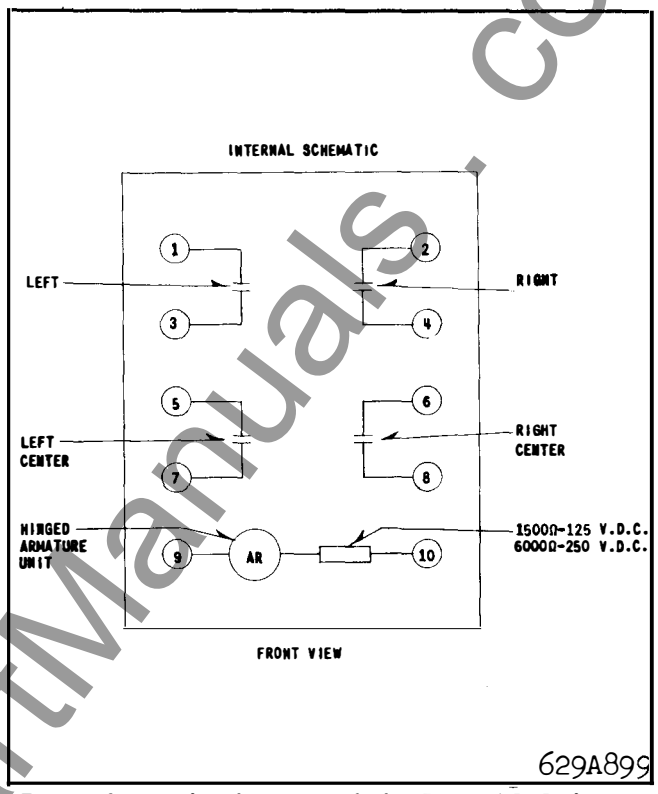


Fig. 8 Internal schematic of the Type AR Relay in front connected molded case with 4 make contacts.

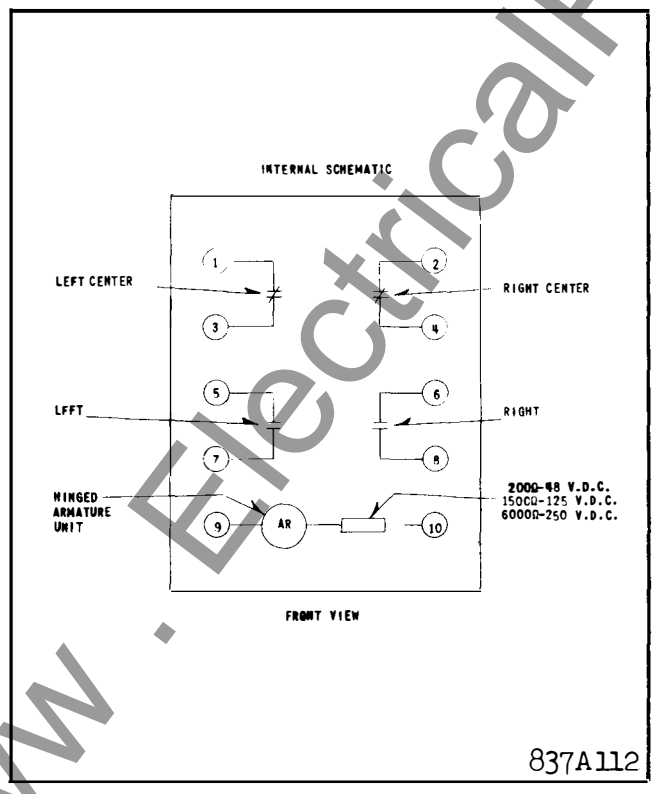


Fig. 9 Internal schematic of the Type AR Relay in front connected molded case with 2 make-2 break contacts.

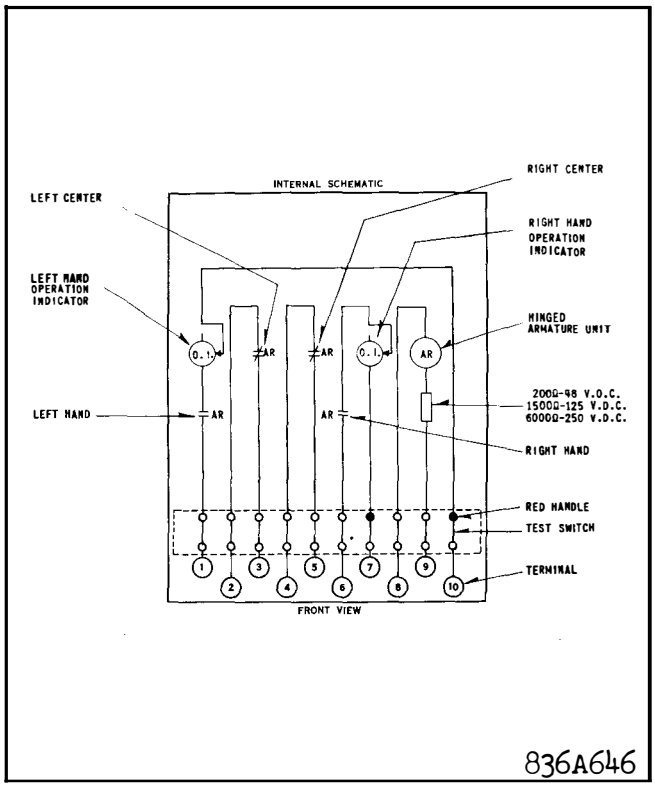
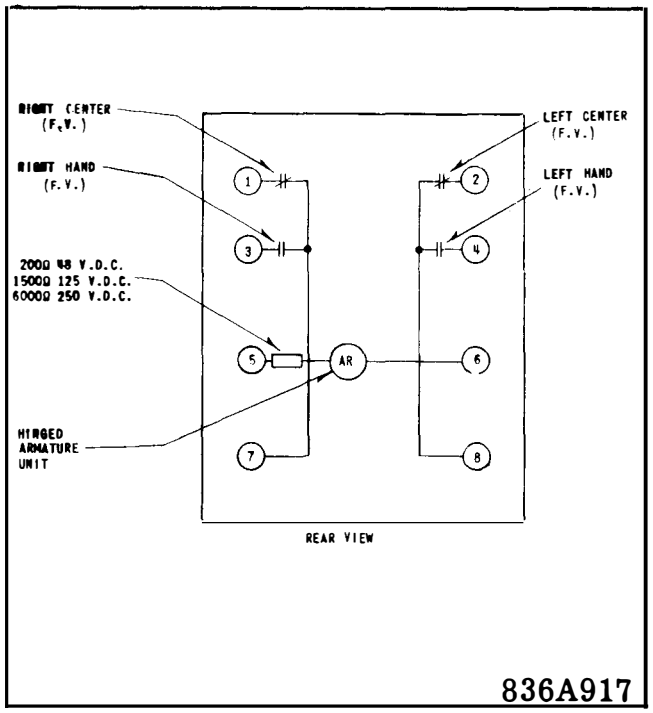


Fig. 10 Internal schematic of the Type AR Relay in the FT-11 case with 2 Operation Indicators.



* *Fig. 11 Internal schematic of the AR Relay with 2 make and 2 break contacts in molded case.*

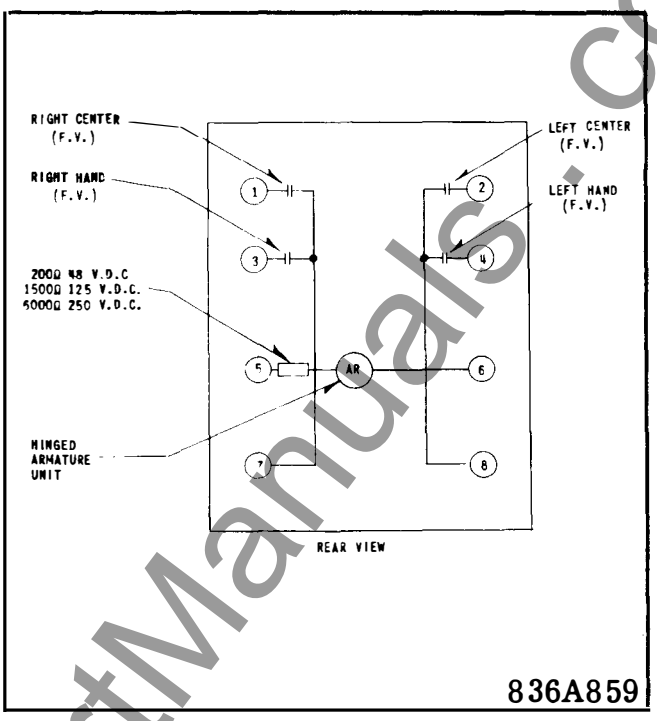


Fig. 12 Internal schematic of the AR with 4 make contacts in molded case.

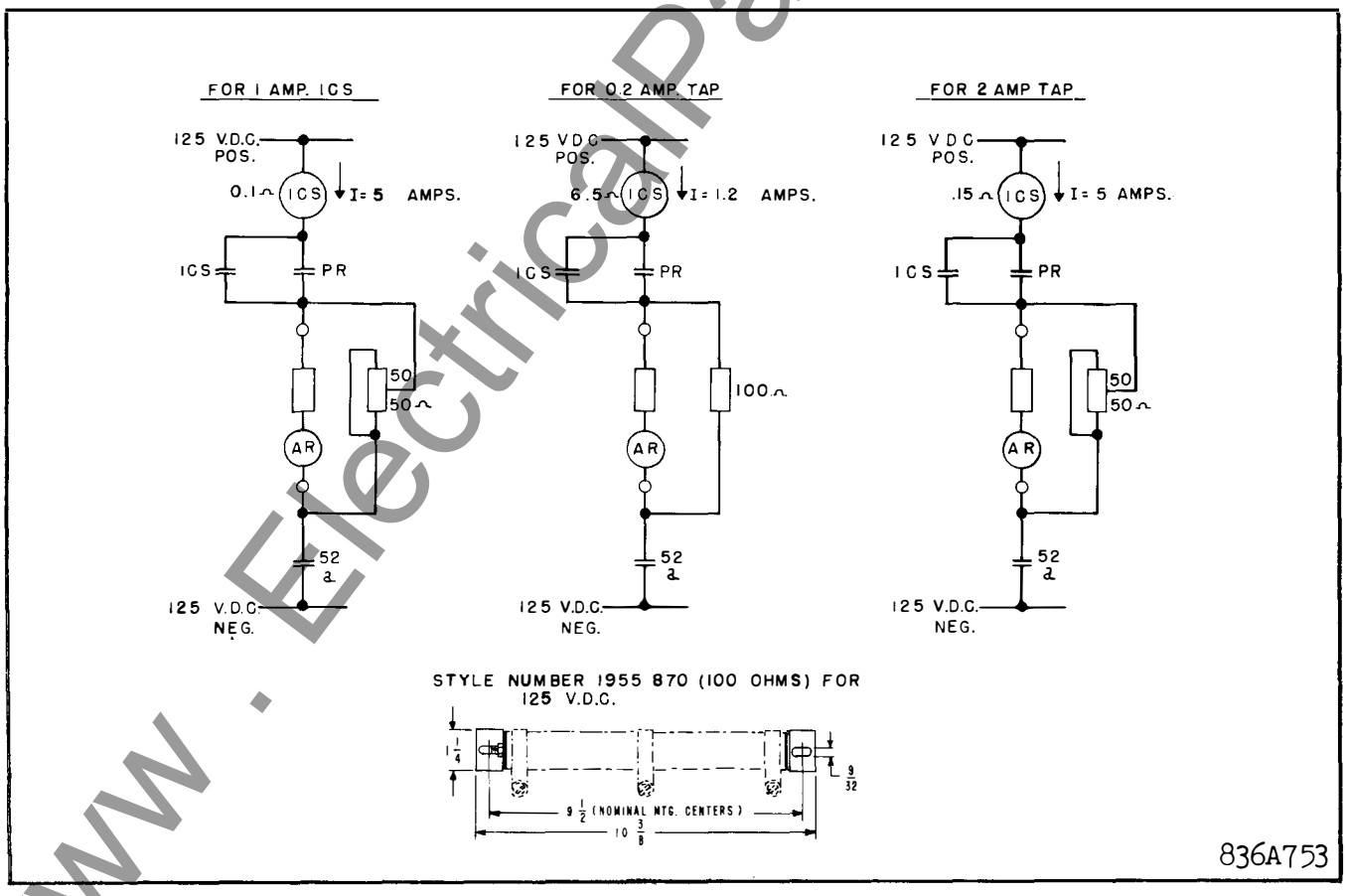


Fig. 13 External schematic for the Type AR Relay.

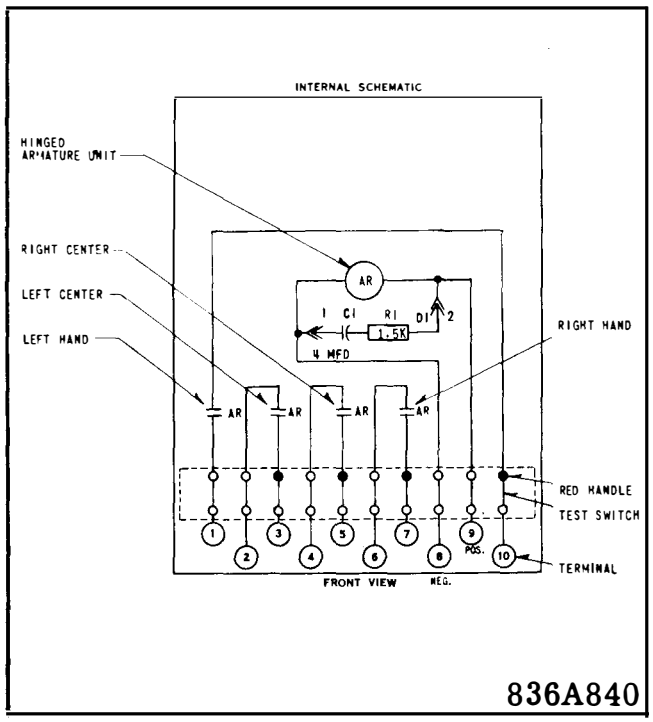


Fig. 14 Internal schematic of the Type AR Relay in the FT-11 case with time delay dropout.

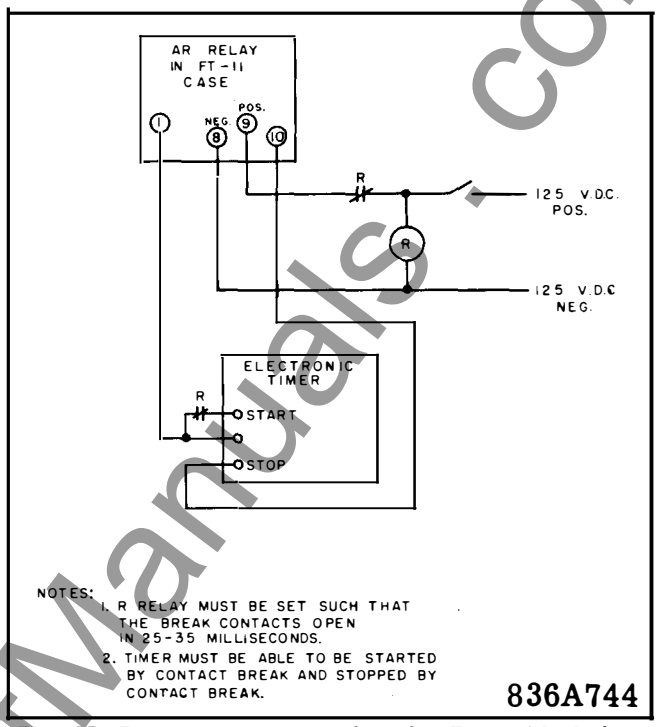


Fig. 15 Test connections for the Type AR Relay with time delay on dropout.

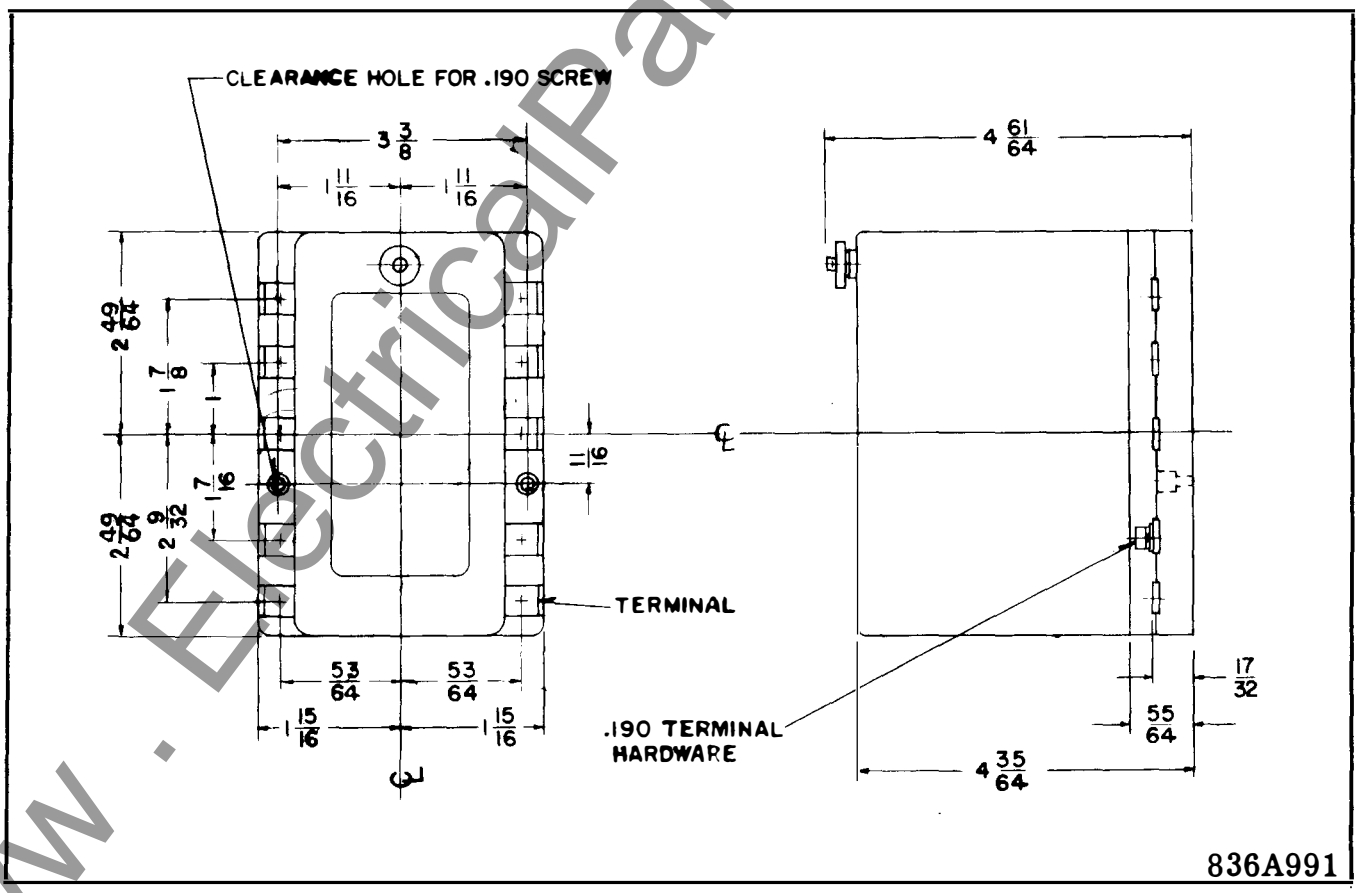


Fig. 16 Outline and drilling plan for the Type AR relay in the front connected molded case.

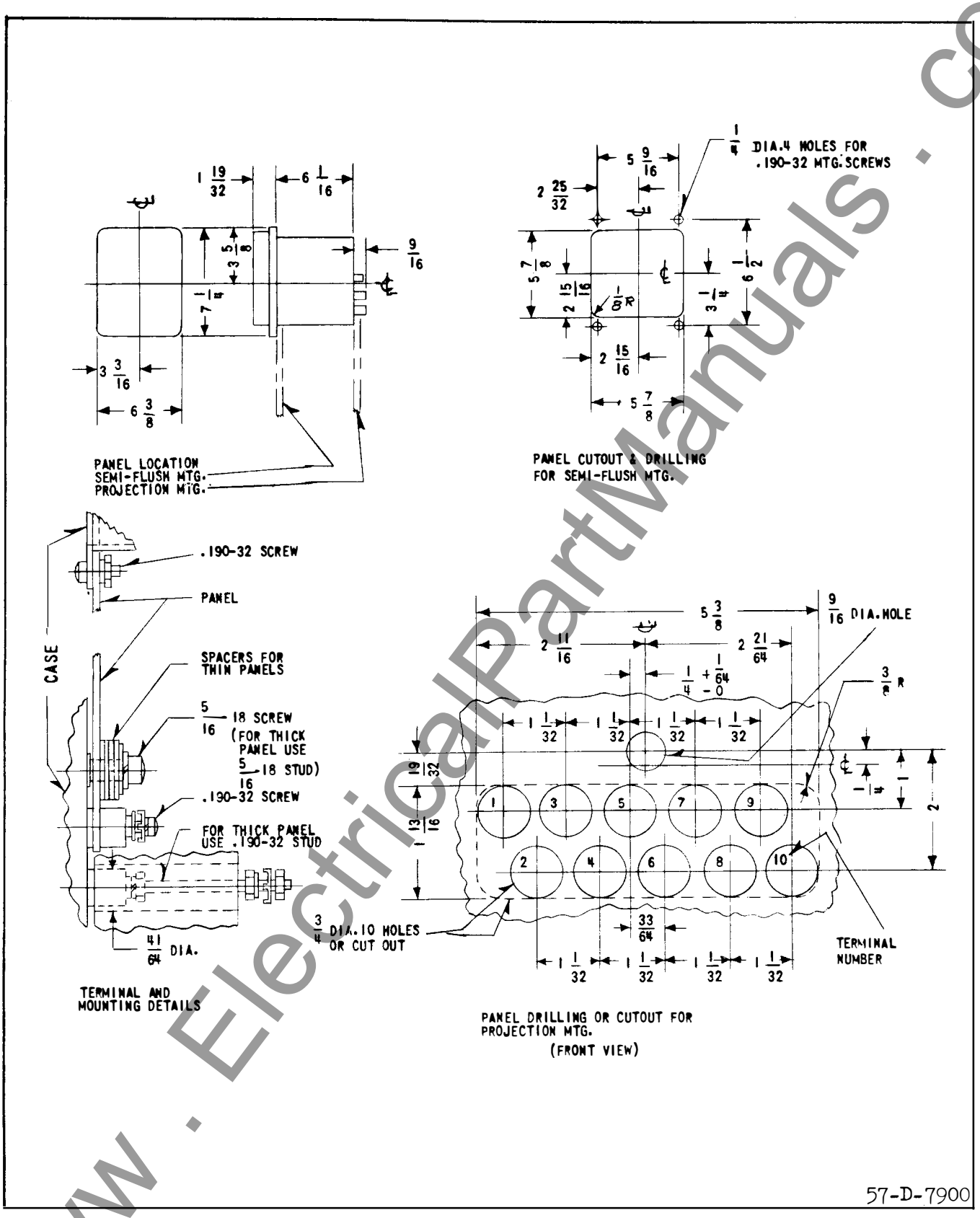


Fig. 17 Outline and drilling plan for the Type AR Relay in the FT-11 case.

