



INSTALLATION • OPERATION • MAINTENANCE INSTRUCTIONS

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although readjustment may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of

the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature by two screws. Silver contact buttons are welded on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is

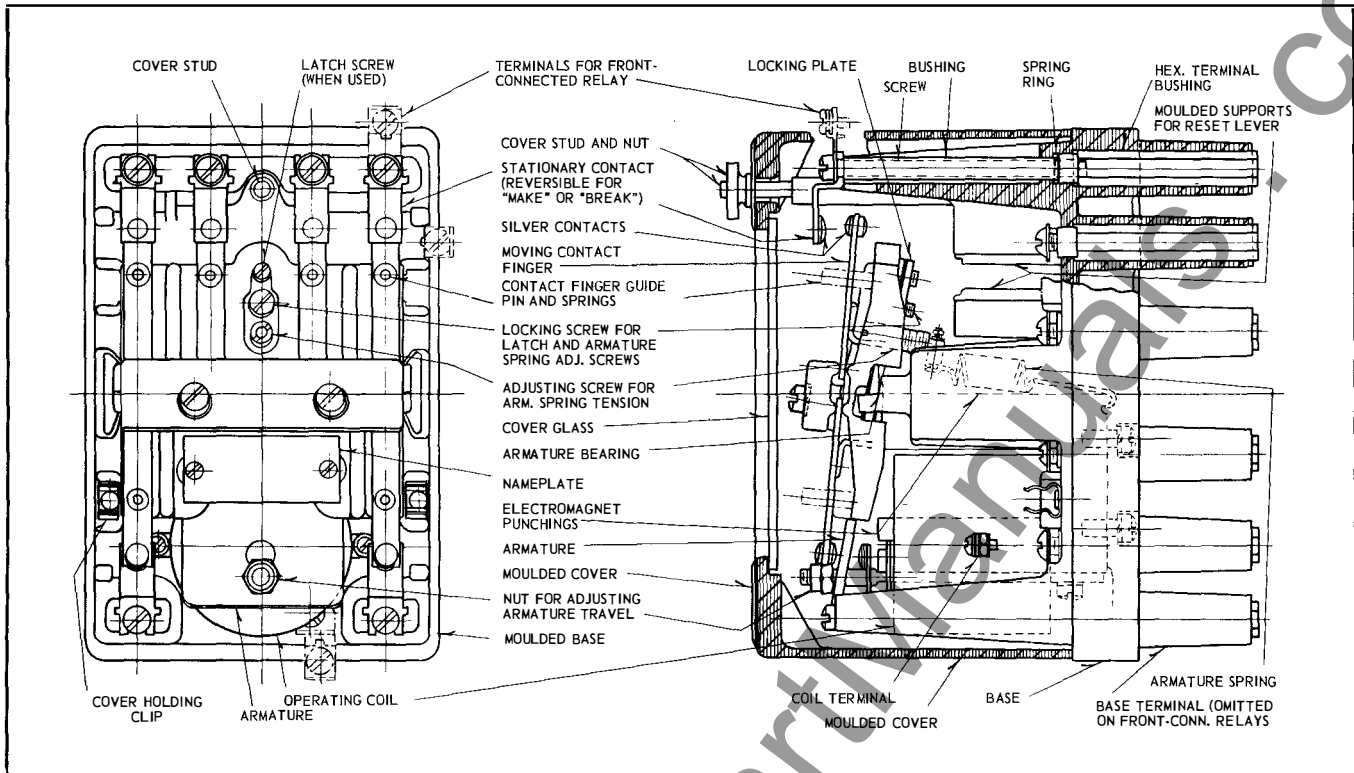


Fig. 1. Front View (Cover Omitted) and Side View of the Type MG-6 Self Reset Relay in Molded Case.

less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the

hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the stationary contact stud of the auxiliary contact, and the end of the moving contact spring is in contact with

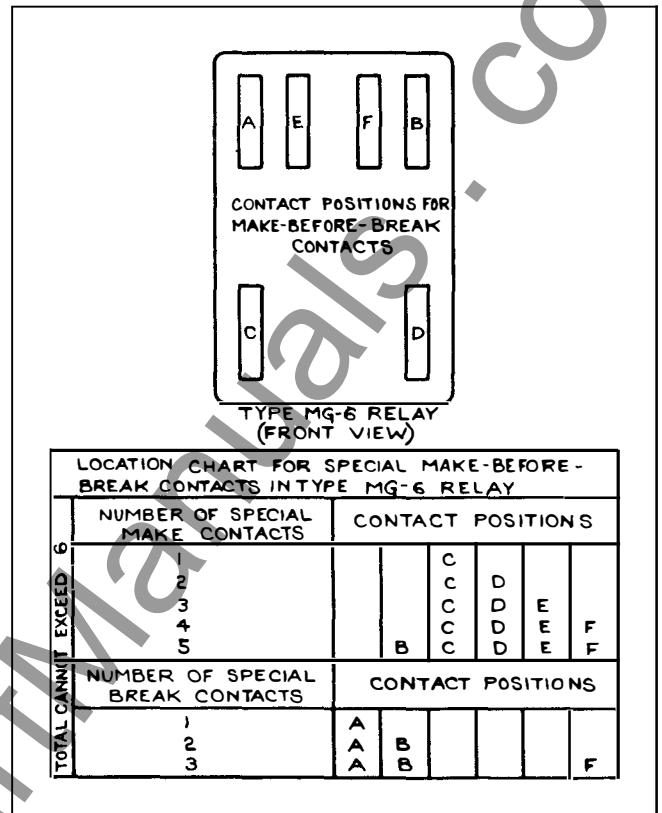


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the internal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

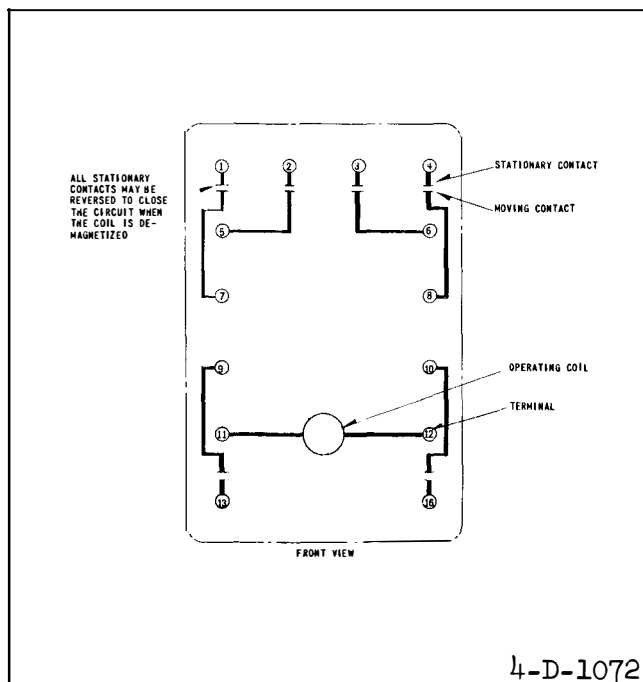


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, In Molded Case.

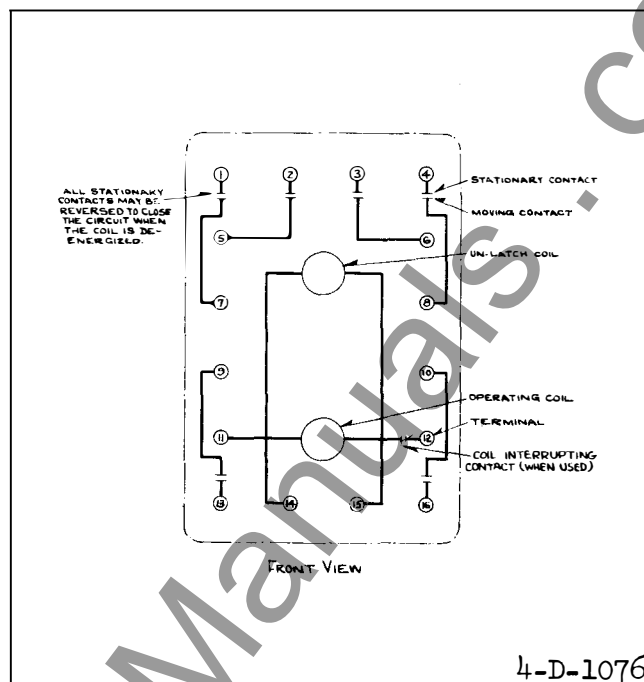


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, In Molded Case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage. If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. The time of the d-c relay can be reduced to slightly over 1 cycle if the coil is energized at five times rated voltage and there is not more than one back contact. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles.

Reset coils are for intermittent duty only and should not be energized longer than one minute.

The relay contacts will close circuits carrying 30

amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay cannot have more than four circuit-opening contacts if the normal contact pressures and armature travel are maintained.

INSTALLATION

The relays should be mounted on switchboard

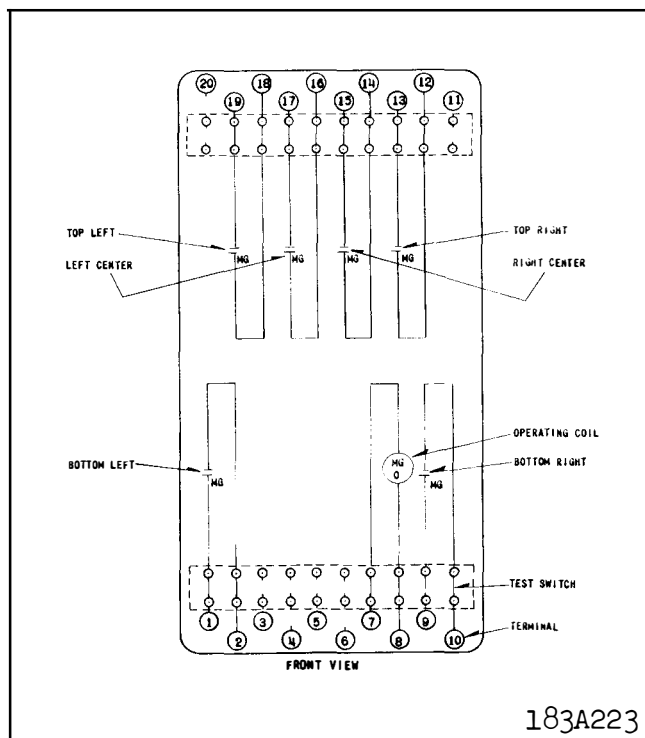


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

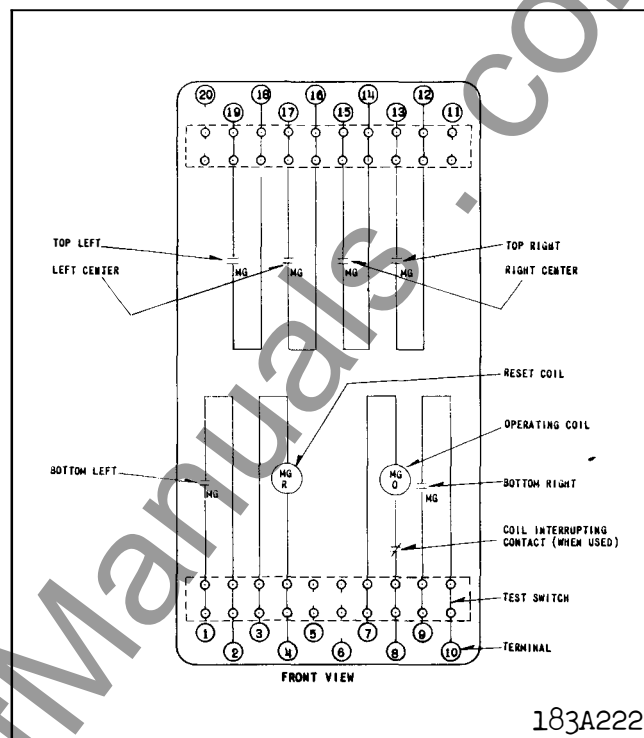


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

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.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of

thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

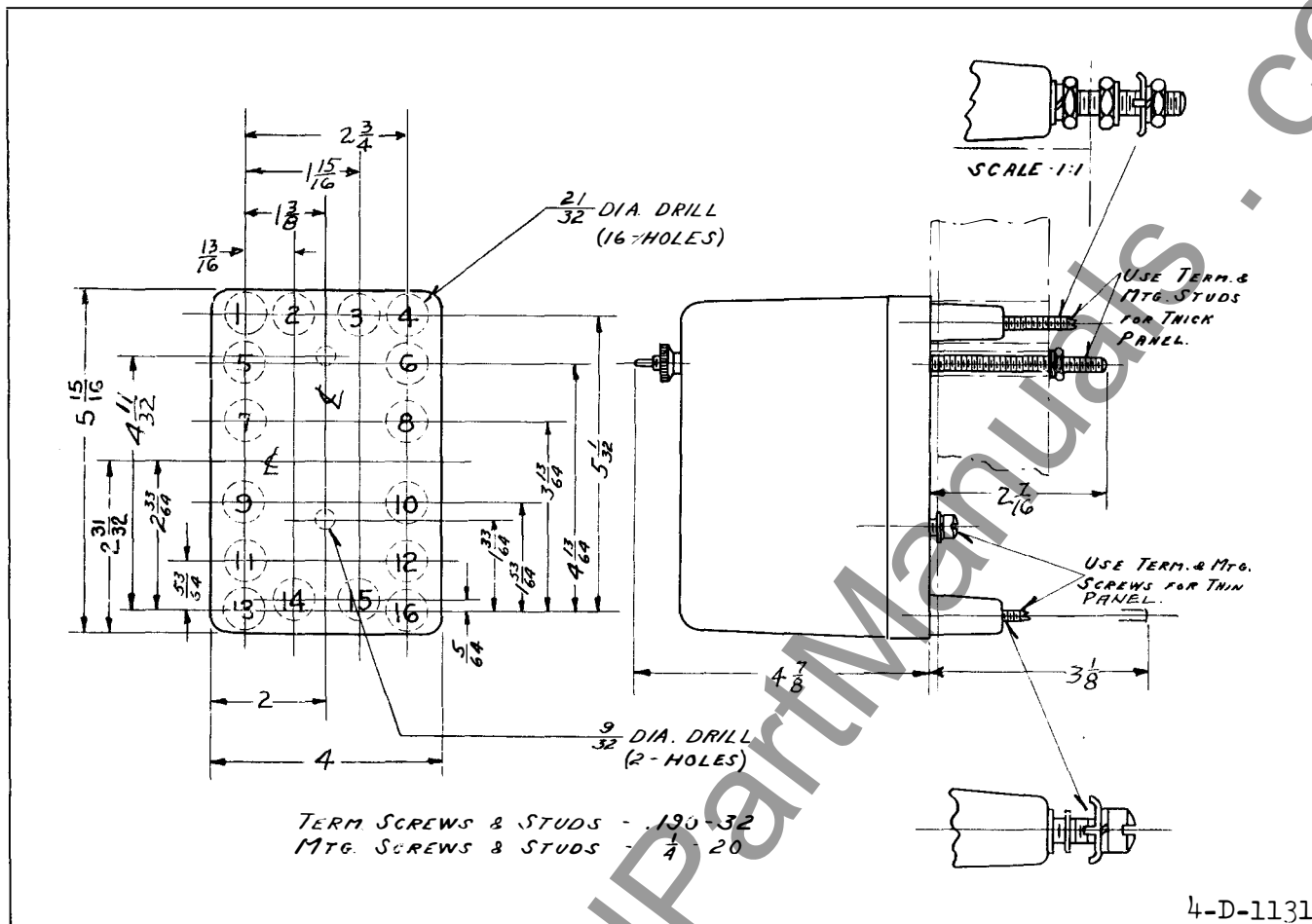


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

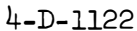
maintained.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the

adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, (except 4 turns for d-c relays with coil-interrupting contacts) and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs