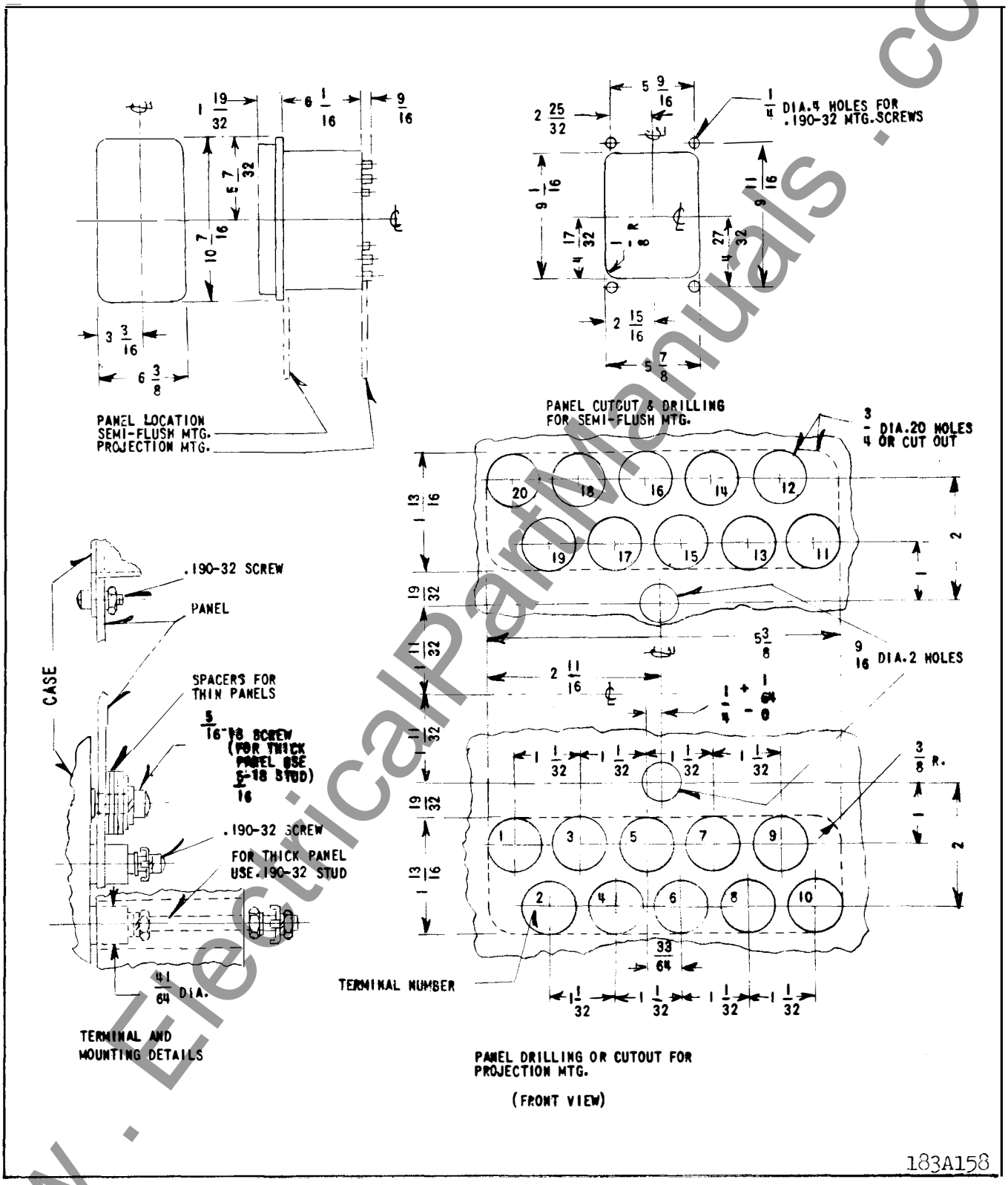
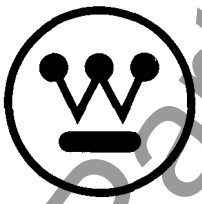


Fig. 18 Outline and drilling plan for the Type AR Relay in the FT-22 case.



WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE AR HIGH SPEED AUXILIARY RELAY

CAUTION: Before putting protection 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.

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 one faults.

* However, when the AR relay is used in the thyristor trip circuit of the SRU, SBFU, STU-91, or STU-92 relays, a 22 ohm resistor must be added in parallel to the AR coil. Without this resistor, it is possible that when d-c voltage is suddenly applied to the relay, sufficient current flows through the series R-C circuit paralleling the tripping thyristor to pickup the 10-watt AR coil of the relay.

An AR relay is available with a time delay dropout. It can be used in applications where a delayed dropout of 0.1 seconds is desired.

CONSTRUCTION AND OPERATION

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 Fig. 1 and 2.

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.

Operation Indicator (O.I.)

The d-c operation indicator is a small 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.

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

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.

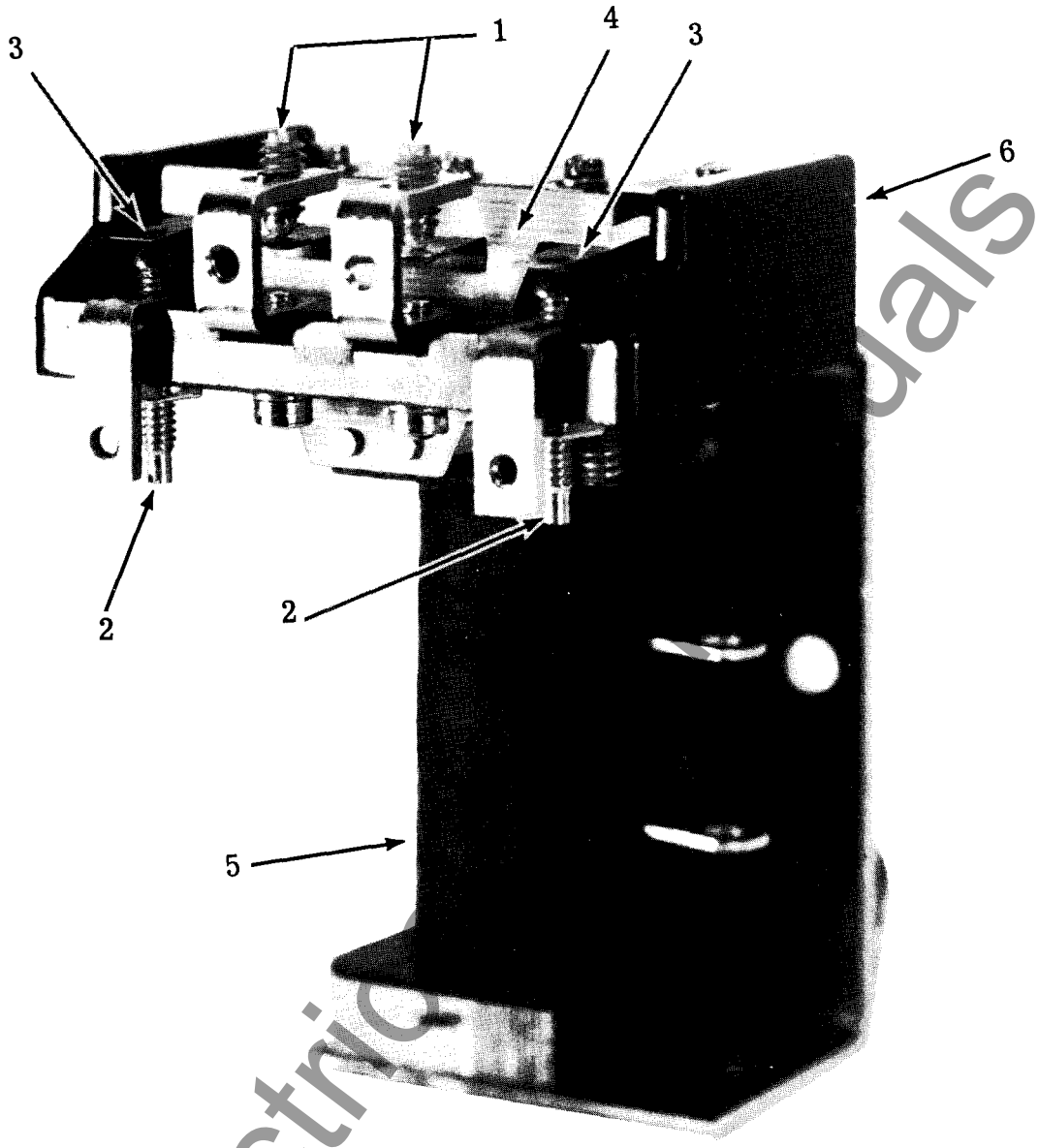
All relays are capable of being energized continuously. All high speed relays will pick up at 80% of rated voltage or less; and drop out at 10% of rated voltage or higher.

Typical operating times and effective contact bounce are outlined in the tables I and II.

The operate time of the relay with delayed dropout is about 6 milliseconds at rated voltage for a normally open contact. The relay will have a 0.1 second dropout time after being energized at least 0.015 seconds.

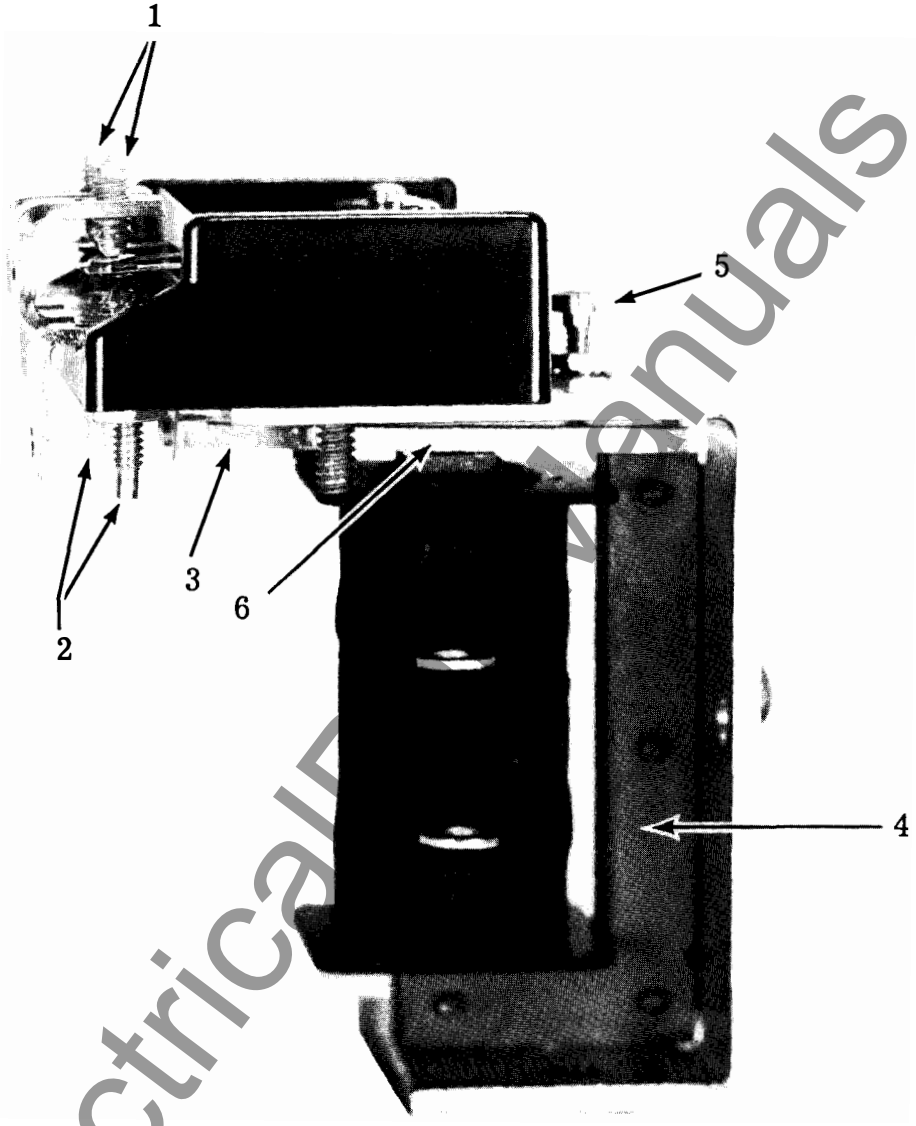
SUPERSEDES I.L. 41-759D
*Denotes change from superseded issue.

EFFECTIVE MAY 1970



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – LEAF SPRING MOVING CONTACTS
4 – MOVING CARD ASSEMBLY
5 – RELAY COIL
6 – MOLDED INSULATION BLOCK

Fig. 1 Type AR Unit with two make and two break contacts (Front View).



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – MOVING ARMATURE.
4 – U-SHAPED LAMINATED CORE.
5 – ARMATURE GAP ADJUSTMENT SET SCREW.
6 – ARMATURE GAP

Fig. 2 Type AR Unit with two make and two break contacts (Side View).

TABLE I
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

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

TABLE II
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	---

Contact Rating

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

SETTINGS

AR Unit

No settings are required.

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.

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 semi-flush mounting or by means of the rear mounting 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.

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 instructions below should be followed.

Acceptance Check

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

1. Contact gaps
   a. Normally open contacts should have a gap of .018 to .023 inch.
   b. Normally closed contact gap should be .013 minimum.
2. Contact pressure
   a. 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.
   b. On two normally open and two normally closed relays, the normally closed contacts should have approximately 8 grams contact pressure in the de-energized position. Each normally open contact spring should have approximately 8 grams pressure against the card.

3. Armature gap

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

4. Contact operate time

   Per Table 1

5. Operation Indicator (O.I.)

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

6. AR relay with time delay on dropout.

   Connect the relay as shown in Fig. 15. When the AR coil has been energized for 25-35 milliseconds its dropout time should be a minimum of 100 milliseconds. The R relay should be adjusted such that its contact break time is 25-35 milliseconds. Also the timer must be of the type which may be started and stopped by break contacts.

CALIBRATION

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs of 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")

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. 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.

c. Adjust each stationary contact screw to obtain a contact gap of 0.020 to 0.022 inches for the normally open contacts. Energize the relay and the normally open contacts should have 15 to 30 grams contact follow. 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 Table I and II.

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.

TABLE III

CONTACT INTERRUPTING CAPABILITY (AMPERES)

D.C. VOLTAGE	RESISTIVE LOAD	INDUCTIVE LOAD
	WILL INTERRUPT	WILL INTERRUPT
250	0.2	0.1
125	0.5	0.25
48	1.5	1.0

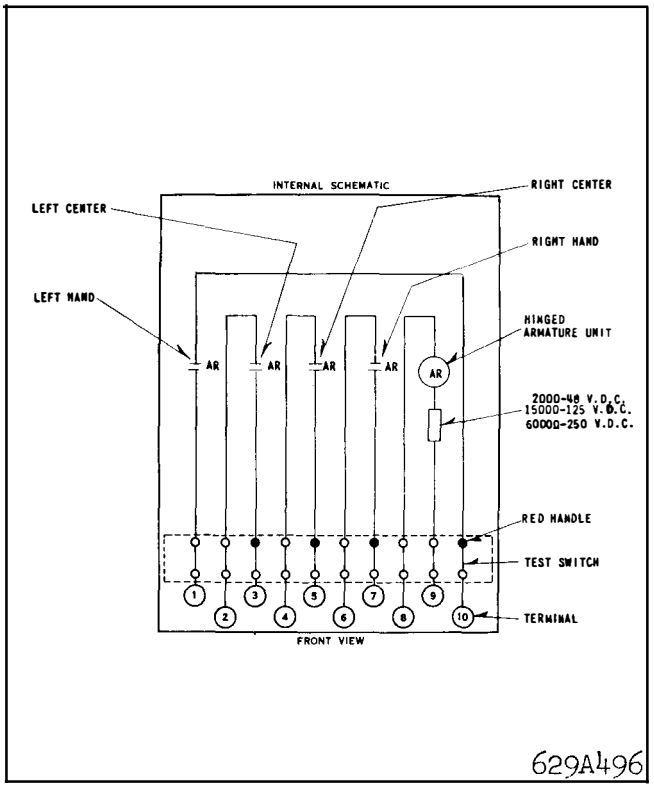


Fig. 3 Internal schematic of the Type AR Relay with 4 make contacts in FT-11 case.

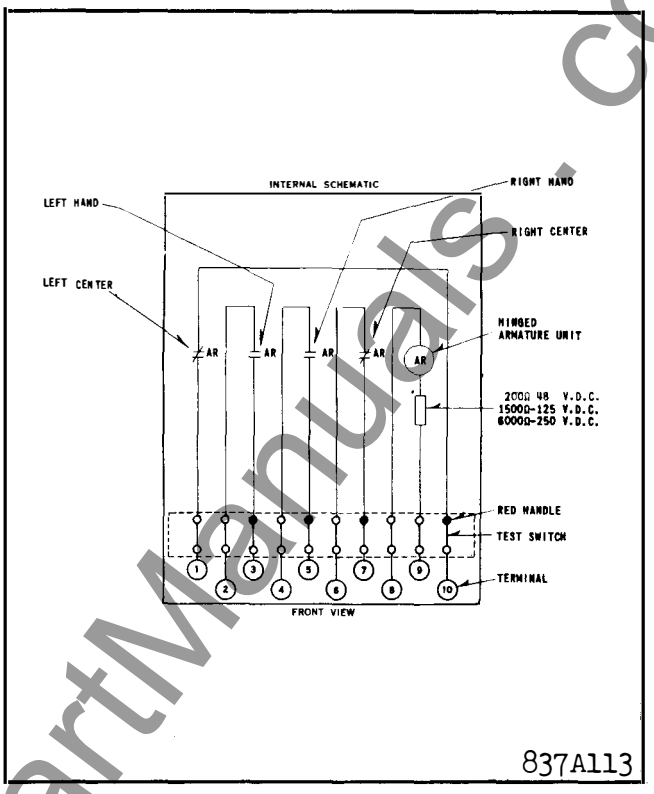


Fig. 4 Internal schematic of the Type AR Relay with 2 make - 2 break contacts in FT-11 case.

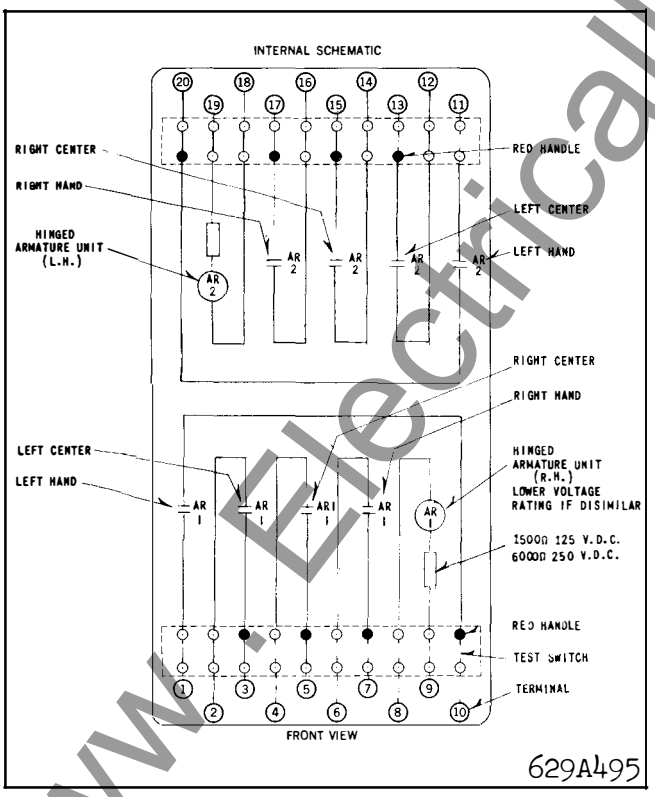


Fig. 5 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 8 make contacts.

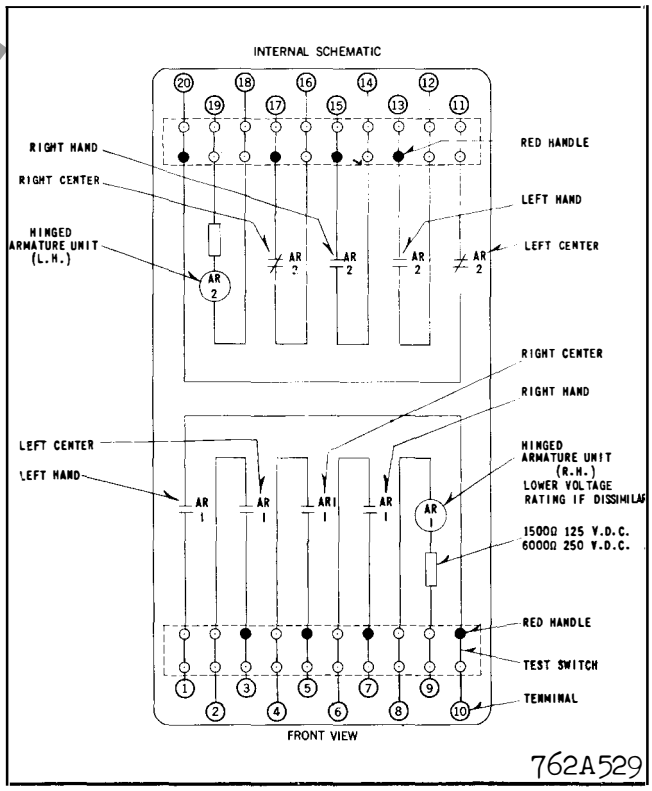


Fig. 6 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 6 make and 2B contacts.