If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the arma-

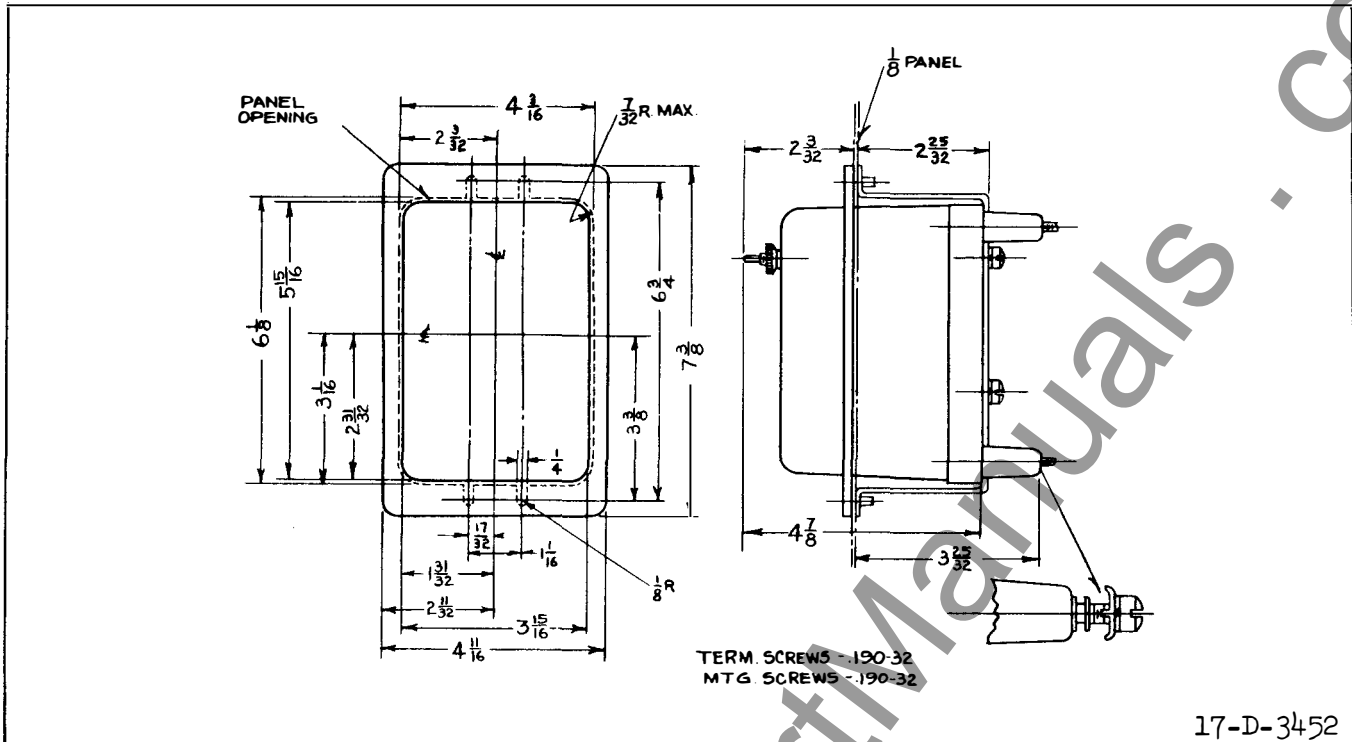


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

ture is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about $1/8$ " of that position. A pair of tweezers on which the ends are bent at a right angle to the body, or a similar tool, is useful in replacing the upper end of the spring in the groove of the adjusting member. Such a tool is particularly helpful on relays which have an electrical reset assembly.

On latch-type relays the latch screw is adjusted so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .010 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .005 inch, and should not be more

than about $1/64$ ". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 5 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to

strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil-interrupting contact, the following points must be observed to assure satisfactory operation. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is only .005 inch. With the armature in this position the coil interrupting contact should be open by about 1/16 inch. This gap is adjusted at the factory by varying the number of slotted shims used between the relay base and the contact supporting bracket. The two main contacts at the lower end of the base should be assembled as circuit-opening contacts, and the main armature restraining spring should have 4 turns tension (see 3rd paragraph of this section) for DC as well as for AC relays. It is necessary also that the L-shaped spring which carries the moving member of the coil-interrupting contact have its sides approximately straight before assembly with

the supporting bracket, and that the angle between the sides be approximately 80°.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
60	12.	37	17.6	92
D-C	7.8	cold--	7.8	cold--
D-C	6.5	hot --	6.5	hot -

Reset Coil Burdens at Rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	23	26	24	27
50	18	23	20	25
60	23	32	26	36
D-C	31	cold--	31	cold--

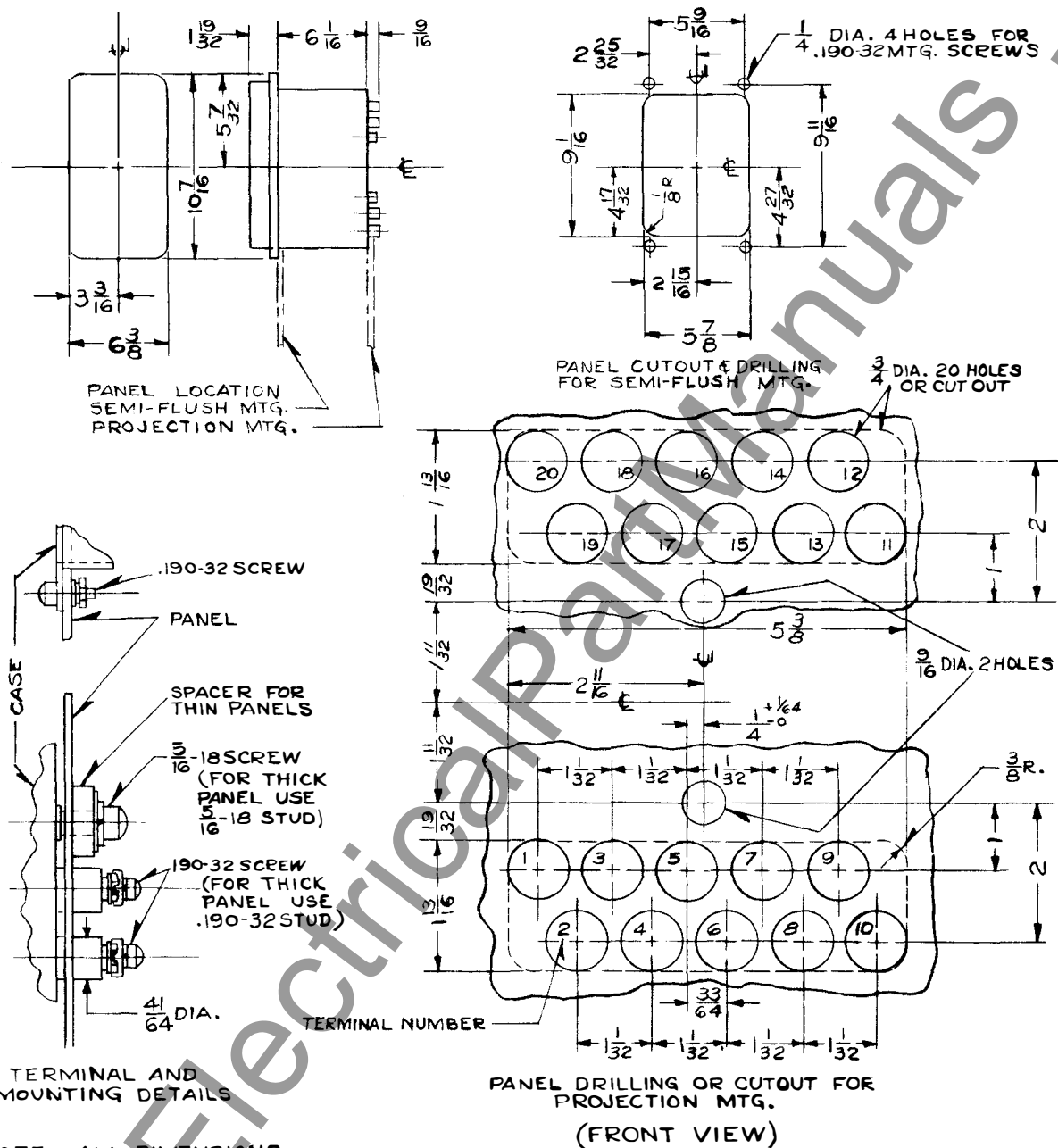


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of

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The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature by two screws. Silver contact buttons are welded on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is

SUPERSEDES I.L. 41-753.1

*Denotes change from superseded issue.

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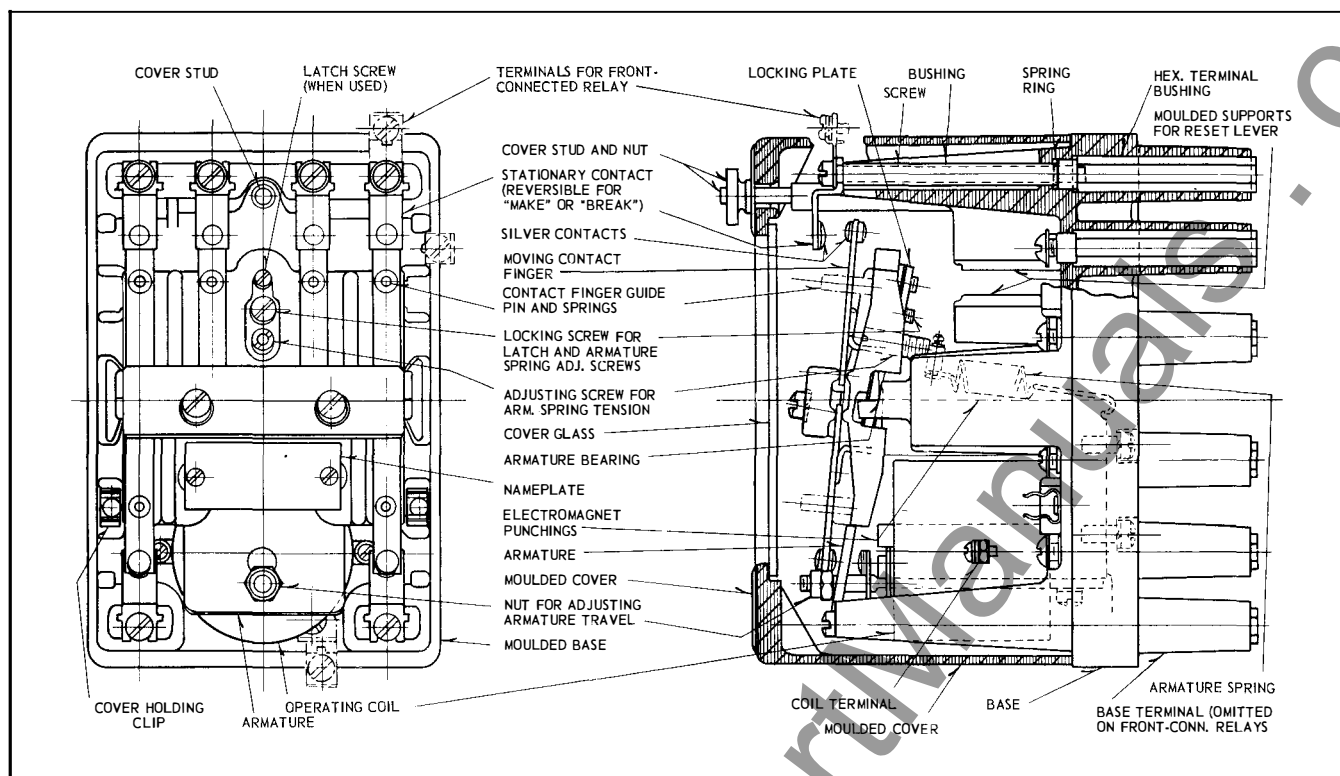


Fig. 1. Front View (Cover Omitted) and Side View of the Type MG-6 Self Reset Relay in Molded Case.

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The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the

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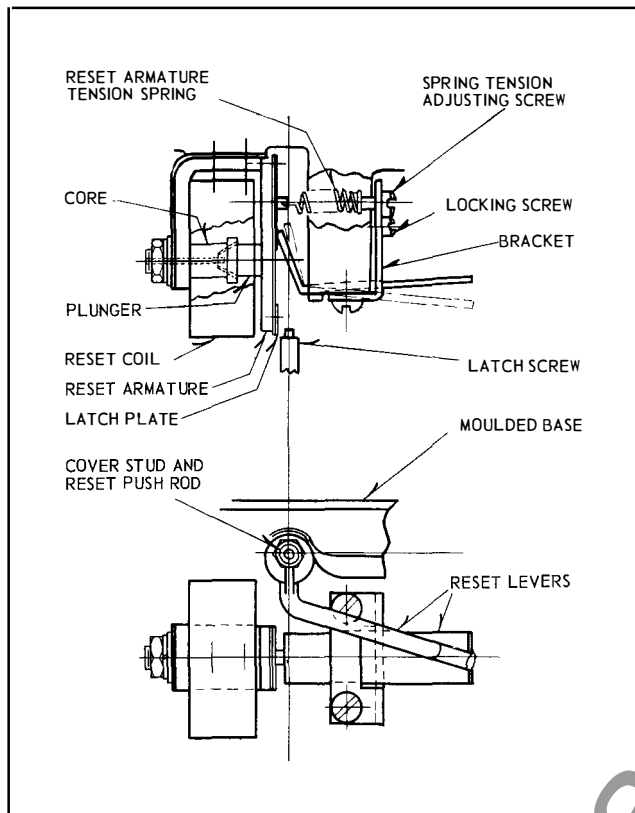


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the moulded insulation block strikes the end of the auxiliary contact spring and causes the contacts to part with a gap which is appreciably greater than the travel of the armature block at the point where it strikes the spring. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current at any rated coil voltage, but it is not intended for use in applications where several times rated voltage is applied to the operating coil in order to reduce the operating time.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection