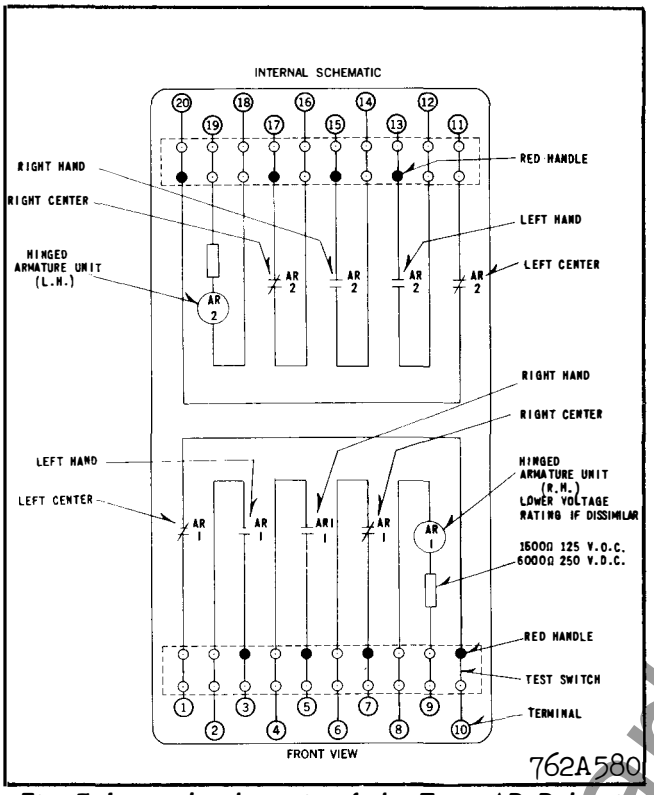


Fig. 7 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 4 make and 4 break contacts.

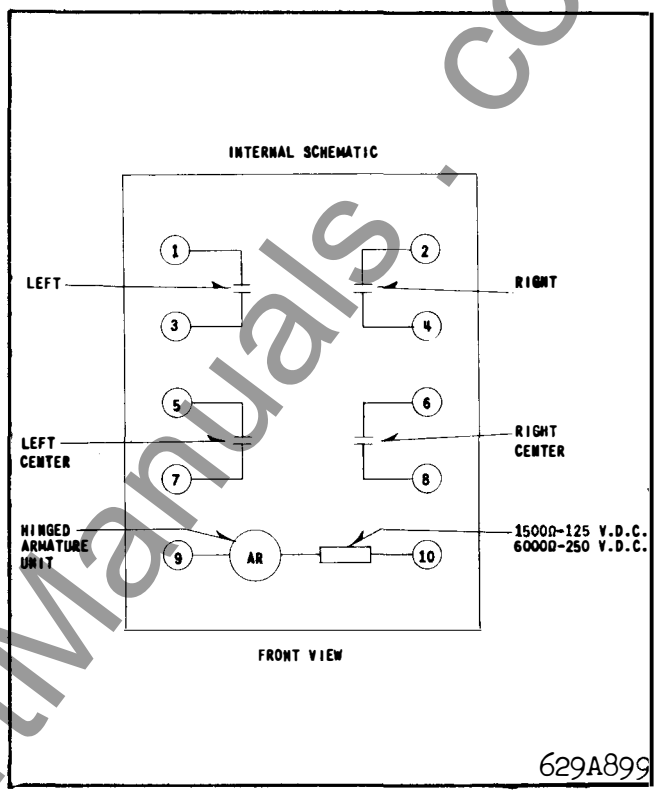


Fig. 8 Internal schematic of the Type AR Relay in front connected molded case with 4 make contacts.

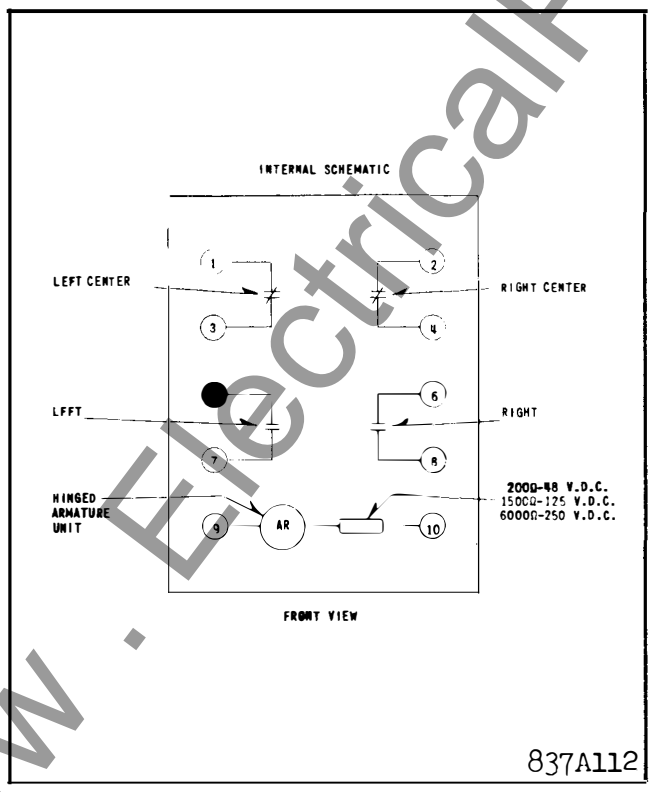


Fig. 9 Internal schematic of the Type AR Relay in front connected molded case with 2 make-2 break contacts.

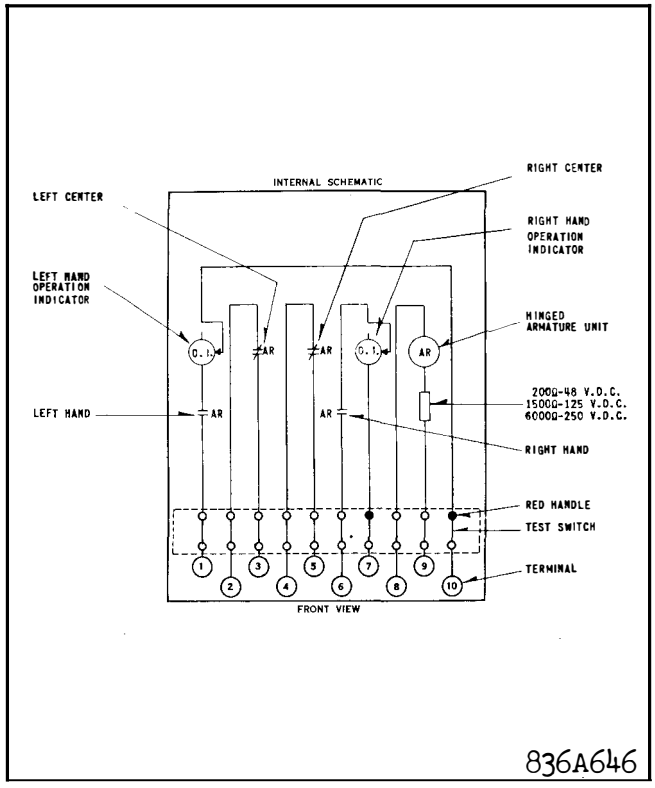


Fig. 10 Internal schematic of the Type AR Relay in the FT-11 case with 2 Operation Indicators.

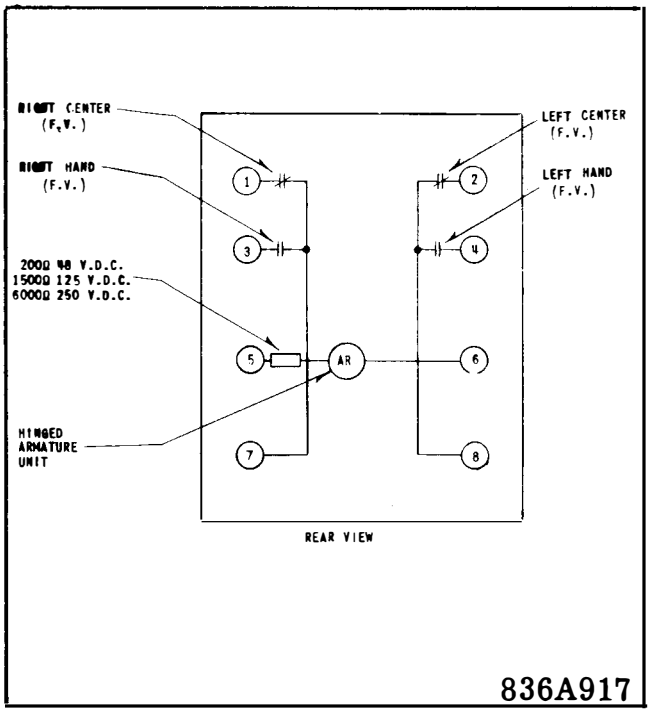


Fig. 11 Internal schematic of the AR Relay with 2 make and 2 break contacts in molded case.

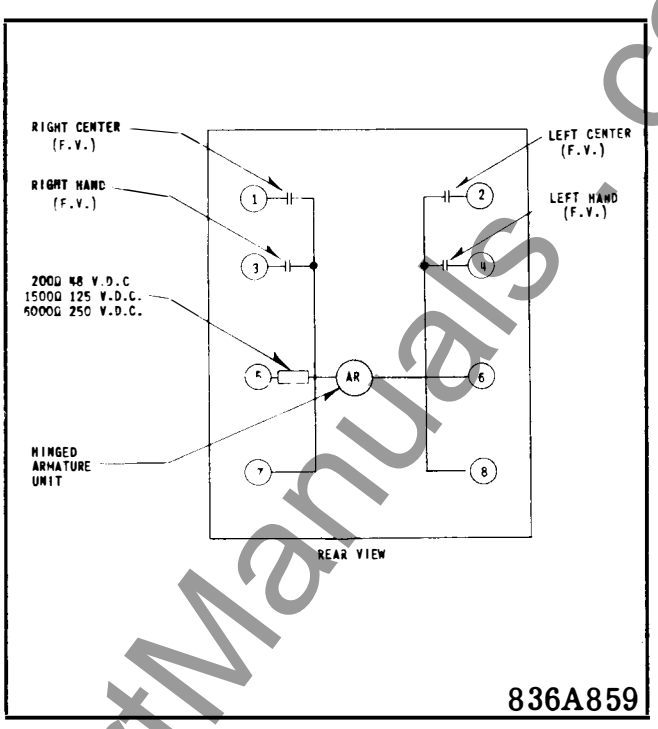
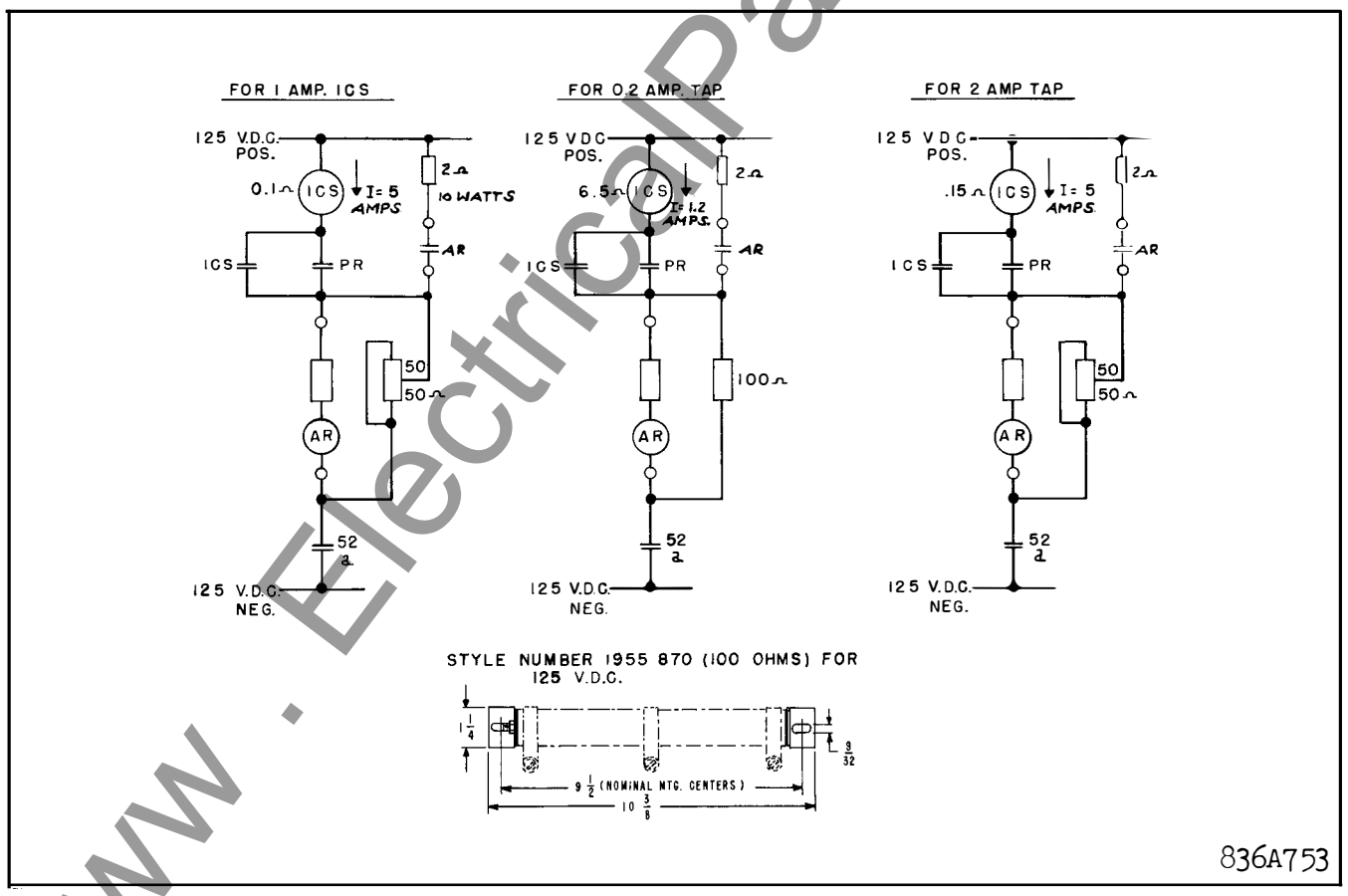


Fig. 12 Internal schematic of the AR with 4 make contacts in molded case.



* *Fig. 13 External schematic for the Type AR Relay.*

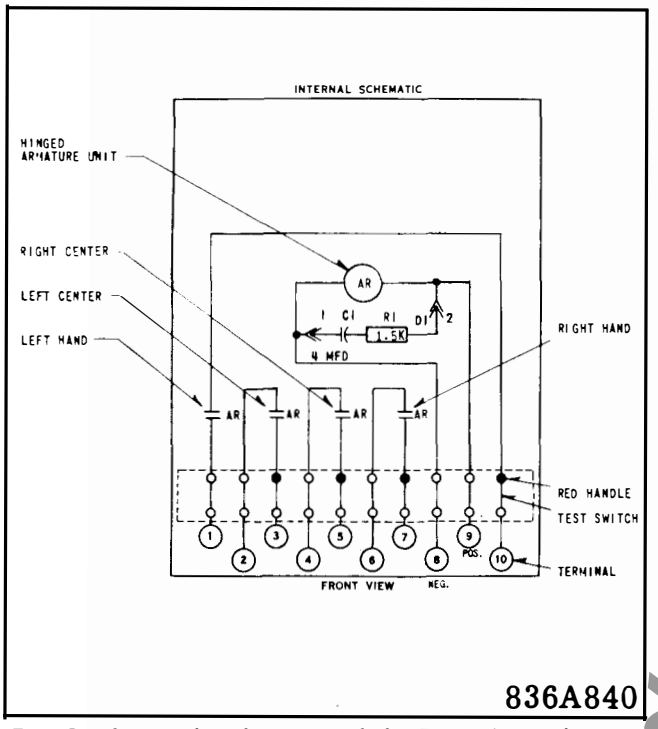


Fig. 14 Internal schematic of the Type AR Relay in the FT-11 case with time delay dropout.

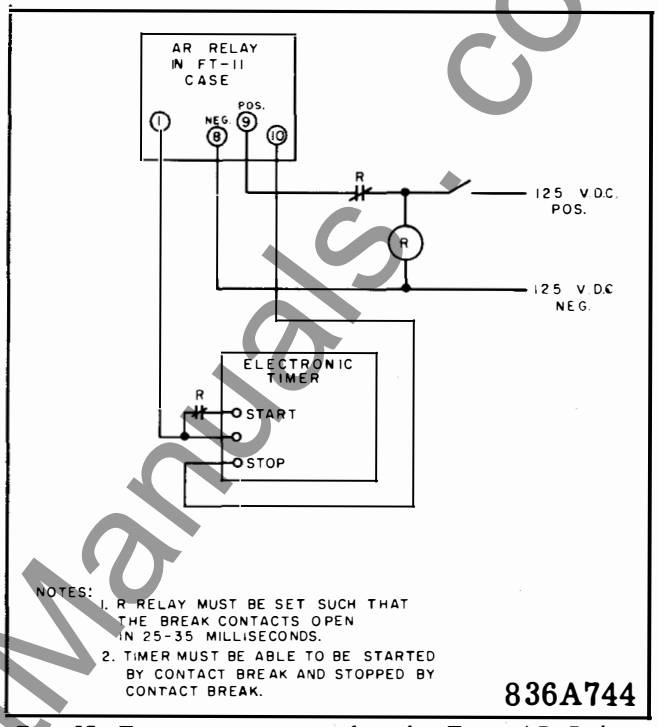


Fig. 15 Test connections for the Type AR Relay with time delay on dropout.

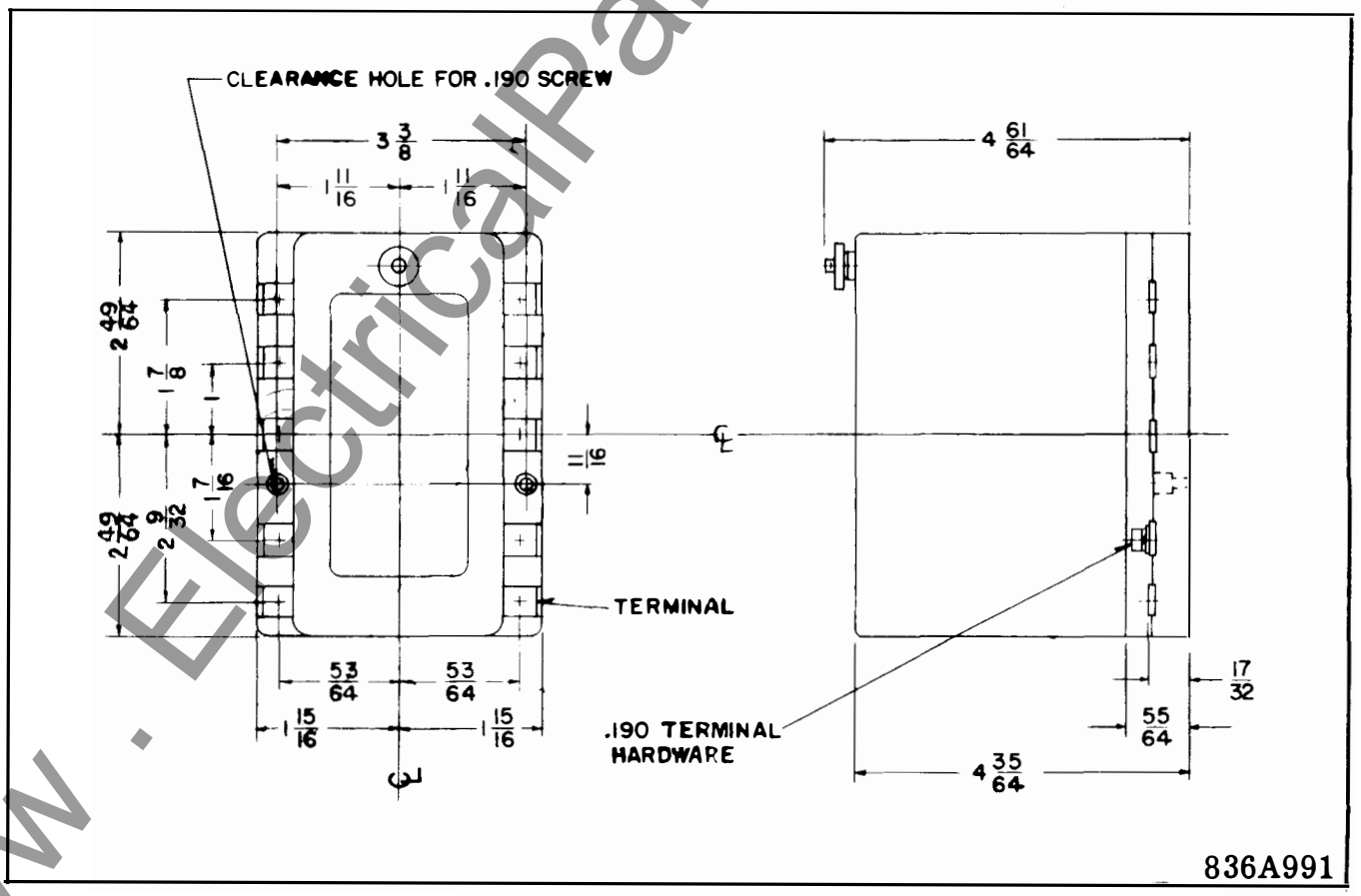
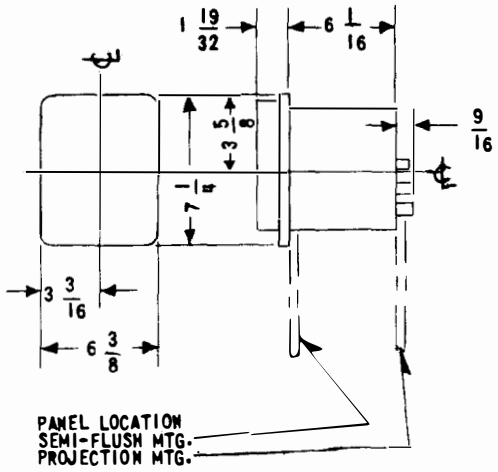
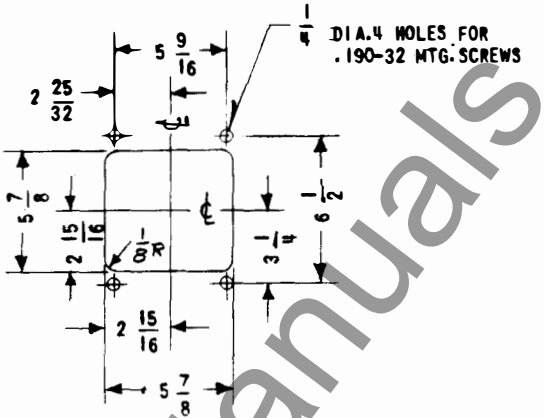
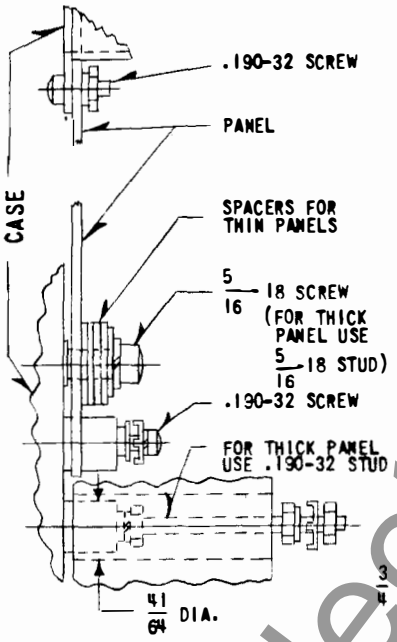


Fig. 16 Outline and drilling plan for the Type AR relay in the front connected molded case.







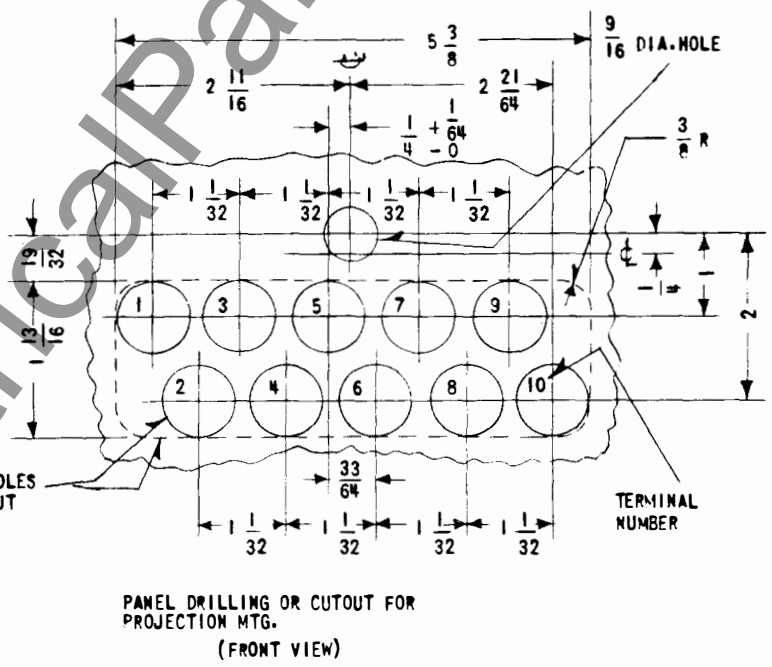


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Fig. 17 Outline and drilling plan for the Type AR Relay in the FT-11 case.

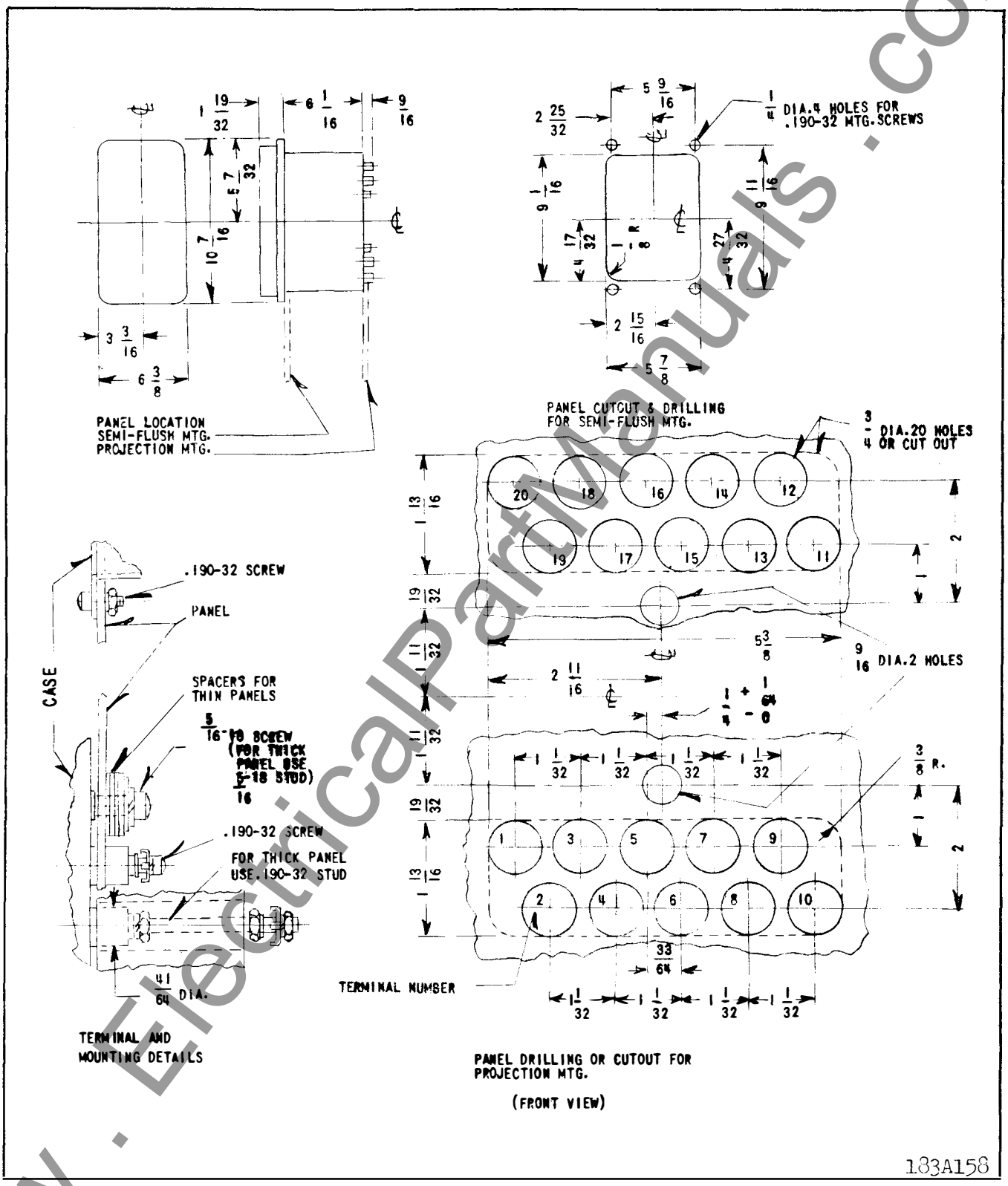


Fig. 18 Outline and drilling plan for the Type AR Relay in the FT-22 case.

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE AR HIGH SPEED AUXILIARY RELAY

CAUTION: Before putting protection 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.

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 one faults.

However, when the AR relay is used in the thyristor trip circuit of the SRU, SBFU, STU-91, or STU-92 relays, a 22 ohm resistor or its equivalent must be added in parallel to the AR coil. Without this resistor, it is possible that when d-c voltage is suddenly applied to the relay, sufficient current flows through the series R-C circuit paralleling the tripping thyristor to pickup the 10-watt AR coil of the relay.

An AR relay is available with a time delay dropout. It can be used in applications where a delayed dropout of 0.1 seconds is desired.

CONSTRUCTION AND OPERATION

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 Fig. 1 and 2.

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.

Operation Indicator (O.I.)

The d-c operation indicator is a small 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.

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

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.

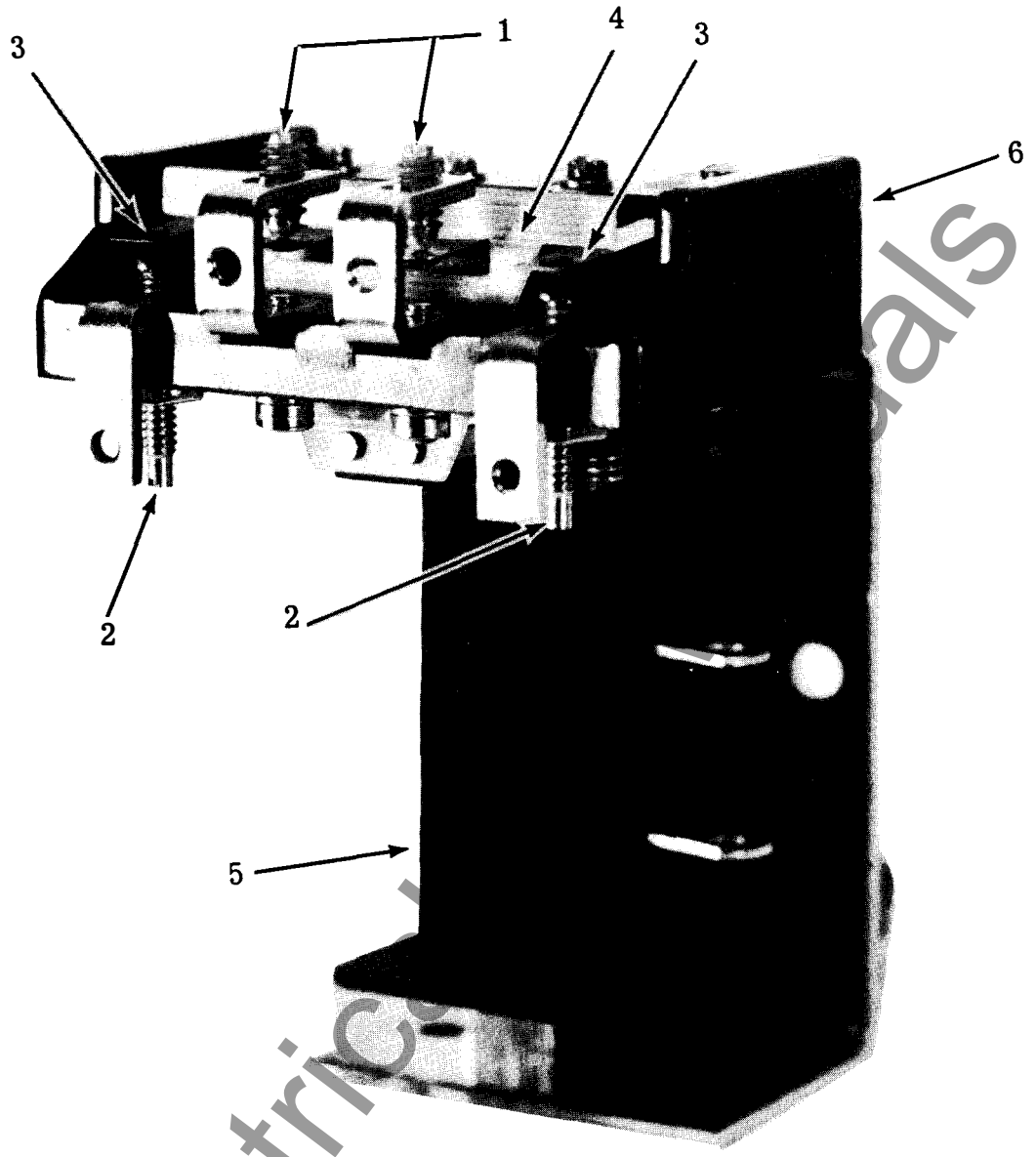
All relays are capable of being energized continuously. All high speed relays will pick up at 80% of rated voltage or less; and drop out at 10% of rated voltage or higher.

Typical operating times and effective contact bounce are outlined in the tables I and II.

The operate time of the relay with delayed dropout is about 6 milliseconds at rated voltage for a normally open contact. The relay will have a 0.1 second dropout time after being energized at least 0.015 seconds.

SUPERSEDES I.L. 41-759E
*Denotes change from superseded issue.

EFFECTIVE SEPTEMBER 1972



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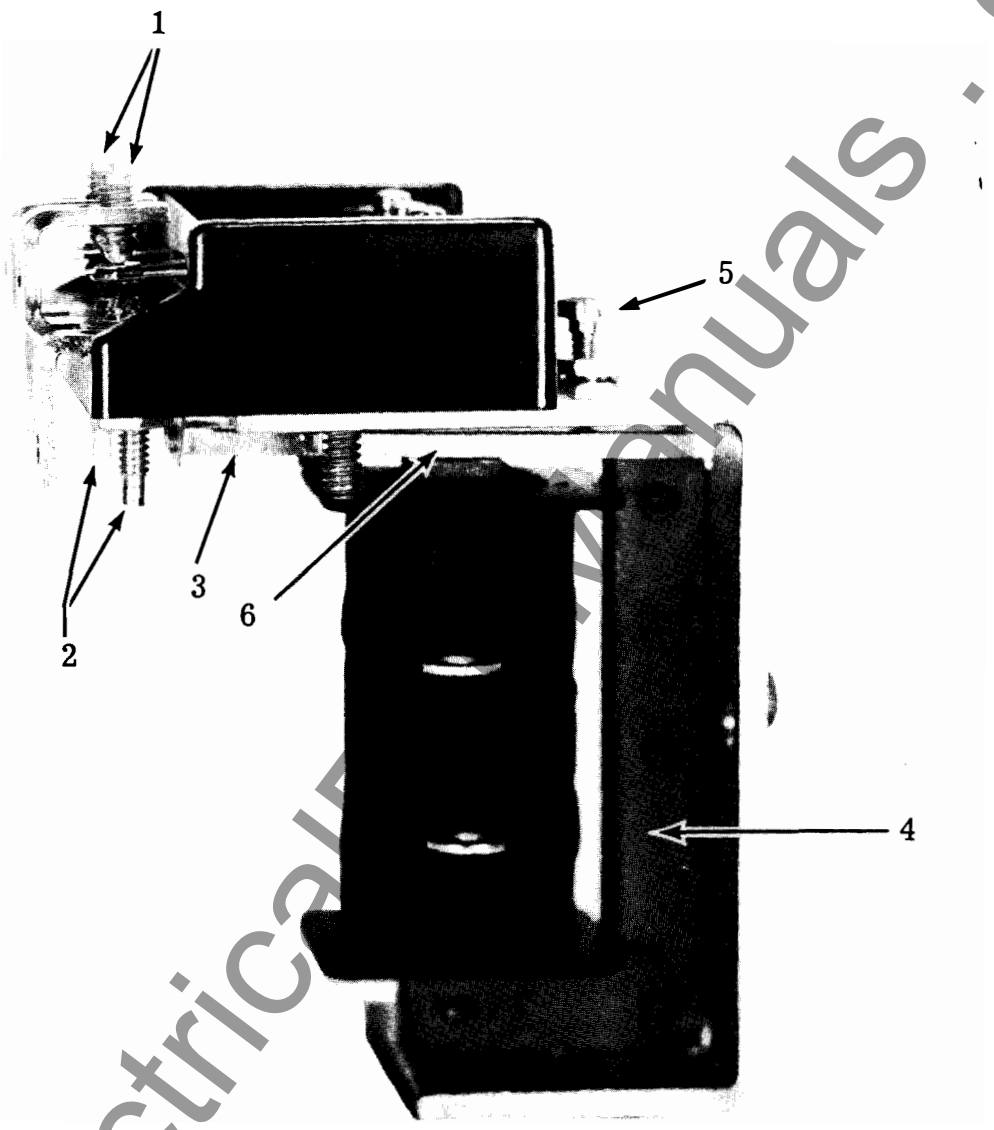
4 – MOVING CARD ASSEMBLY
5 – RELAY COIL
6 – MOLDED INSULATION BLOCK

Fig. 1 Type AR Unit with two make and two break contacts (Front View).



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
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3 – MOVING ARMATURE.
4 – U-SHAPED LAMINATED CORE.
5 – ARMATURE GAP ADJUSTMENT SET SCREW.
6 – ARMATURE GAP

Fig. 2 Type AR Unit with two make and two break contacts (Side View).

TABLE I
OPERATE AND RESET TIMES

Rated Operating † Energy (WATTS)	Operate Time (Milliseconds)		Reset Time (Milliseconds)
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2.25	3.5	2.5	3.5

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

TABLE II
CONTACT BOUNCE

Contact Loading	Effective Bounce Time in Milliseconds	
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Breaker Trip Coil	.2	---

Contact Rating

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

SETTINGS

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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.

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

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 instructions below should be followed.

Acceptance Check

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

1. Contact gaps
   a. Normally open contacts should have a gap of .018 to .023 inch.
   b. Normally closed contact gap should be .013 minimum.
2. Contact pressure
   a. 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.
   b. On two normally open and two normally closed relays, the normally closed contacts should have approximately 8 grams contact pressure in the de-energized position. Each normally open contact spring should have approximately 8 grams pressure against the card.

3. Armature gap

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

4. Contact operate time

   Per Table 1

5. Operation Indicator (O.I.)

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

6. AR relay with time delay on dropout.

   Connect the relay as shown in Fig. 15. When the AR coil has been energized for 25-35 milliseconds its dropout time should be a minimum of 100 milliseconds. The R relay should be adjusted such that its contact break time is 25-35 milliseconds. Also the timer must be of the type which may be started and stopped by break contacts.

CALIBRATION

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs of 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")

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. 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.

c. Adjust each stationary contact screw to obtain a contact gap of 0.020 to 0.022 inches for the normally open contacts. Energize the relay and the normally open contacts should have 15 to 30 grams contact follow. 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 Table I and II.

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.

TABLE III

CONTACT INTERRUPTING CAPABILITY (AMPERES)

D.C. VOLTAGE	RESISTIVE LOAD	INDUCTIVE LOAD
	WILL INTERRUPT	WILL INTERRUPT
250	0.2	0.1
125	0.5	0.25
48	1.5	1.0

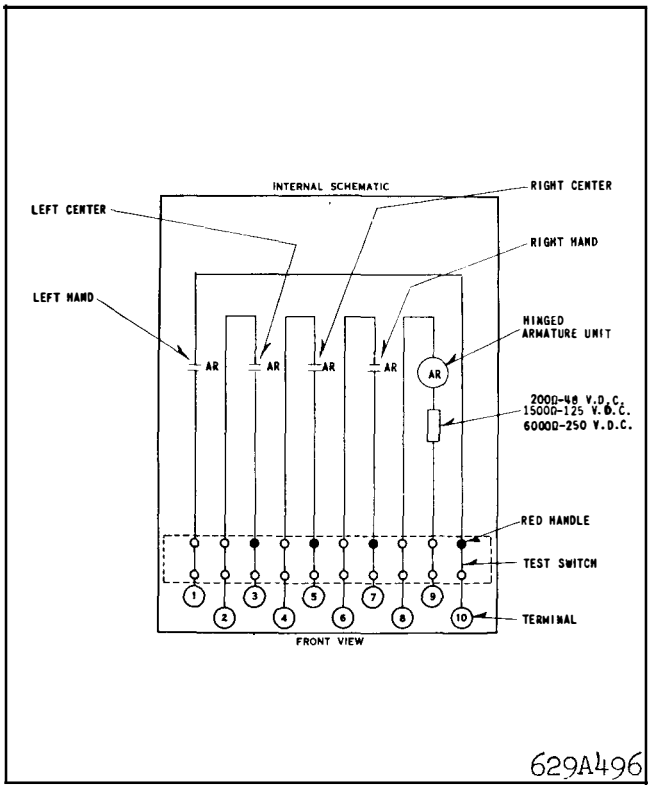


Fig. 3 Internal schematic of the Type AR Relay with 4 make contacts in FT-11 case.

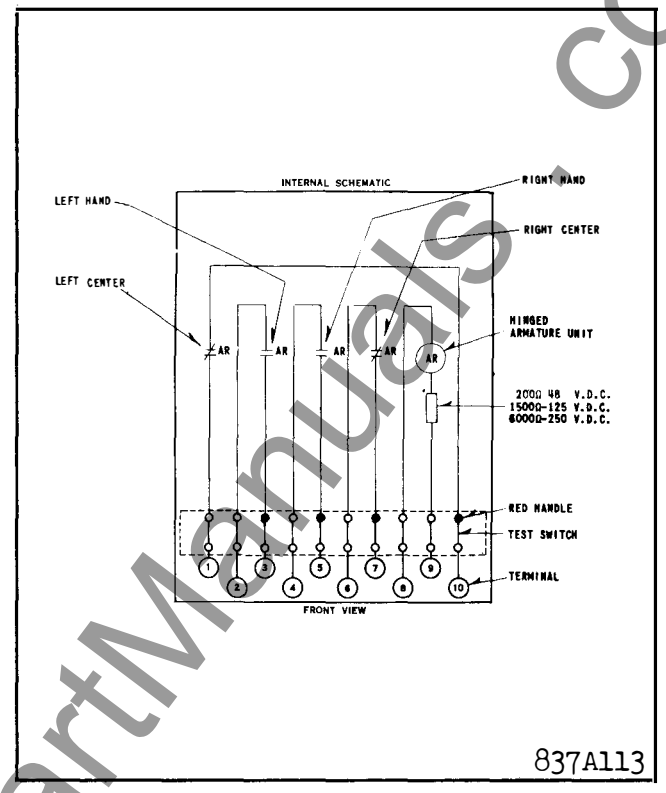


Fig. 4 Internal schematic of the Type AR Relay with 2 make - 2 break contacts in FT-11 case.