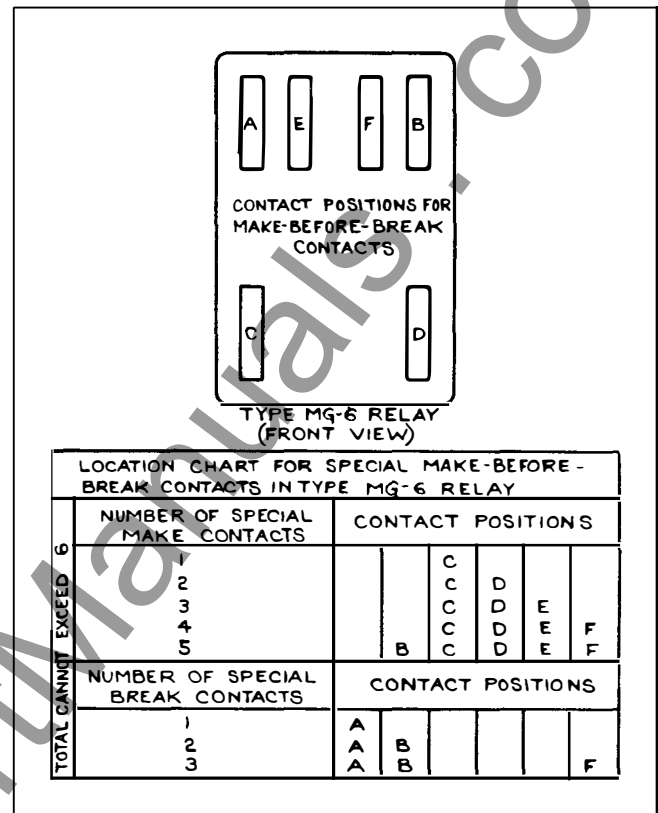


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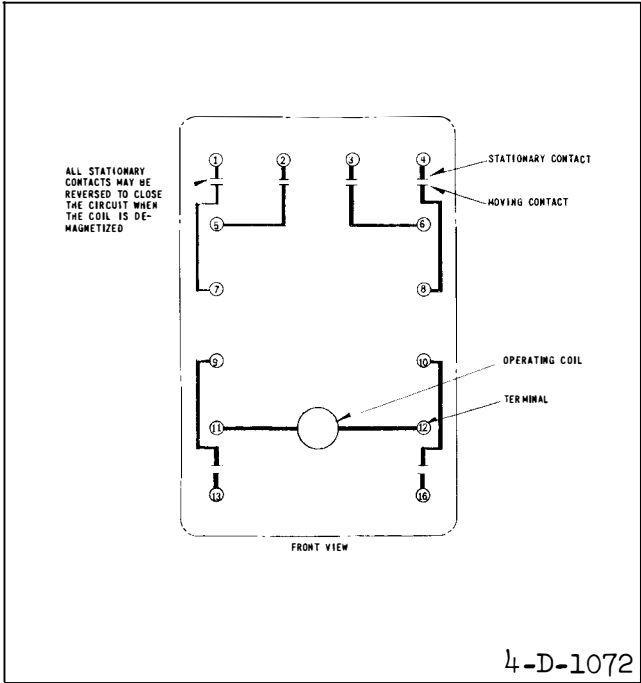


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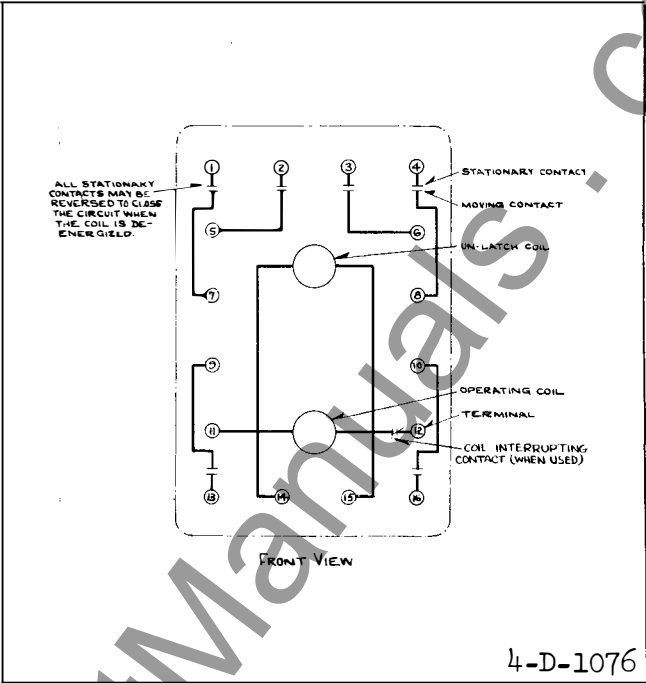


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* Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30

amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay cannot have more than four circuit-opening contacts if the normal contact pressures and armature travel are maintained.

INSTALLATION

The relays should be mounted on switchboard

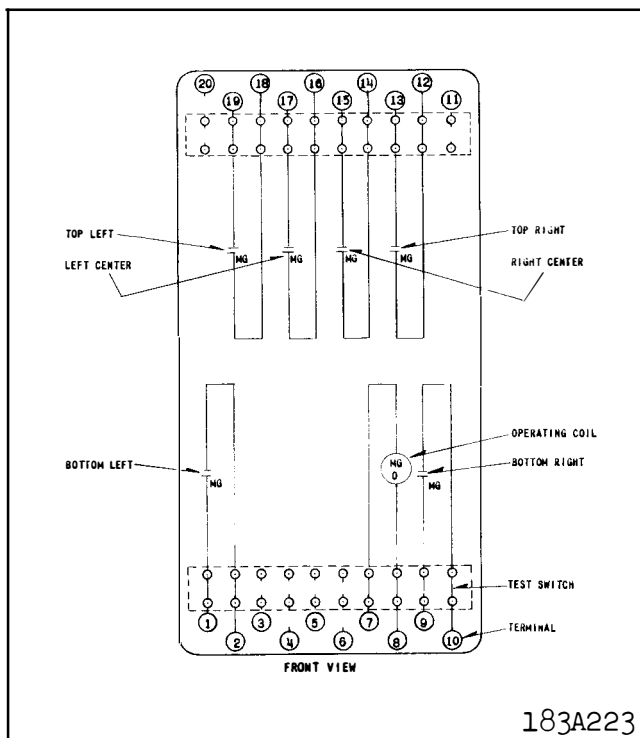


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

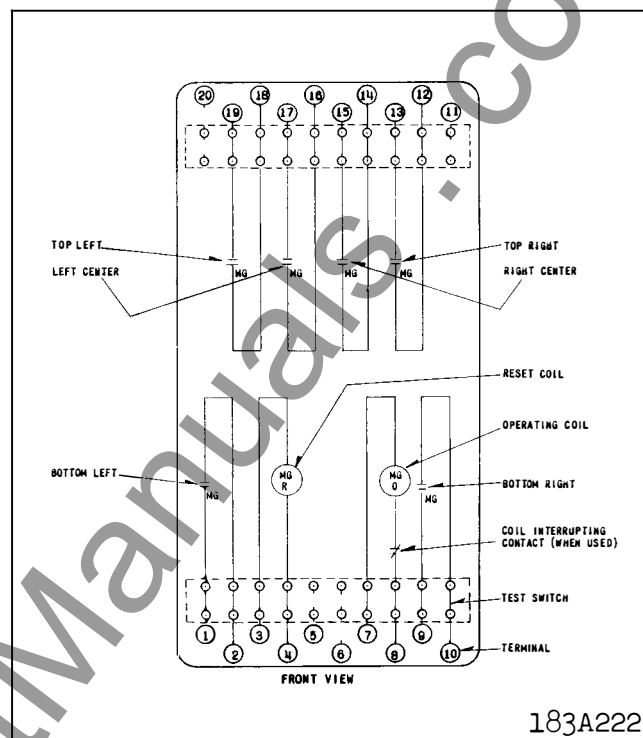


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

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.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of

thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

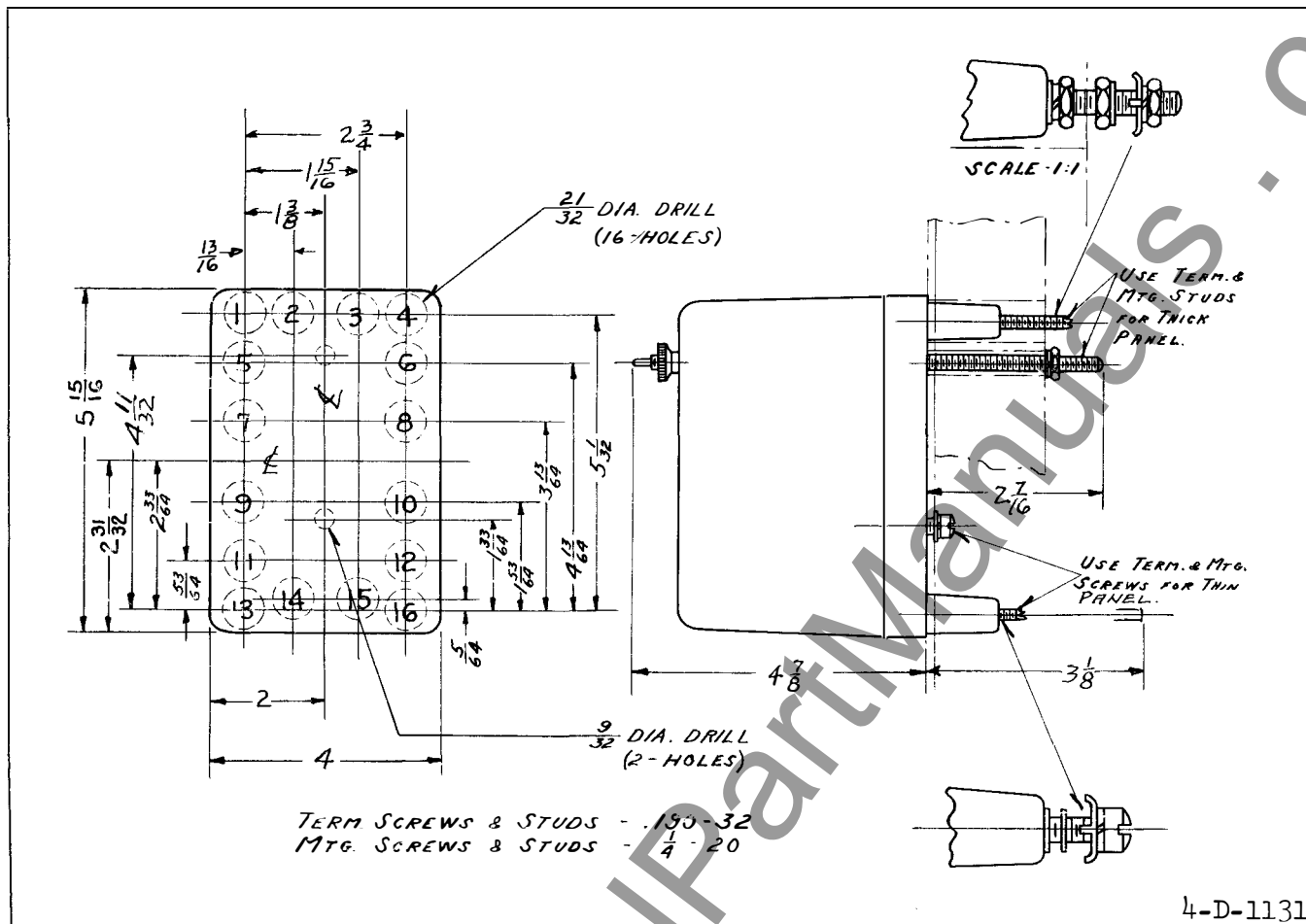


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

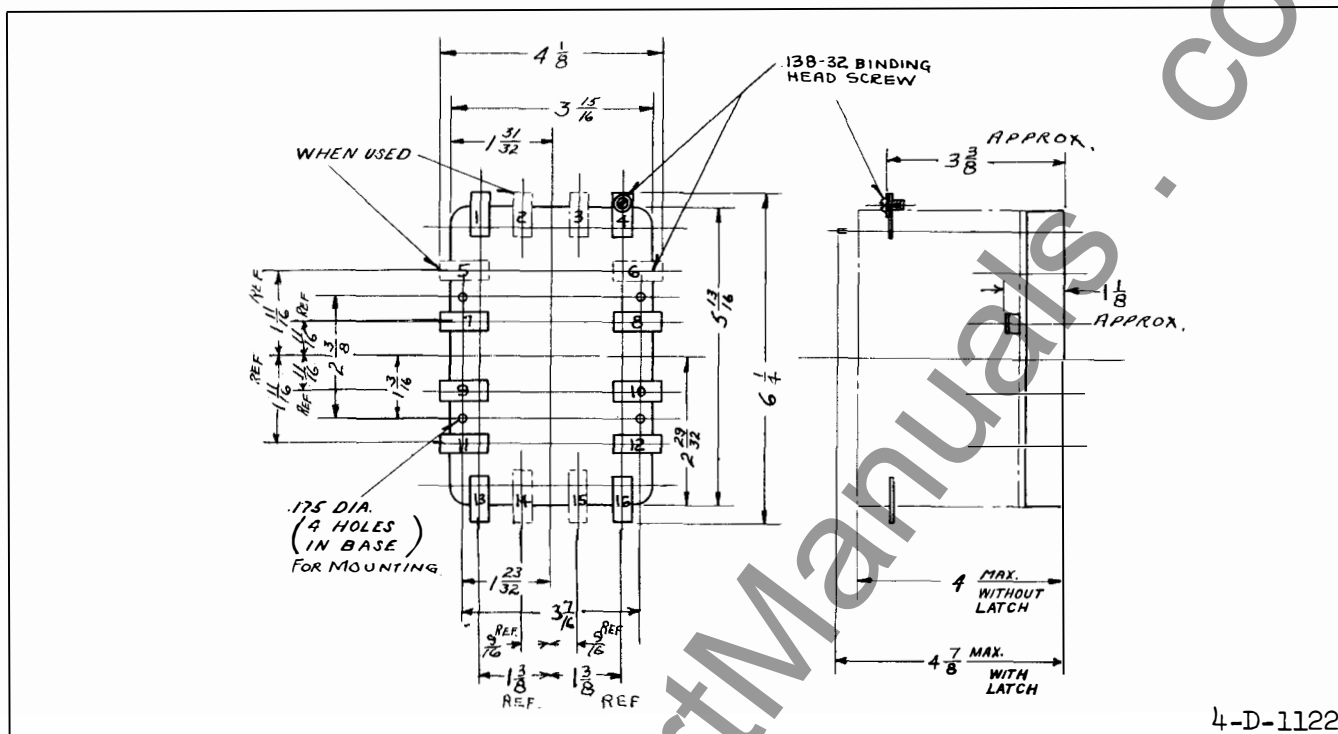
maintained.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the

adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, (except 4 turns for d-c relays with coil-interrupting contacts) and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs



4-D-1122

Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about $1\frac{1}{2}$ turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the

impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the arma-

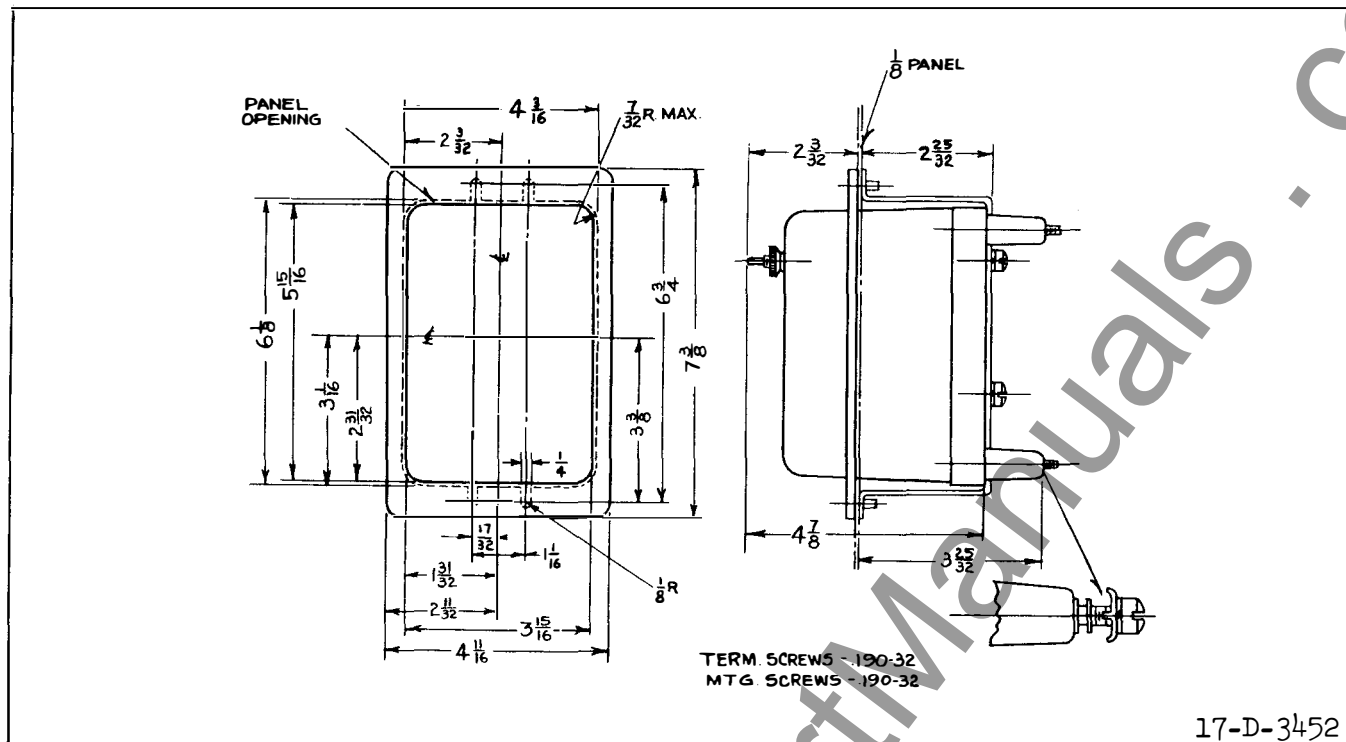


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

ture is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about $\frac{1}{8}$ " of that position. A pair of tweezers on which the ends are bent at a right angle to the body, or a similar tool, is useful in replacing the upper end of the spring in the groove of the adjusting member. Such a tool is particularly helpful on relays which have an electrical reset assembly.

On latch-type relays the latch screw is adjusted so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .010 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .005 inch, and should not be more

than about $\frac{1}{64}$ ". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 5 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to

strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil-interrupting contact, the following points must be observed to assure satisfactory operation. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is only .005 inch. With the armature in this position the coil interrupting contact should be open by about 1/16 inch. This gap is adjusted at the factory by varying the number of slotted shims used between the relay base and the contact supporting bracket. The two main contacts at the lower end of the base should be assembled as circuit-opening contacts, and the main armature restraining spring should have 4 turns tension (see 3rd paragraph of this section) for DC as well as for AC relays. It is necessary also that the L-shaped spring which carries the moving member of the coil-interrupting contact have its sides approximately straight before assembly with

the supporting bracket, and that the angle between the sides be approximately 80°.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
* Δ 60	15	35.5	19	96.5
D-C	7.8	cold--	7.8	cold--
D-C	6.5	hot --	6.5	hot --

Δ Rated voltage is 120 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66	cold--	68	cold--

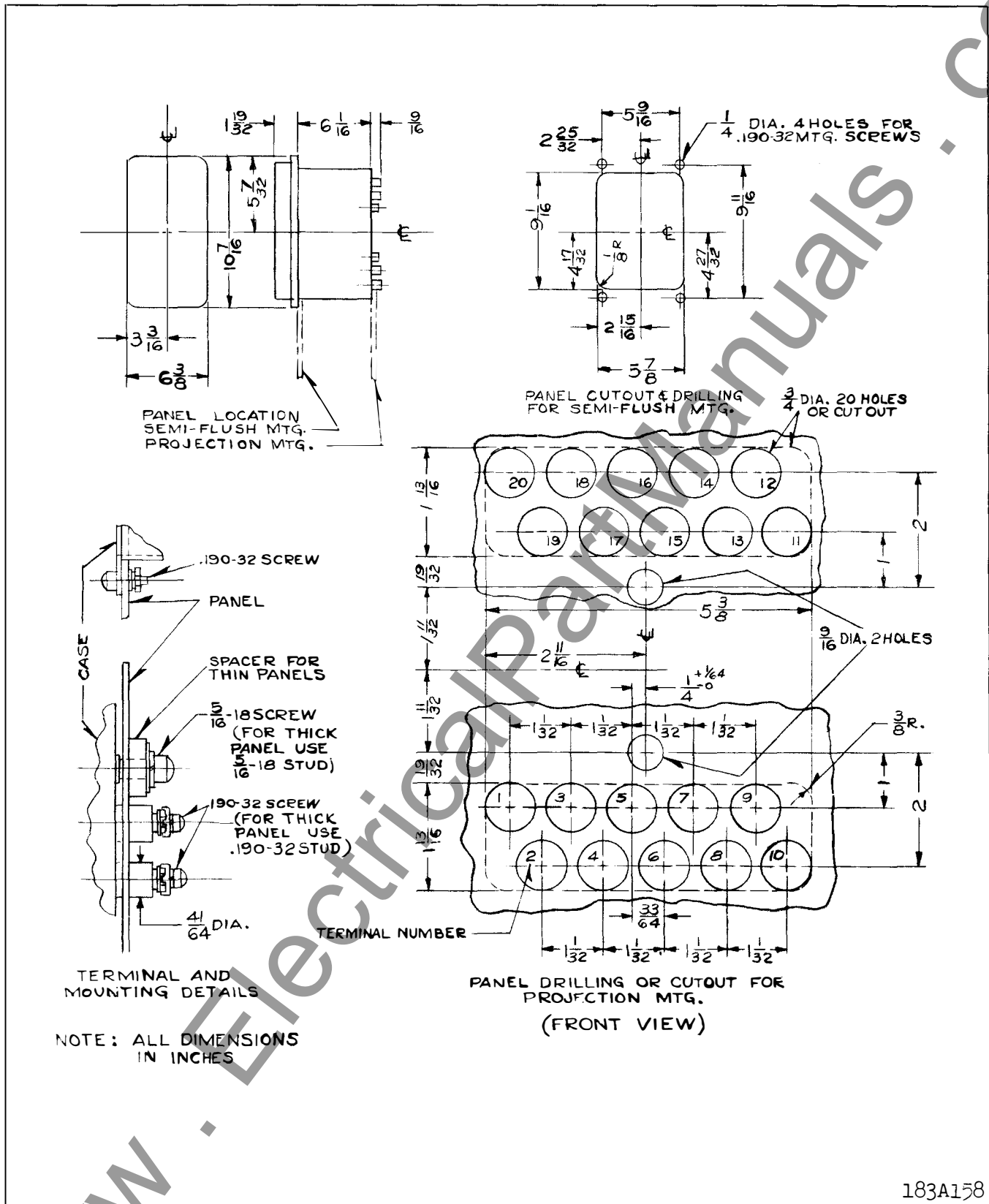


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although readjustment may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of

the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature by two screws. Silver contact buttons are welded on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is