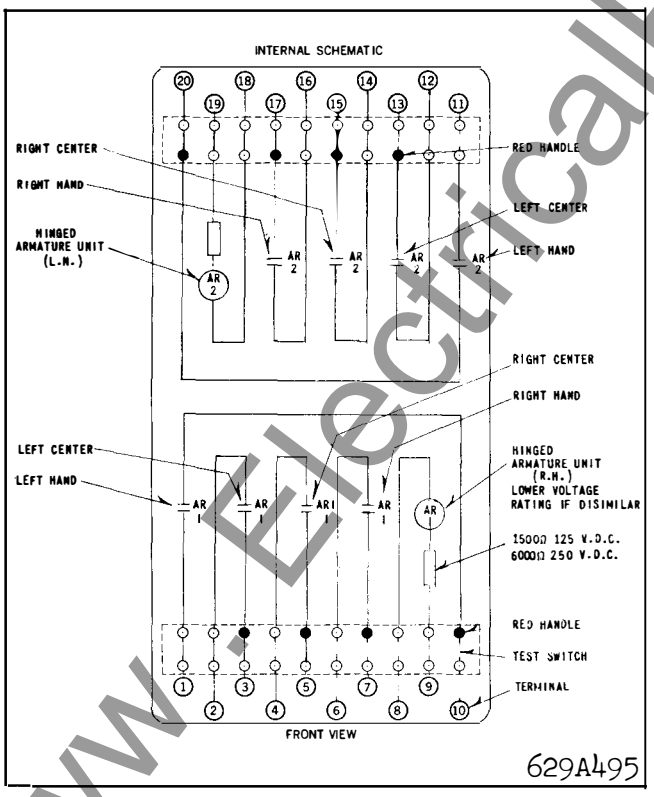


Fig. 5 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 8 make contacts.

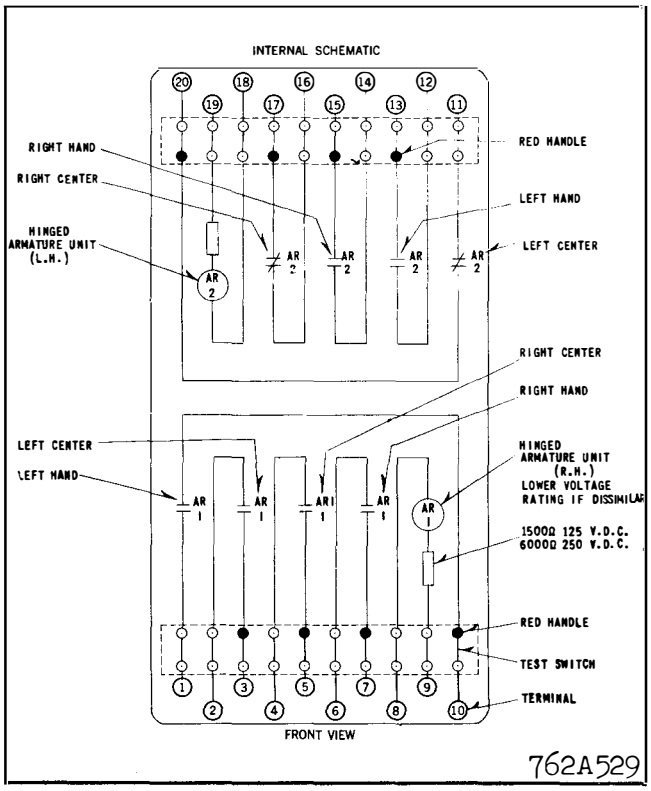


Fig. 6 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 6 make and 2B contacts.

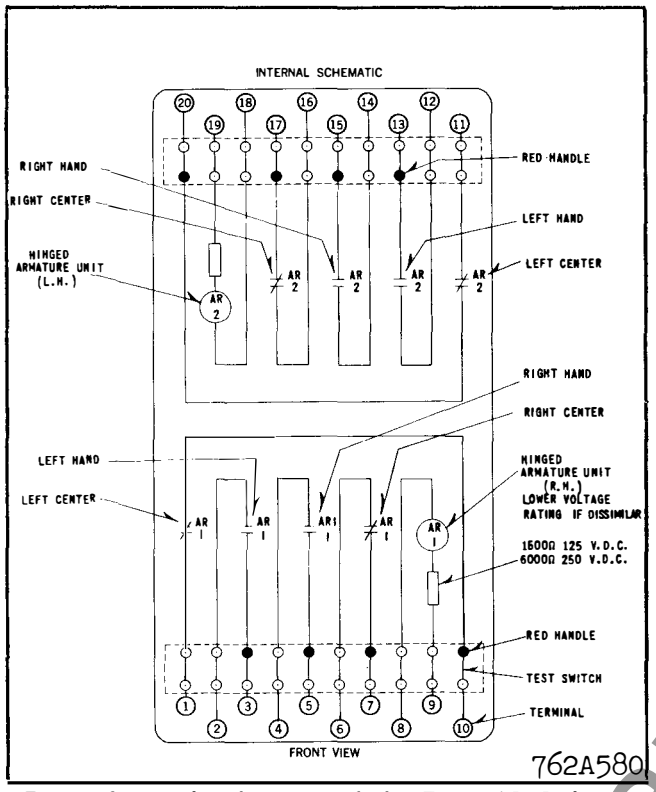


Fig. 7 Internal schematic of the Type AR Relay in FT-22 case, double unit, with 4 make and 4 break contacts.

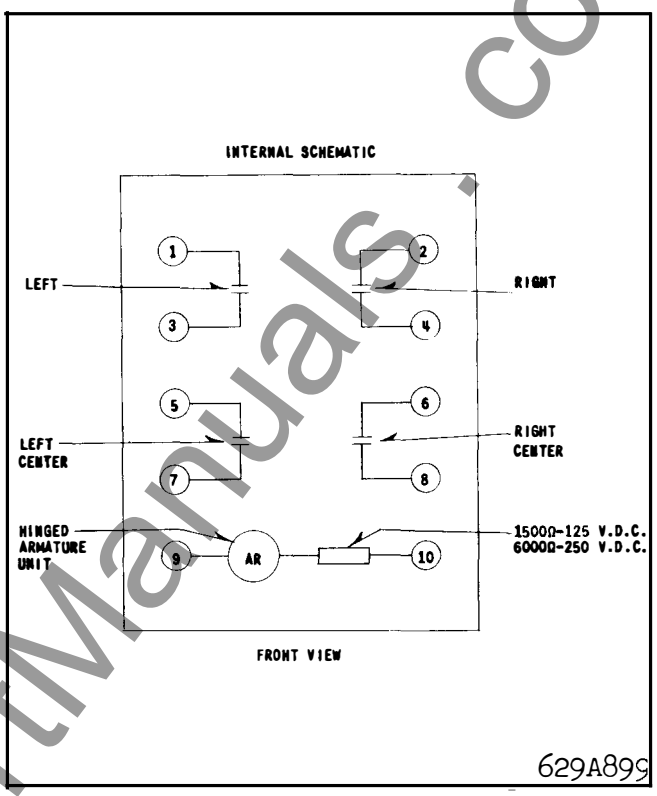


Fig. 8 Internal schematic of the Type AR Relay in front connected molded case with 4 make contacts.

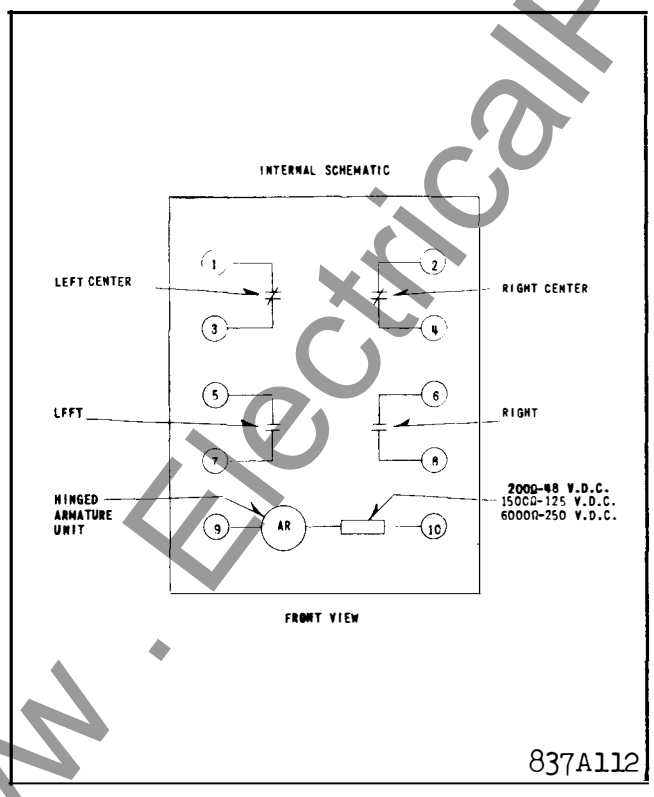


Fig. 9 Internal schematic of the Type AR Relay in front connected molded case with 2 make-2 break contacts.

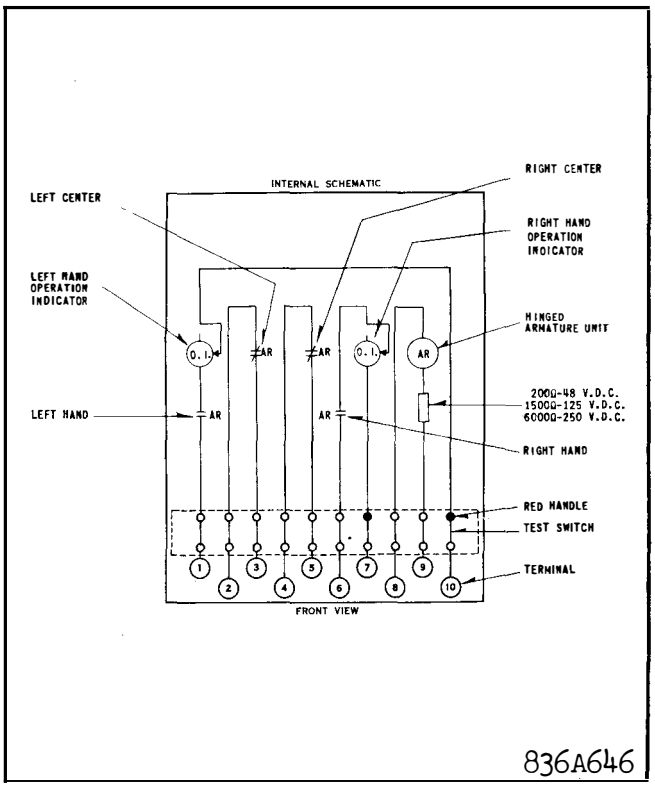


Fig. 10 Internal schematic of the Type AR Relay in the FT-11 case with 2 Operation Indicators.

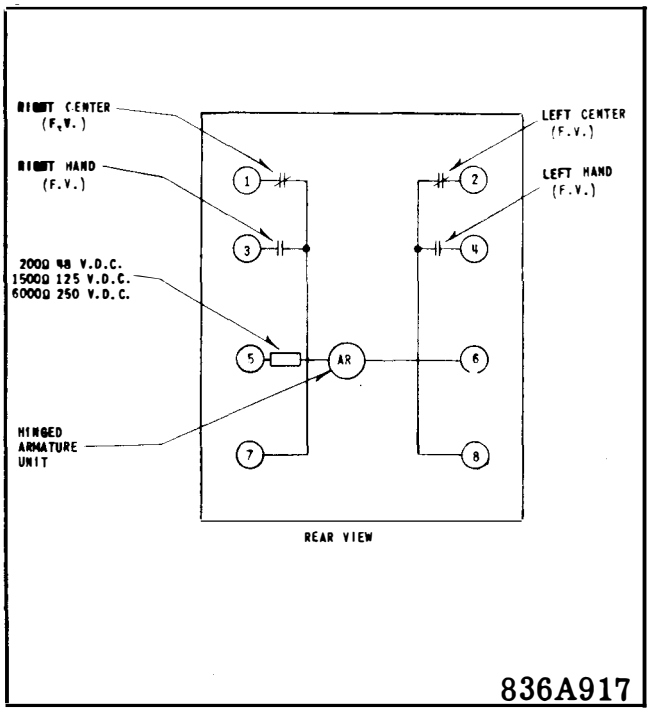


Fig. 11 Internal schematic of the AR Relay with 2 make and 2 break contacts in molded case.

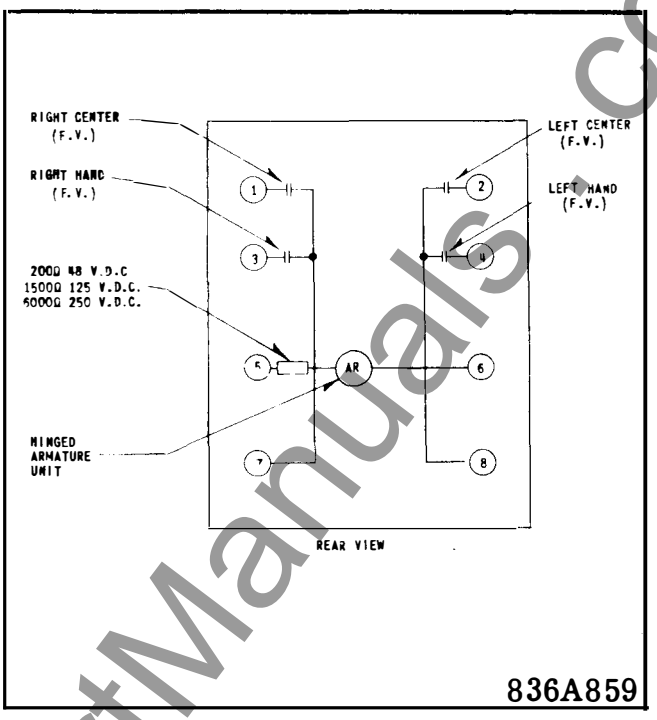


Fig. 12 Internal schematic of the AR with 4 make contacts in molded case.

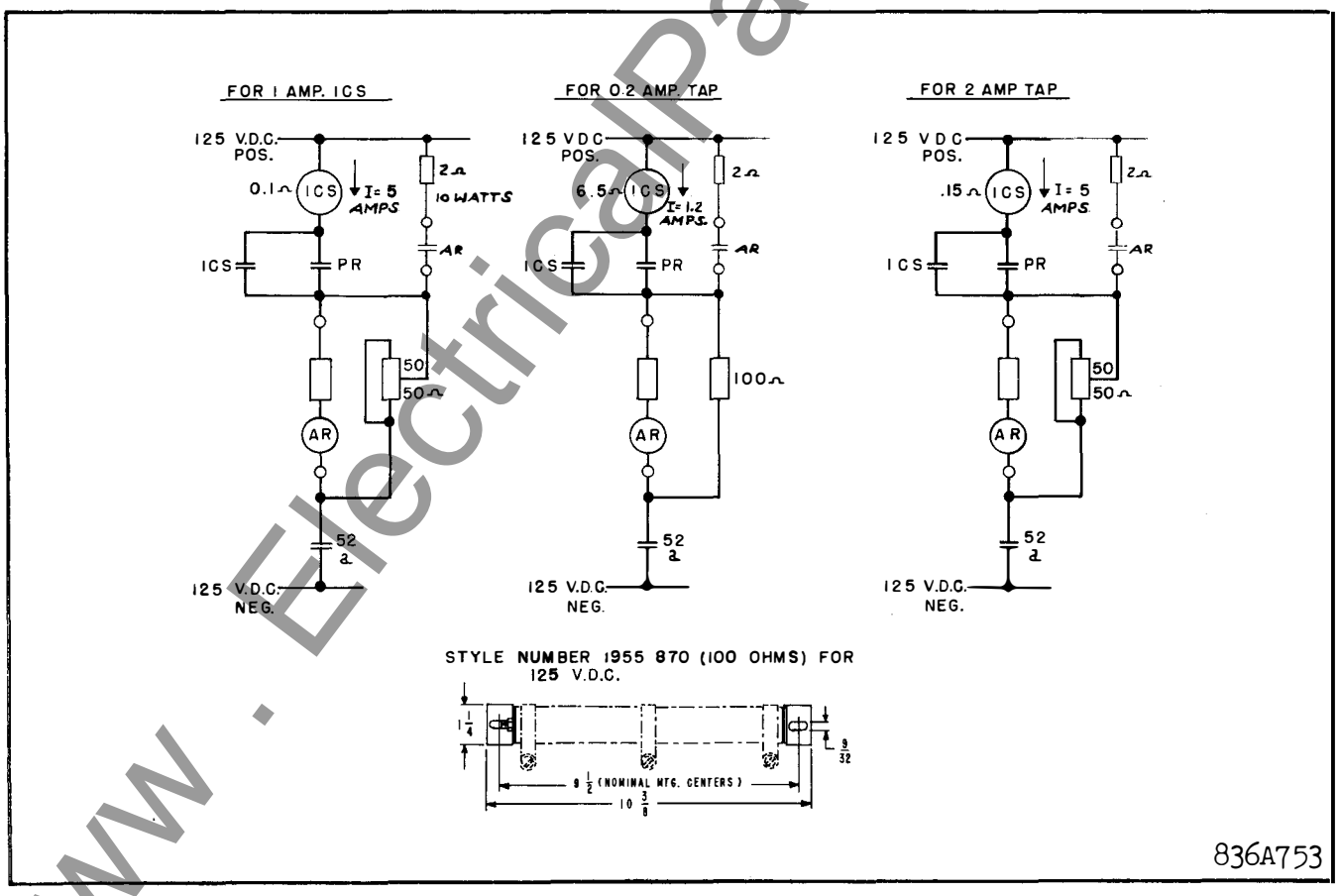


Fig. 13 External schematic for the Type AR Relay.

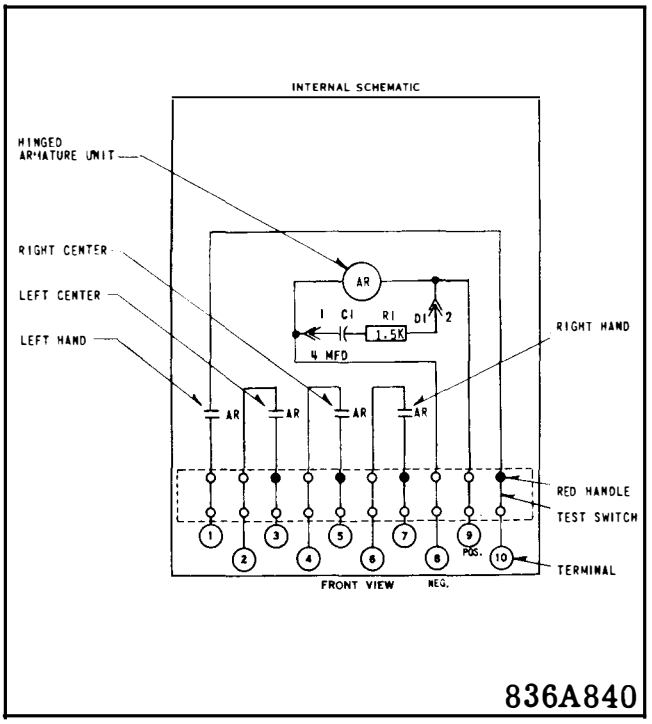


Fig. 14 Internal schematic of the Type AR Relay in the FT-11 case with time delay dropout.

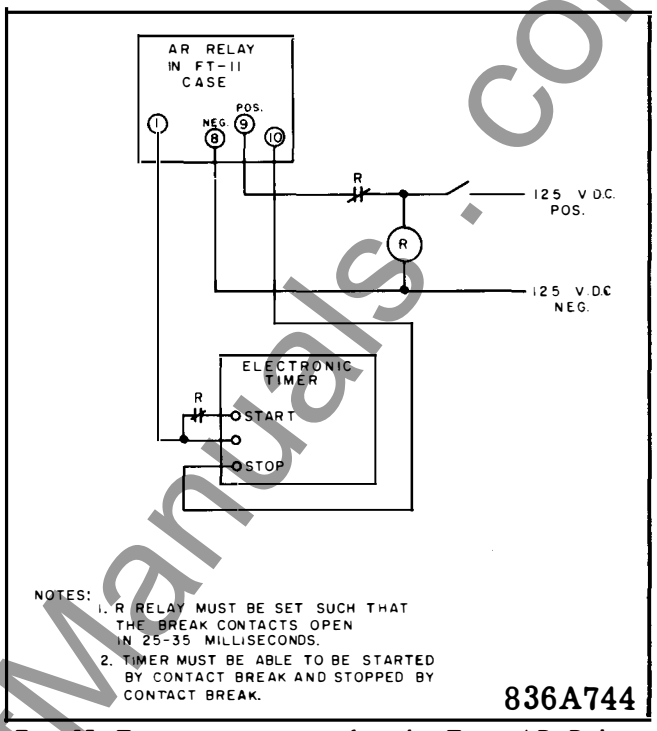


Fig. 15 Test connections for the Type AR Relay with time delay on dropout.

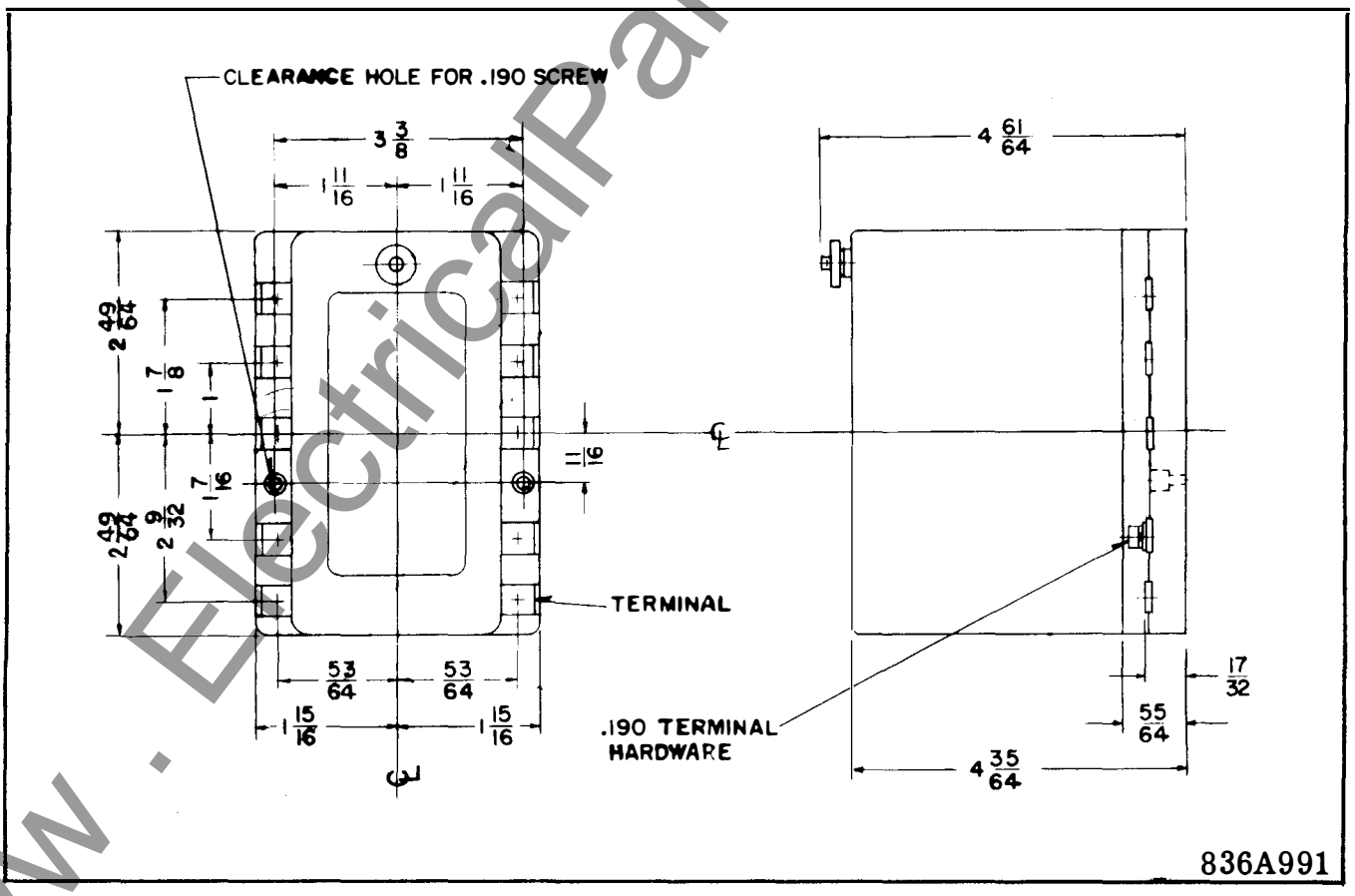
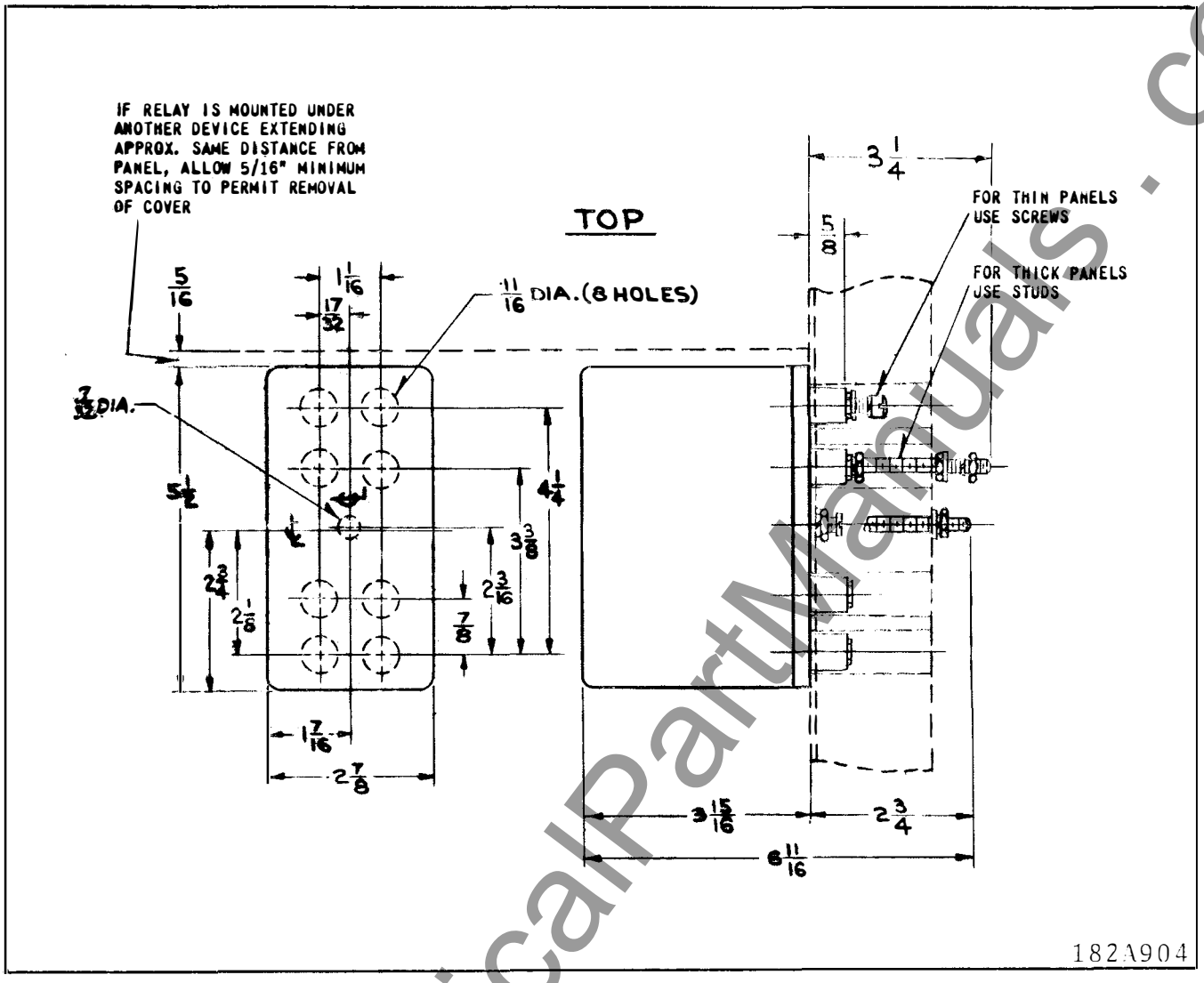


Fig. 16 Outline and drilling plan for the Type AR relay in the front connected molded case.



* *Fig. 17. Type AR Relay – Molded Base Rear Connected Outline & Drilling Plan*

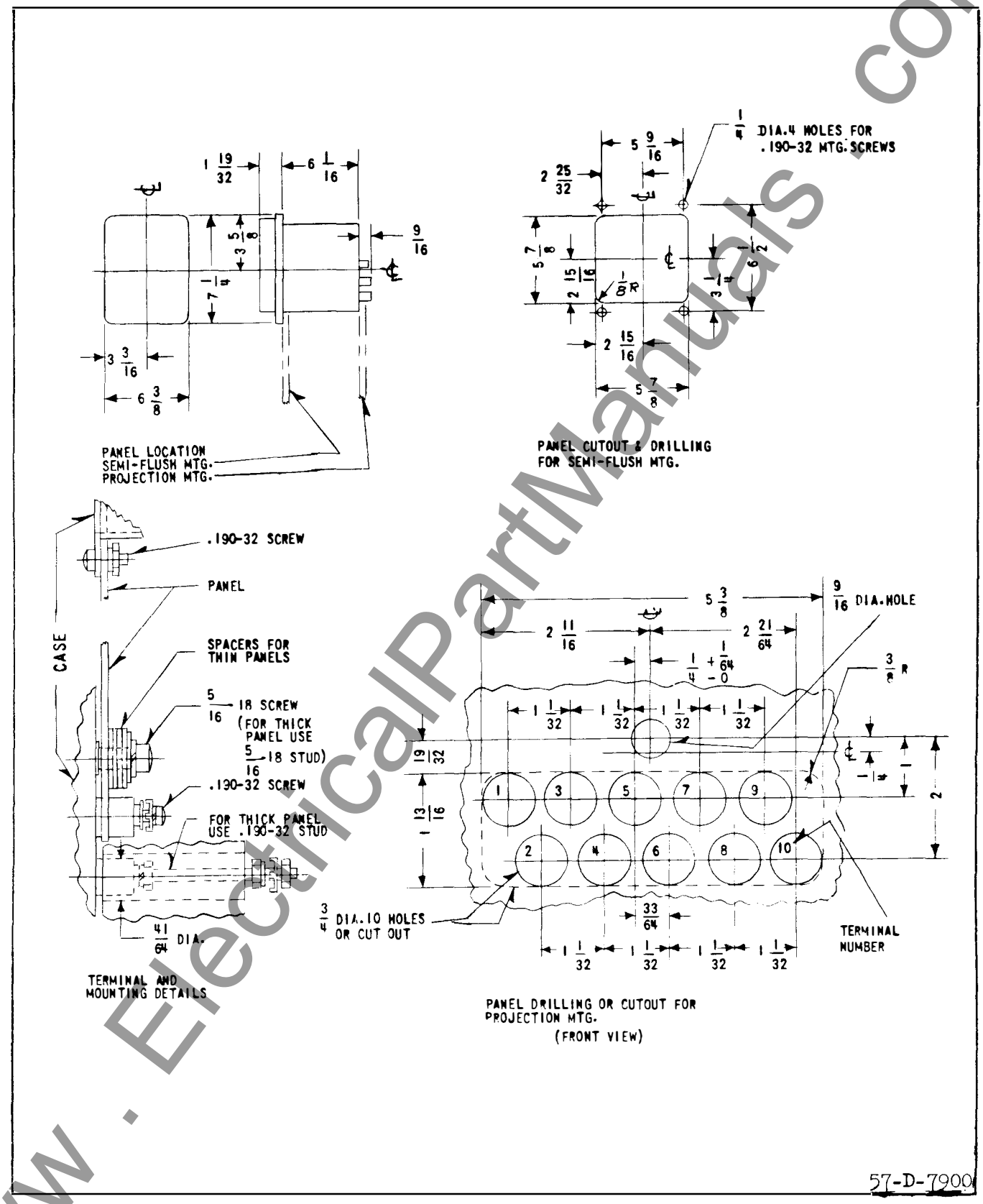


Fig. 18 Outline and drilling plan for the Type AR Relay in the FT-11 case.

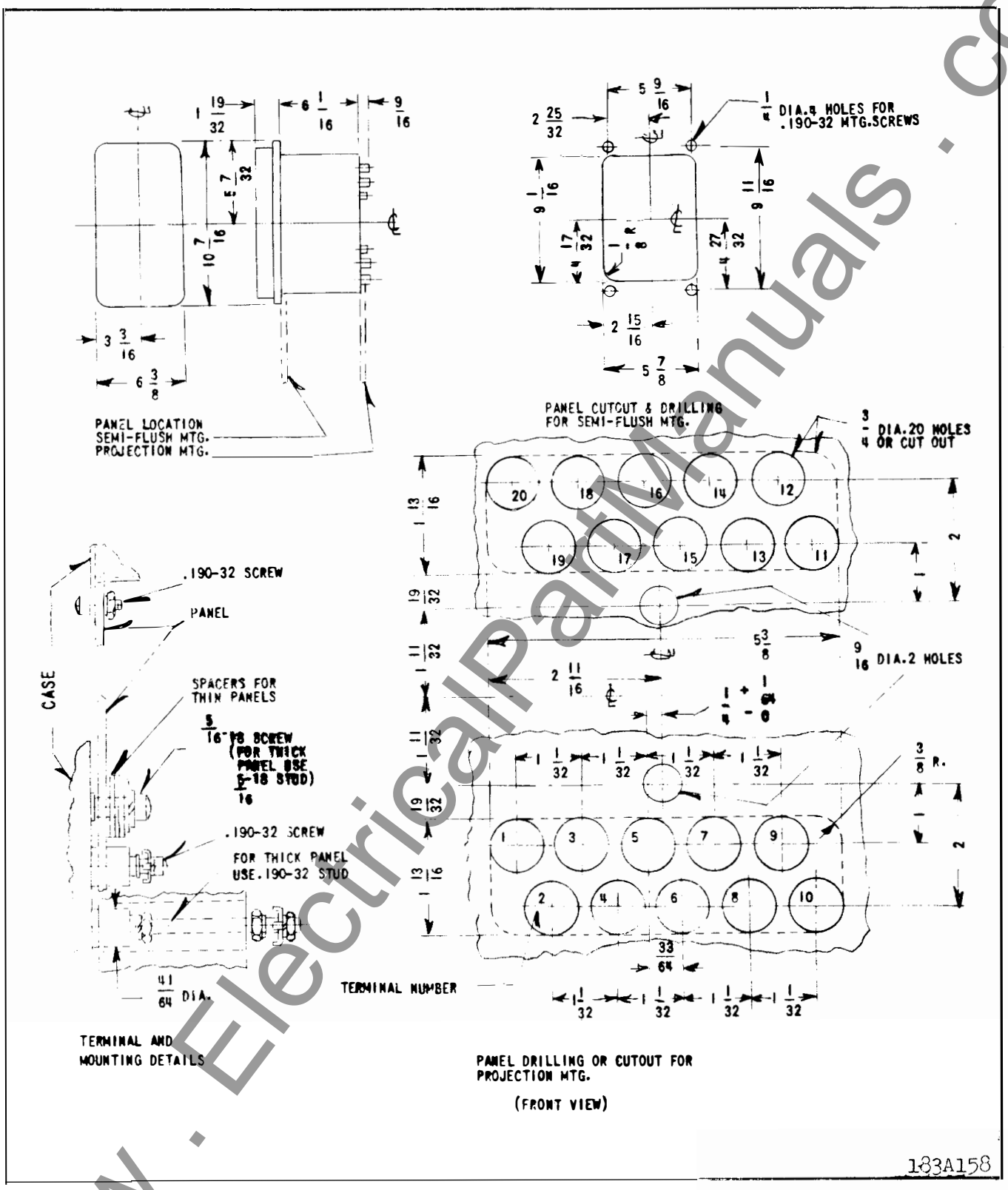


Fig. 19 Outline and drilling plan for the Type AR Relay in the FT-22 case.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE AR HIGH SPEED AUXILIARY RELAY

CAUTION: Before putting protection 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.

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 one 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 R-C circuit paralleling the tripping thyristor to cause the 10-watt AR relay to pickup.

An AR relay is available with a time delay dropout. It can be used in applications where a delayed dropout of 0.1 seconds is desired.

The AR-2 relay is 2 four-pole AR units wired in series with 1 series resistor. The relay provides an 8 pole relay with the same 10 watt burden, but with a slower time, approximately 4 ms.

Both the AR and AR-2 relays have a high seismic fragility level.

CONSTRUCTION AND OPERATION

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 Fig. 1 and 2.

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.

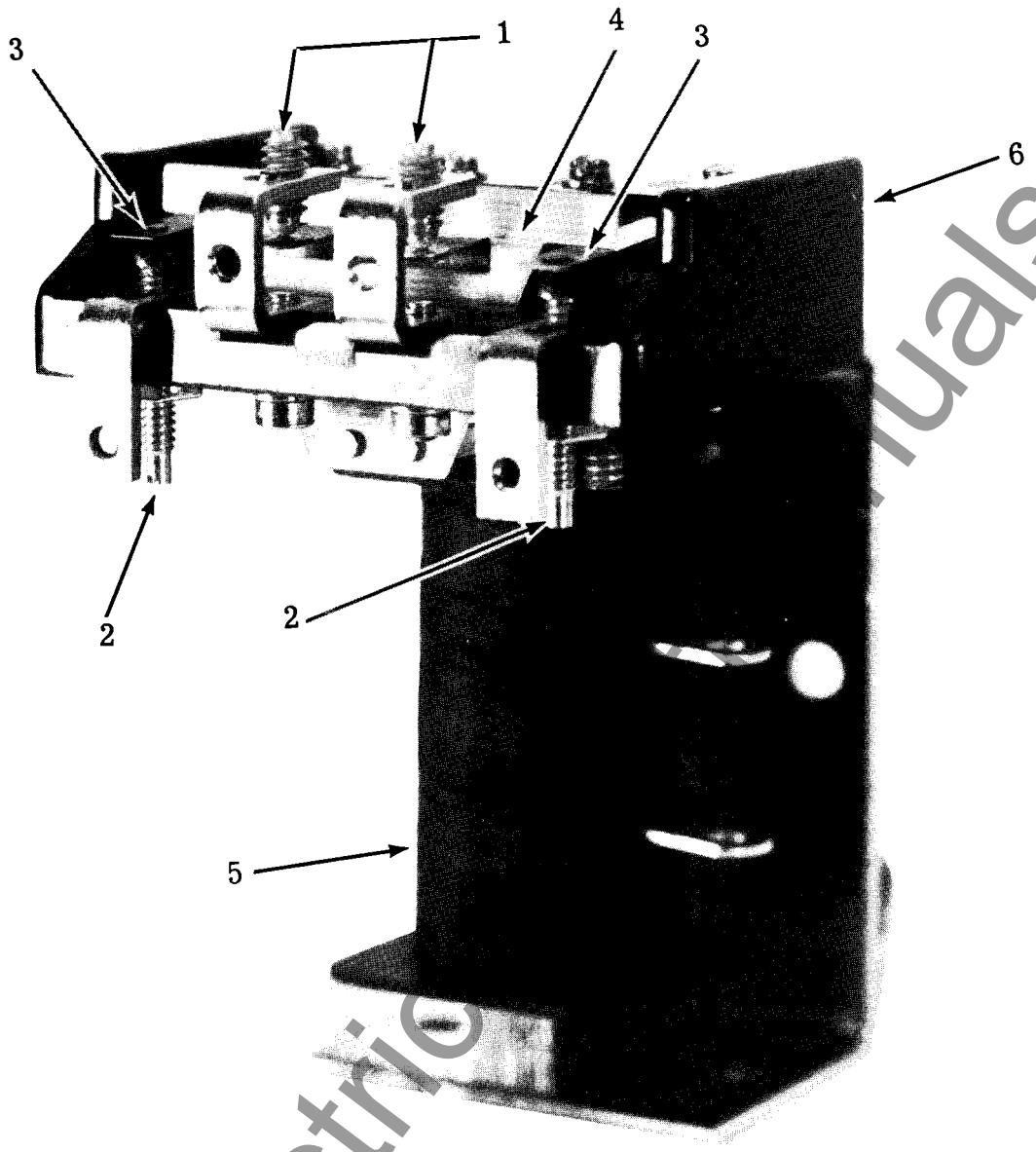
The AR unit used for a time delay dropout is similar to the one described above. The series resistor in the above is replaced by a resistor and capacitor combination shunting the AR coil.

OPERATION INDICATOR (O.I.)

The dc operation indicator is a small clapper type device. A magnetic armature is attracted to

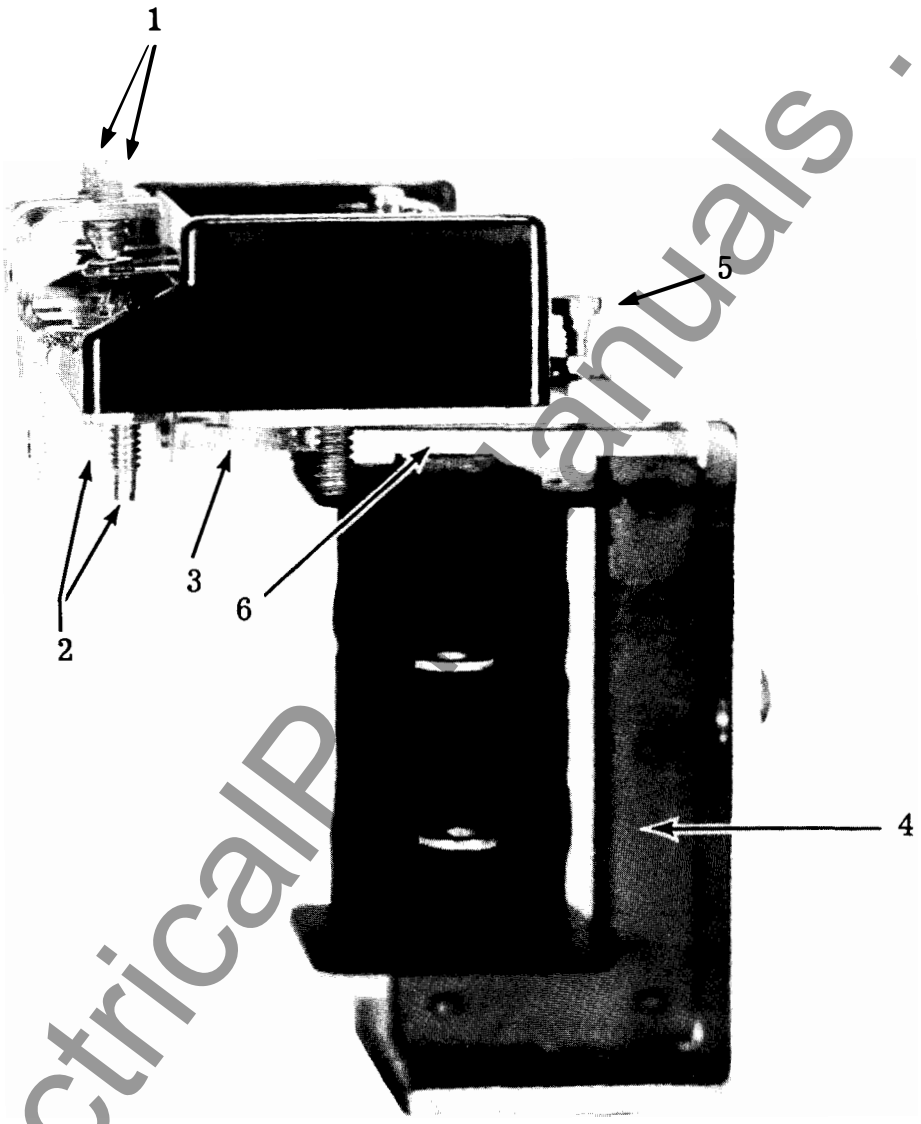
SUPERSEDES I.L 41-759F
Denotes change from superseded issue.

EFFECTIVE OCTOBER 1976



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – LEAF SPRING MOVING CONTACTS
4 – MOVING CARD ASSEMBLY
5 – RELAY COIL
6 – MOLDED INSULATION BLOCK

Fig. 1. Type AR Unit with two make and two break contacts (Front View).



1 – NORMALLY CLOSED STATIONARY CONTACT SCREWS.
2 – NORMALLY OPEN STATIONARY CONTACT SCREWS.
3 – MOVING ARMATURE.
4 – U-SHAPED LAMINATED CORE.
5 – ARMATURE GAP ADJUSTMENT SET SCREW.
6 – ARMATURE GAP

Fig. 2. Type AR Unit with two make and two break contacts (Side View).

TABLE I
OPERATE AND RESET TIMES

Rated Operating† Energy (WATTS)	Operate Time (Milliseconds)		Reset Time (Milli-seconds)
	NO contact Closes	NC contact Opens	NC contact Closes
10	2.0	1.5	4.0
2.25	3.5	2.5	3.5

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

TABLE II
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	- - -

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.

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

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.

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 10% of rated voltage or higher.

Typical operating times and effective contact bounce are outlined in the tables I and II. The AR-2 provides less than 4 ms. operate time for an input of 10 watts.

The operate time of the relay with delayed dropout is about 6 milliseconds at rated voltage for a normally open contact. The relay will have a 0.1 second dropout time after being energized at least 0.015 seconds.

CONTACT RATING

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

SETTINGS

AR UNIT

No settings are required.

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.

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 semi-flush mounting or by means of the rear mounting 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.

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 instructions below should be followed.

ACCEPTANCE CHECK

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

1. Contact gaps
   a. Normally open contacts should have a gap of .018 to .013 inch.
   b. Normally closed contact gap should be .013 minimum.
2. Contact pressure
   a. 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.
   b. On two normally open and two normally closed relays, the normally closed contacts should have approximately 8 grams contact pressure in the de-energized position. Each normally open contact spring should have approximately 8 grams pressure against the card.
3. Armature gap

   The armature gap should be approximately .009 inches measured at the narrowest part of the armature gap.
4. Contact operate time

   Per Table I (Except AR-2 operate time to be less than 4 milliseconds as compared to 2 ms. for the standard 10 watt AR single unit).
5. Operation Indicator (O.I.)

   Close the main relay contacts and pass sufficient dc current through the circuit to drop the O.I. This value of current should be not greater than the particular O.I. tap setting being used. The operation indicator target should drop freely.
6. AR relay with time delay dropout.

   Connect the relay as shown in Fig. 15. When the AR coil has been energized for 25-35 milliseconds its dropout time should be a minimum of 100 milliseconds. The R relay should be adjusted such that its contact break time is 25-35 milliseconds. Also the timer must be of the type which may be started and stopped by break contacts.

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").

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. 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.

c. Adjust each stationary contact screw to obtain a contact gap of 0.020 to 0.022 inches for the normally open contacts. Energize the relay and the normally open contacts should have 15 to 30 grams contact follow. 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 Table I and II.

RENEWAL PARTS

Repair work can be done most satisfactorioy 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.

TABLE III - 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.	1.750	20.	3
125	0.500	1.7	0.350	1.2	3
250	0.250	1.0	0.150	0.250	3

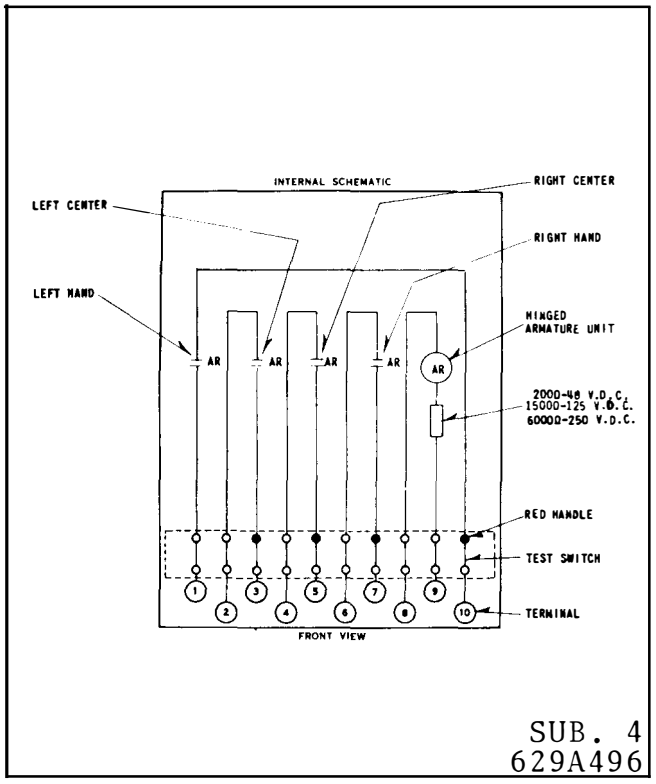


Fig. 3. Internal schematic of the Type AR Relay with 4 make contacts in FT-11 case.

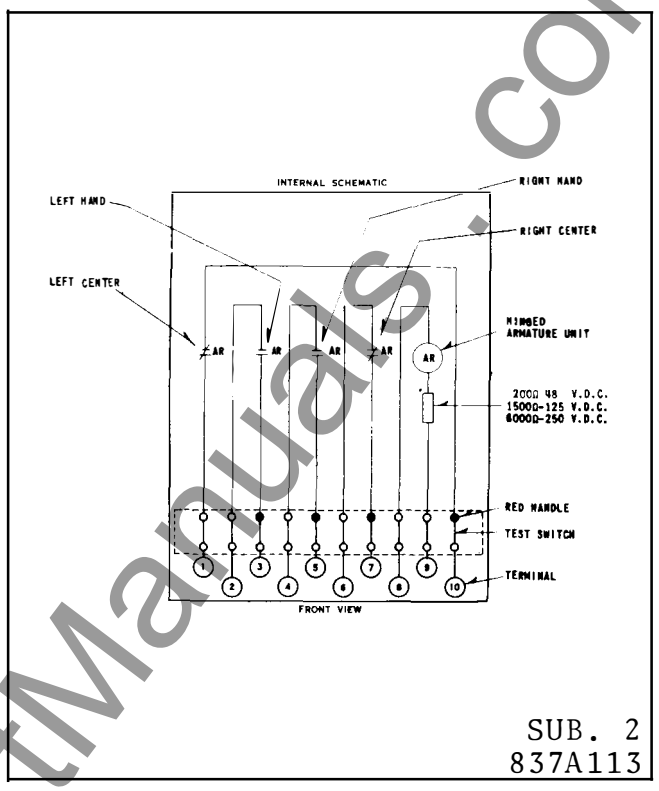


Fig. 4. Internal schematic of the Type A R Relay with 2 make - 2 break contacts in FT-11 case.

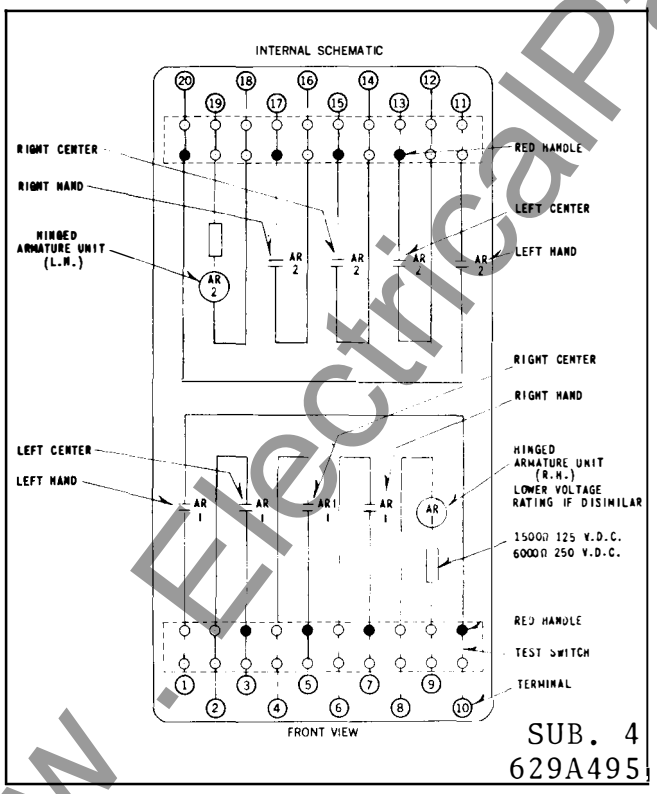


Fig. 5. Internal schematic of the Type AR Relay in FT-22 case, double unit, with 8 make contacts.

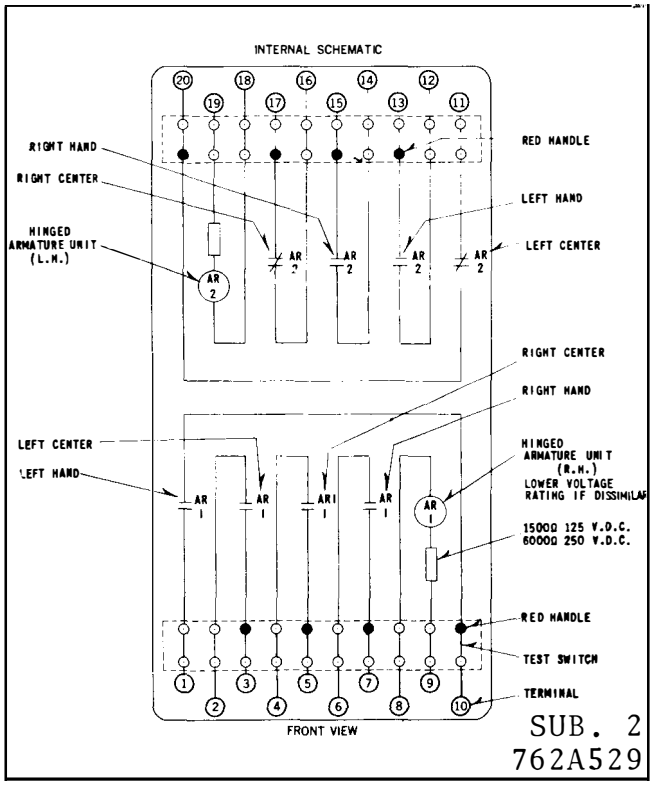


Fig. 6. Internal schematic of the Type AR Relay in FT-22 case, double unit, with 6 make and 2B contacts.

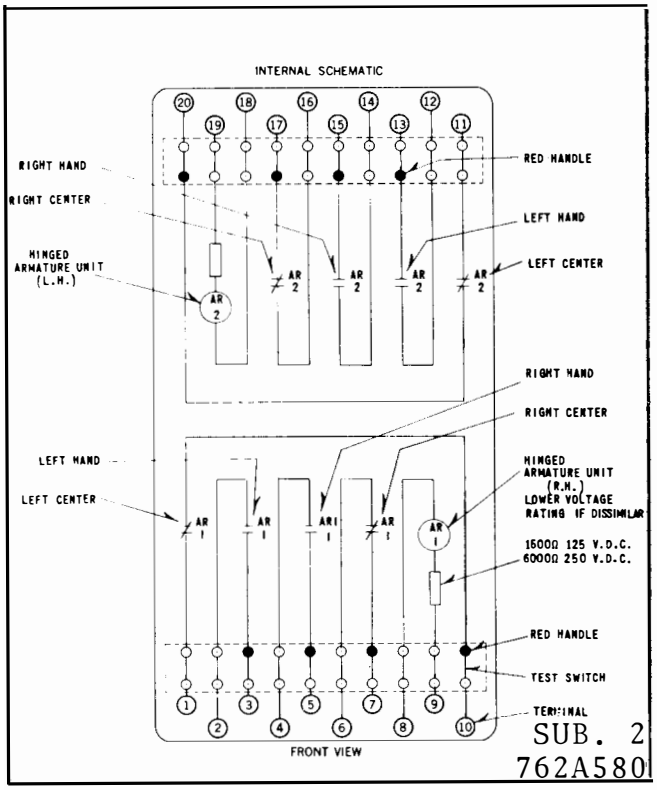


Fig. 7. Internal schematic of the Type AR Relay in FT-22 case, double unit, with 4 make and 4 break contacts.

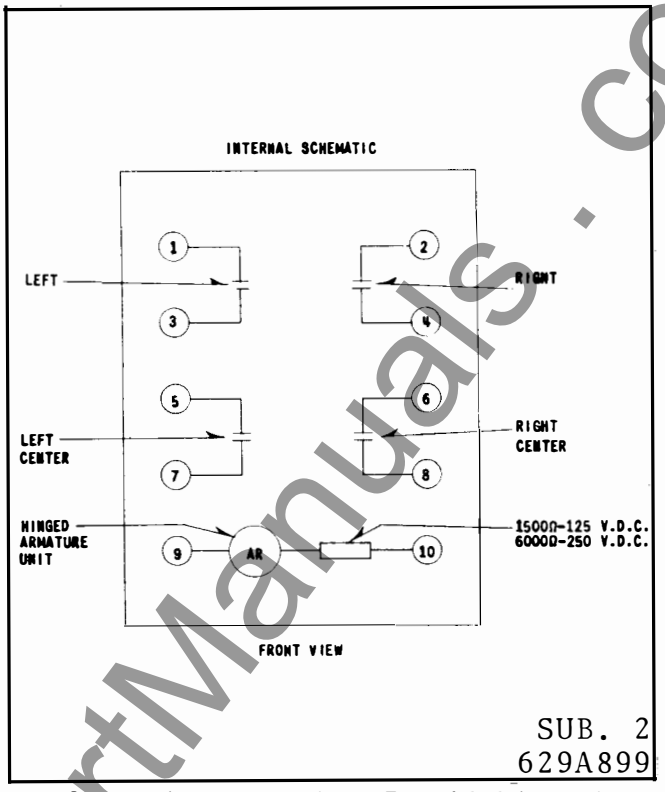


Fig. 8. Internal schematic of the Type AR Relay in front connected molded case with 4 make contacts.

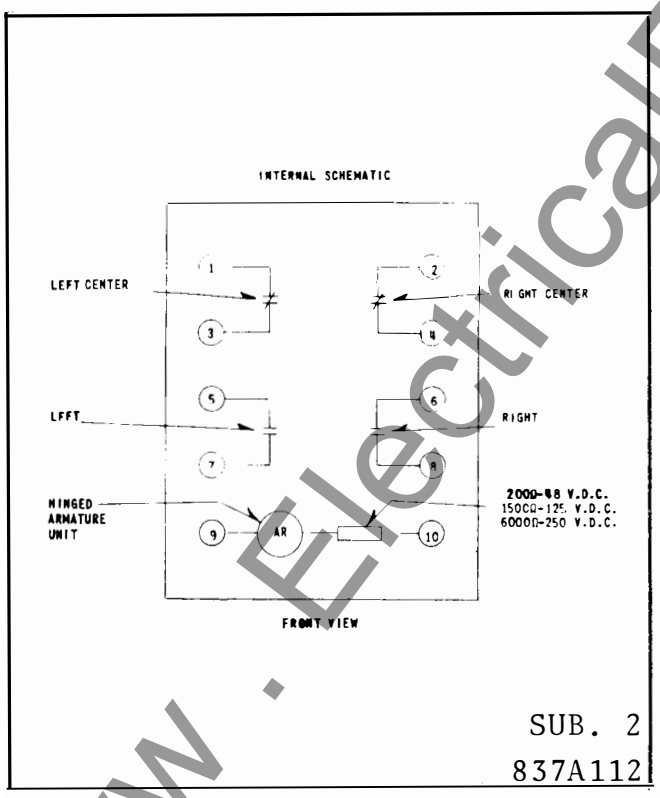


Fig. 9. Internal schematic of the Type AR Relay in front connected molded case with 2 make - 2 break contacts.

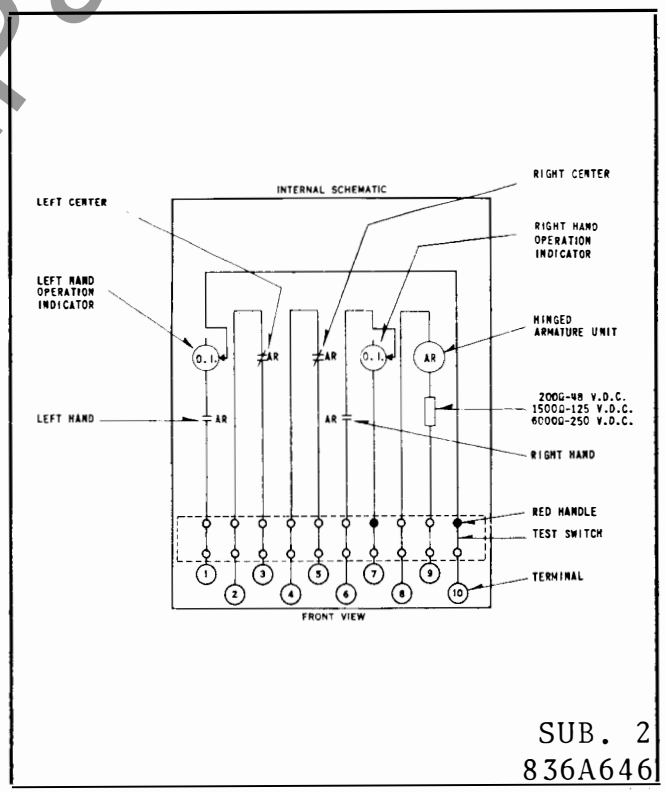


Fig. 10. Internal schematic of the Type AR Relay in the FT-11 case with 2 Operation Indicators.

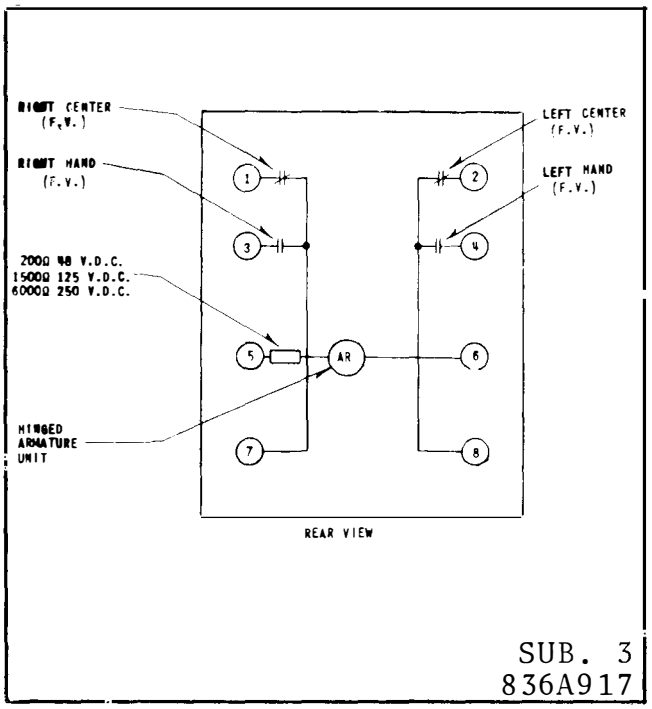


Fig. 11. Internal schematic of the AR Relay with 2 make and 2 break contacts in molded case.

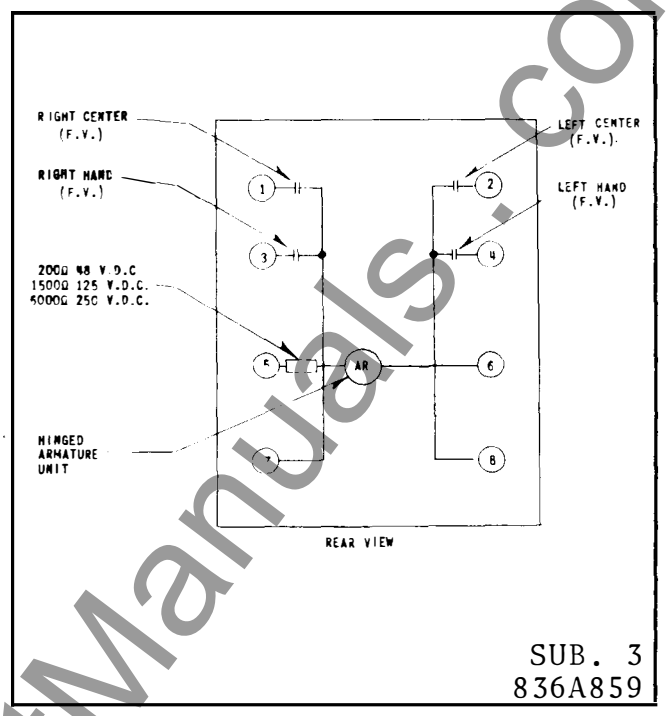


Fig. 12. Internal schematic of the AR with 4 make contacts in molded case.

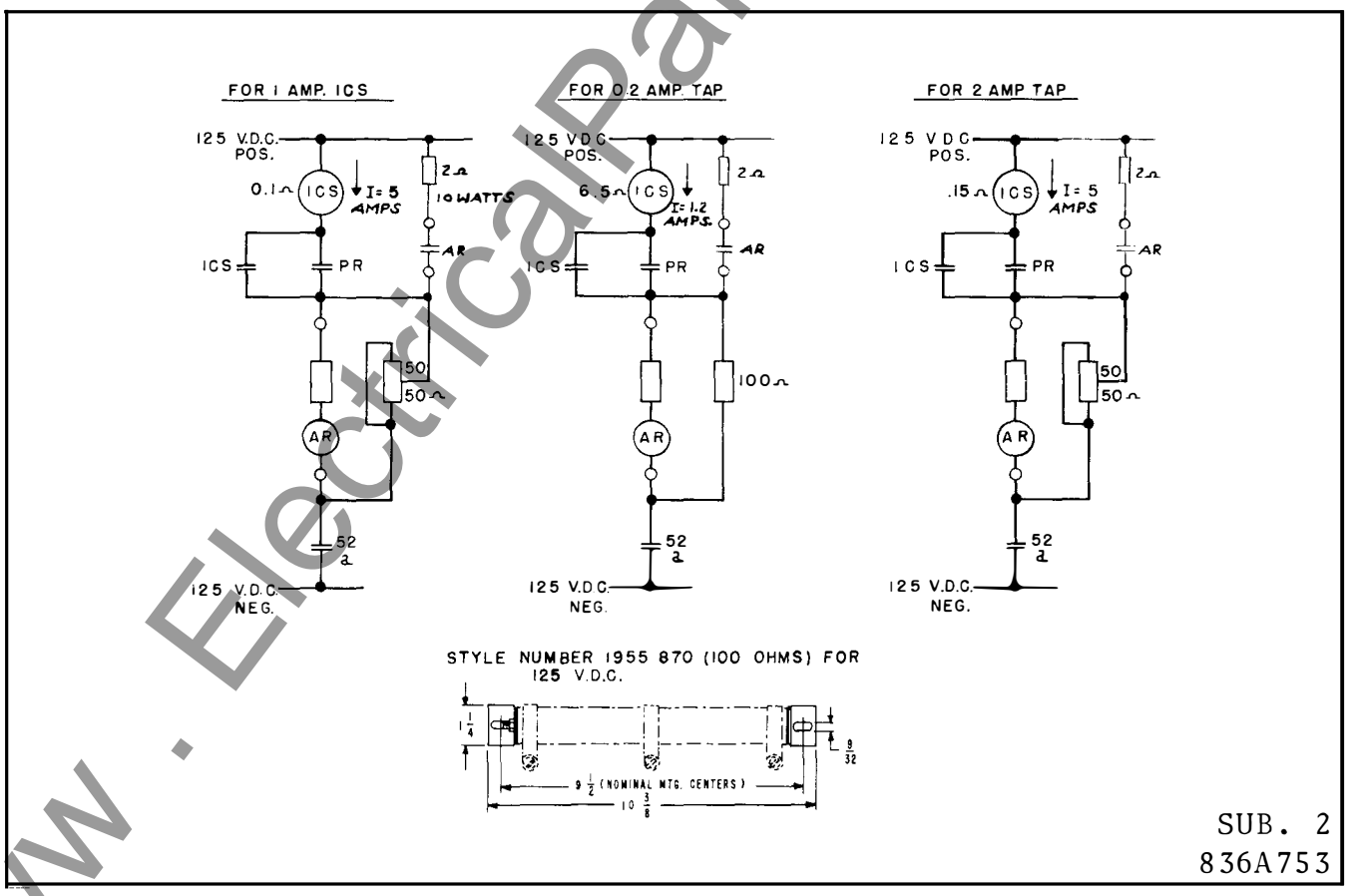


Fig. 13. External schematic for the Type AR Relay.

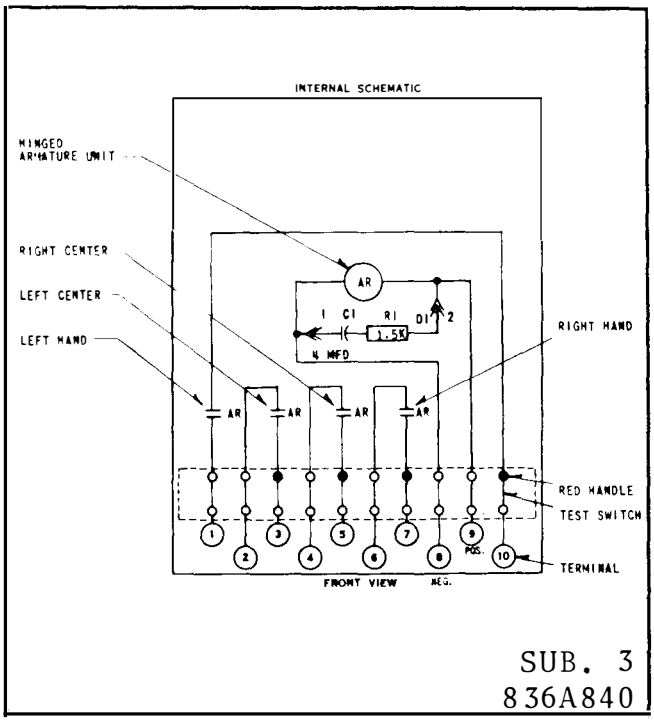


Fig. 14. Internal schematic of the Type AR Relay in the FT-11 case with time delay dropout.

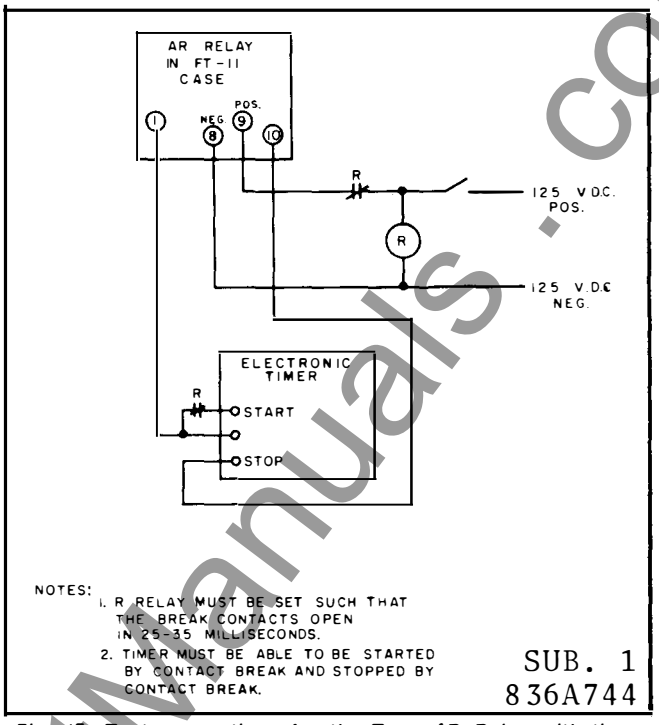


Fig. 15. Test connections for the Type AR Relay with time delay on dropout.

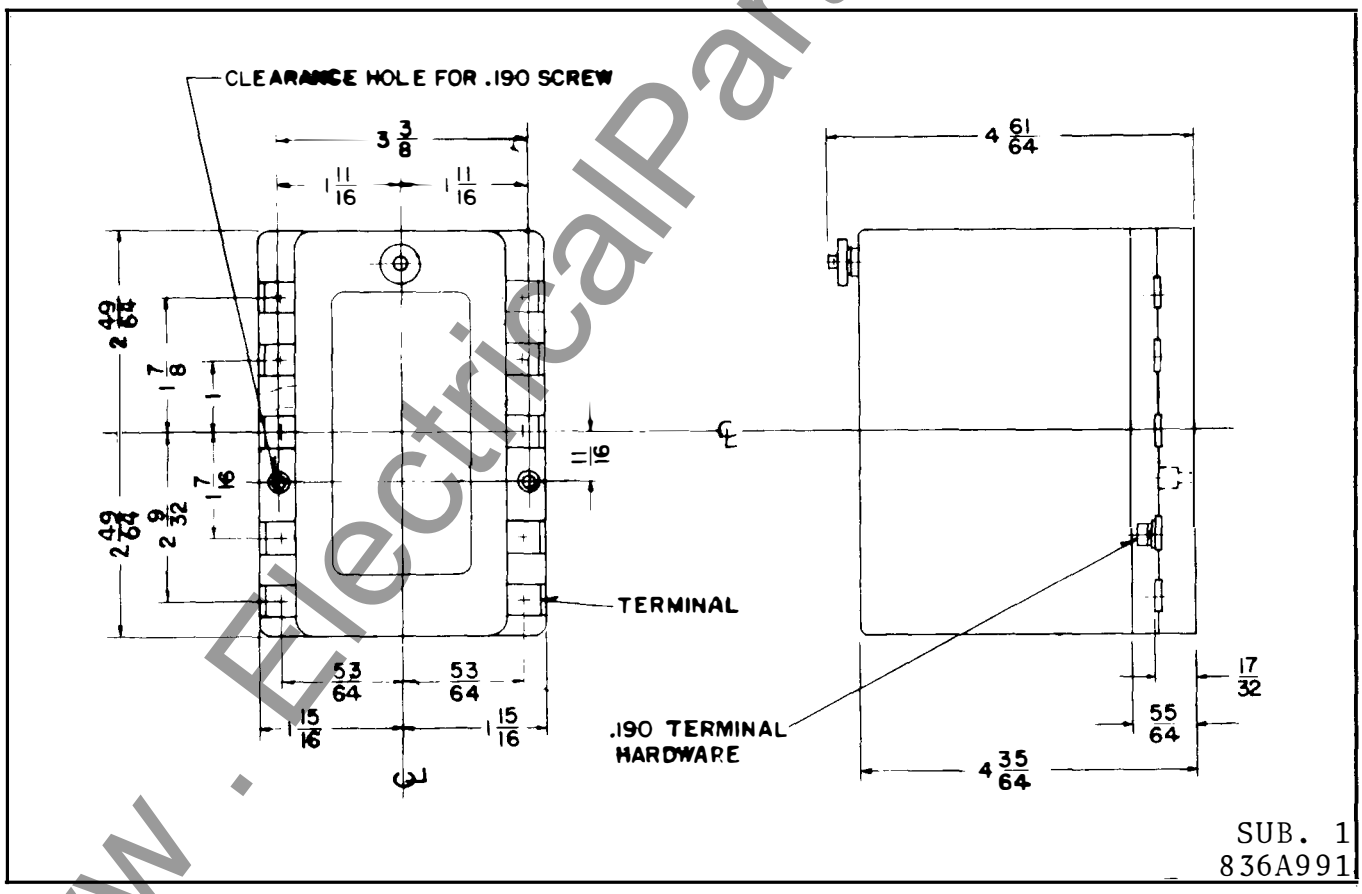


Fig. 16. Outline and drilling plan for the Type AR Relay in the front connected molded case.

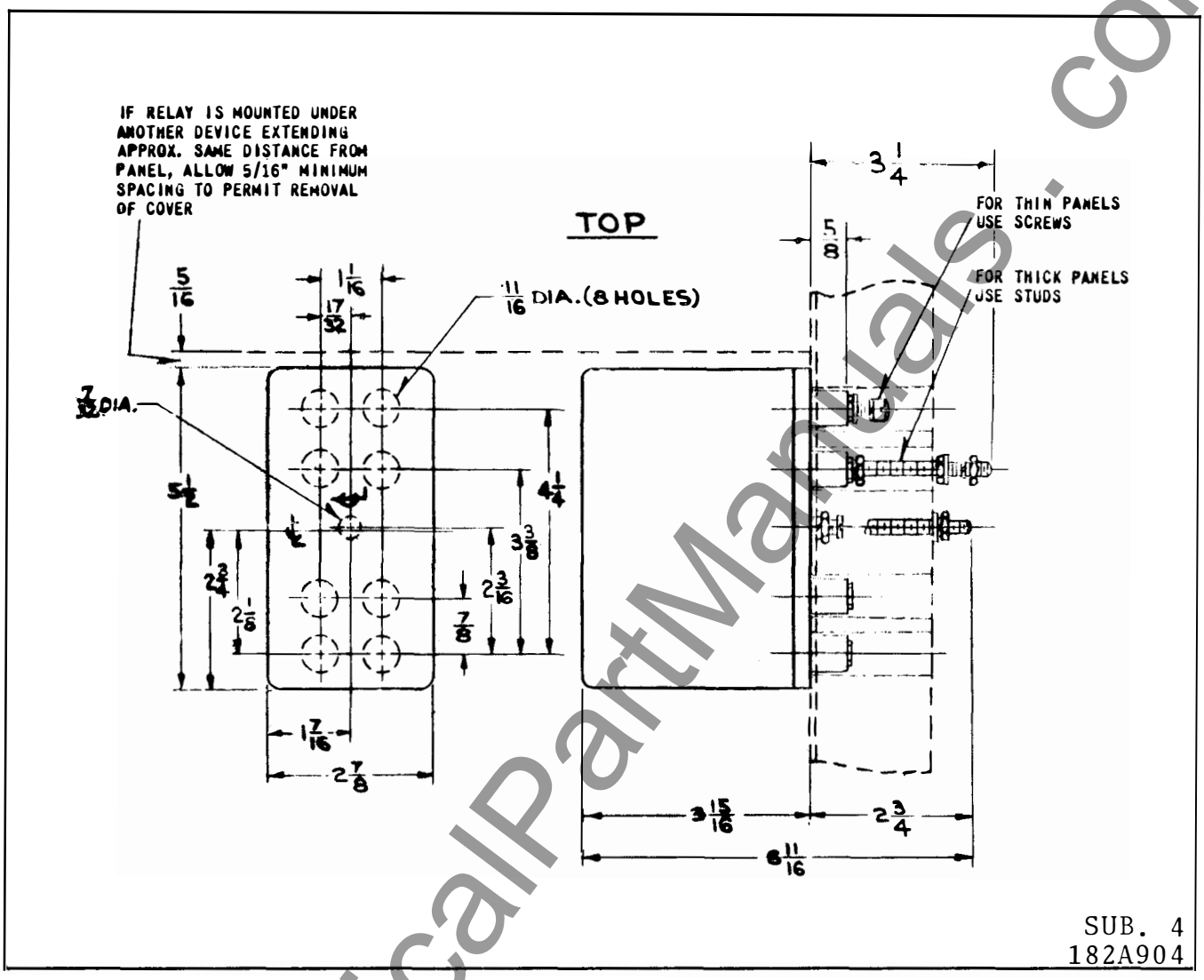


Fig. 17. Type AR Relay — Molded Base Rear Connected Outline & Drilling Plan.

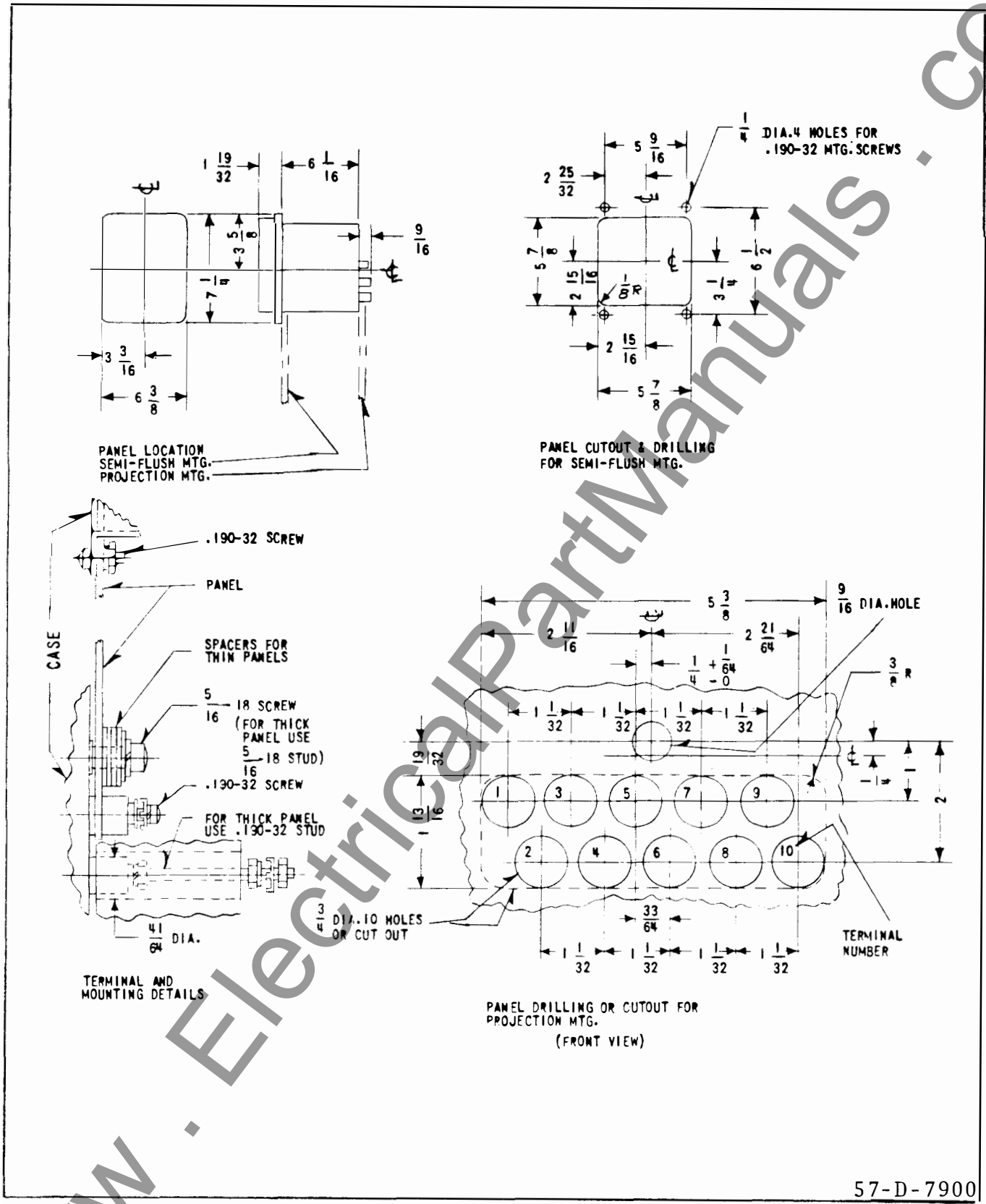


Fig. 18. Outline and drilling plan for the Type AR Relay in the FT-11 case.

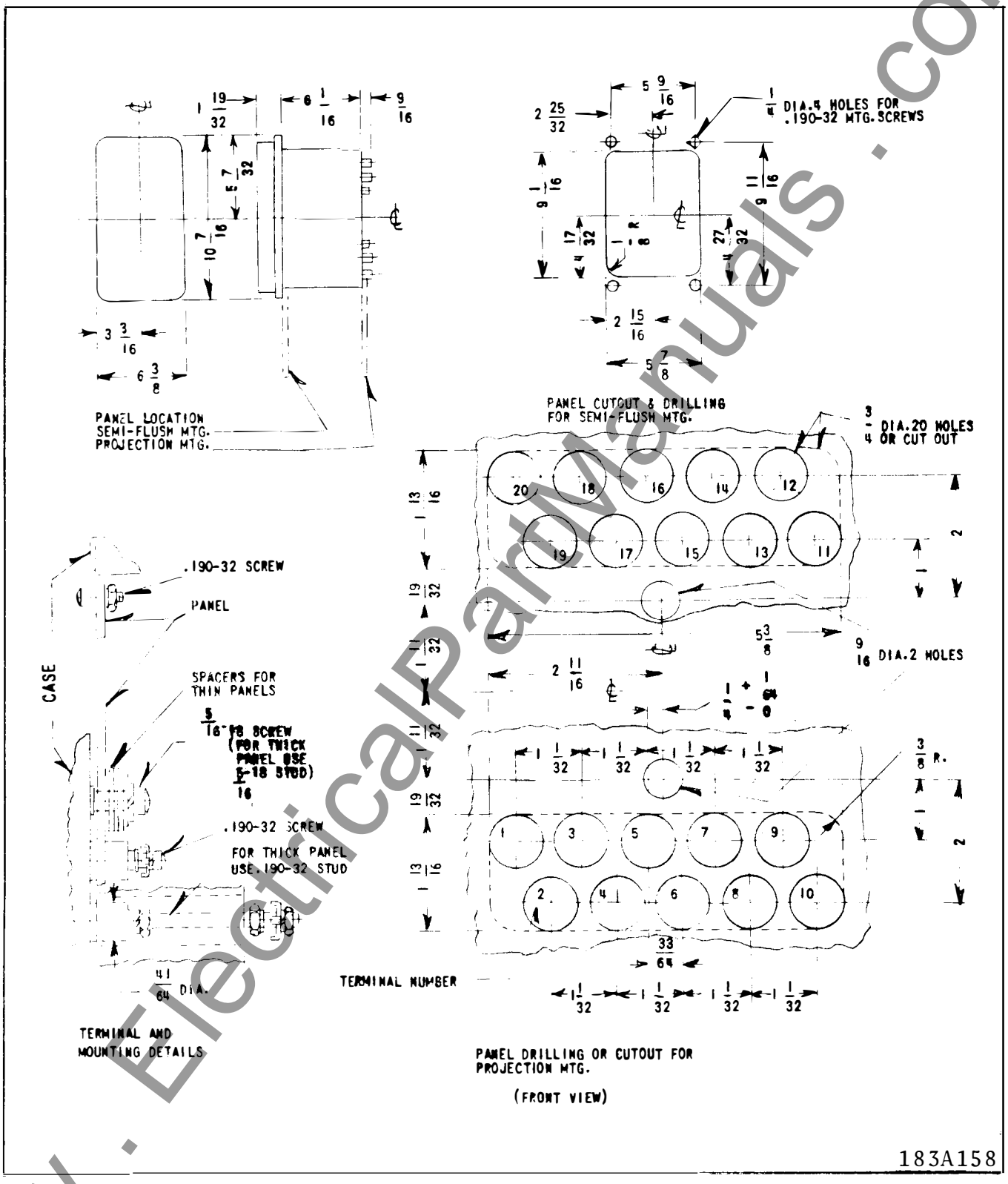


Fig. 19. Outline and drilling plan for the Type AR Relay in the FT-22 case.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE AR HIGH SPEED AUXILIARY RELAY

This sheet notes changes which should be made in instruction leaflet I.L. 41-759G dated October 1976.

1. On page 1, first column

   delete last paragraph "The AR-2 relay . . . 4 ms."

2. On page 1, second column

   delete first paragraph "Both the . . . level."

   should read -

   "The AR relay has a high seismic fragility level."

3. On page 4, first column

   delete last paragraph "Typical operating . . . watts."

   should read -

   "Typical operating times and effective contact bounce are outlined in the Tables I and II."

4. On page 5, second column

   delete section "4 contact operate . . . unit)."

   should read -

   "4 contact operate time per Table I"

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

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