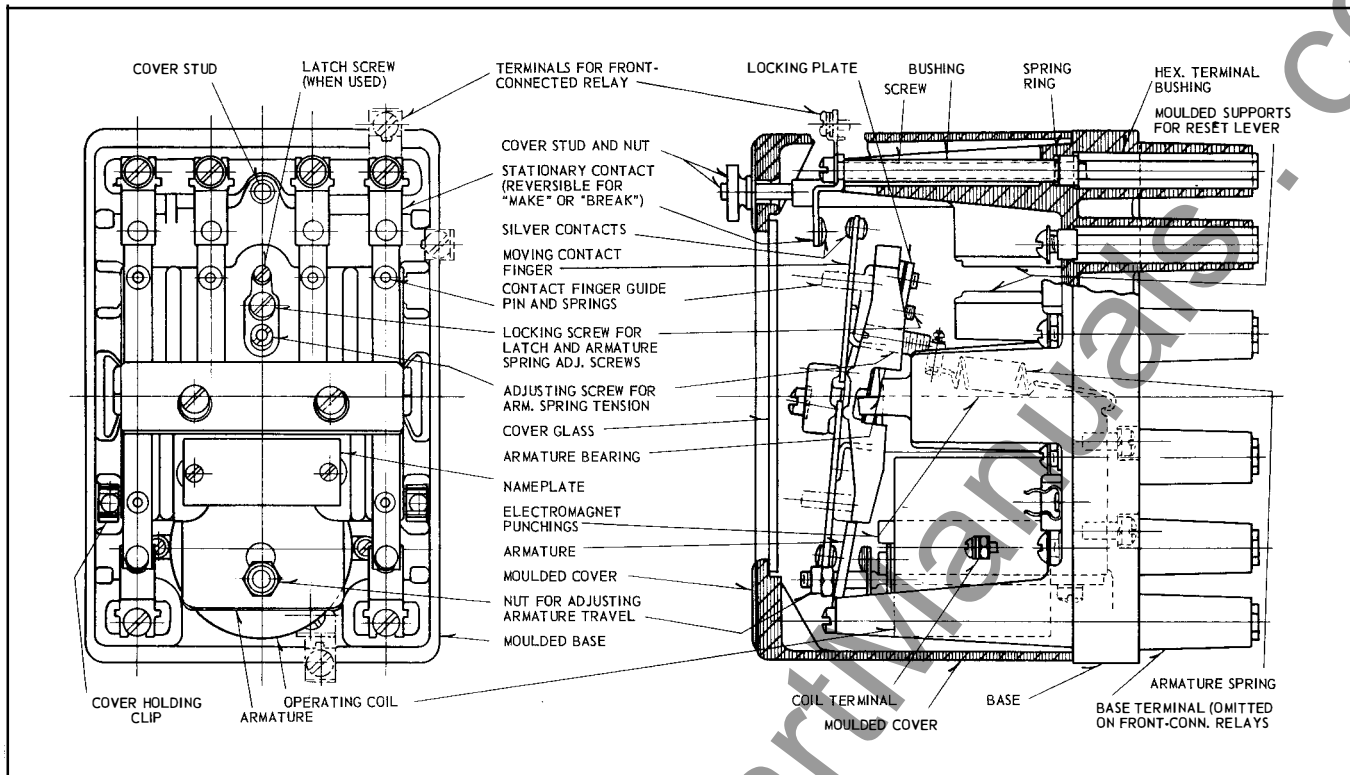


Fig. 1. Front View (Cover Omitted) and Side View of the Type MG-6 Self Reset Relay in Molded Case.

less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the

hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the stationary contact stud of the auxiliary contact, and the end of the moving contact spring is in contact with

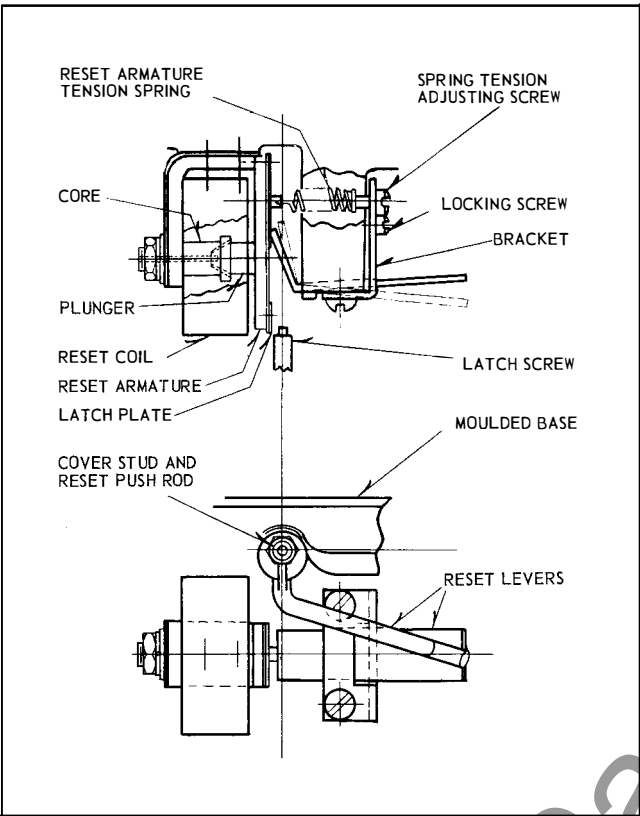


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the moulded insulation block strikes the end of the auxiliary contact spring and causes the contacts to part with a gap which is appreciably greater than the travel of the armature block at the point where it strikes the spring. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current at any rated coil voltage, but it is not intended for use in applications where several times rated voltage is applied to the operating coil in order to reduce the operating time.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection

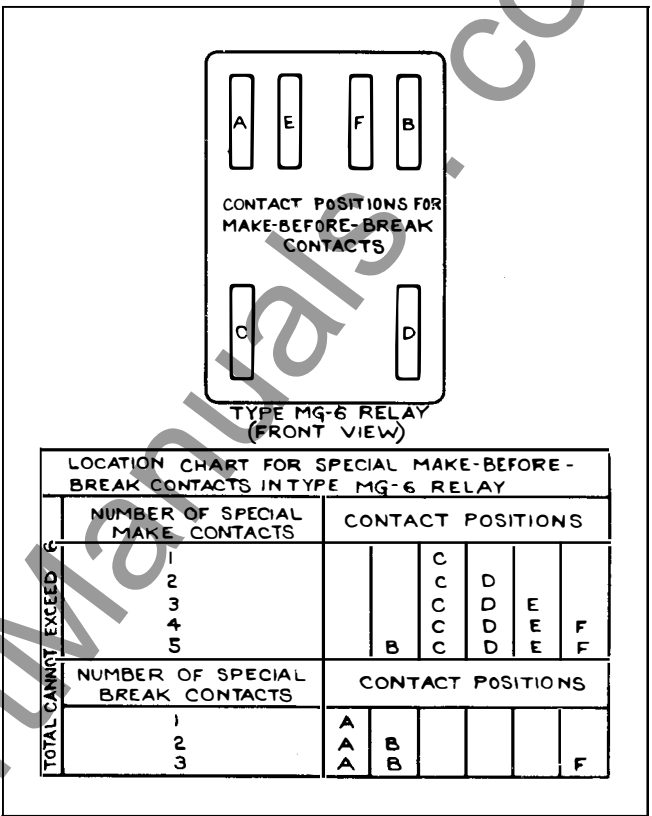


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the internal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

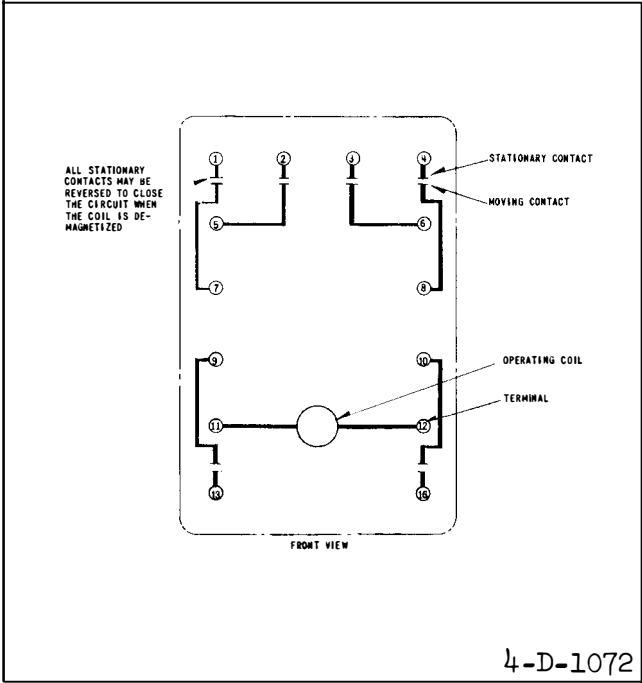


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

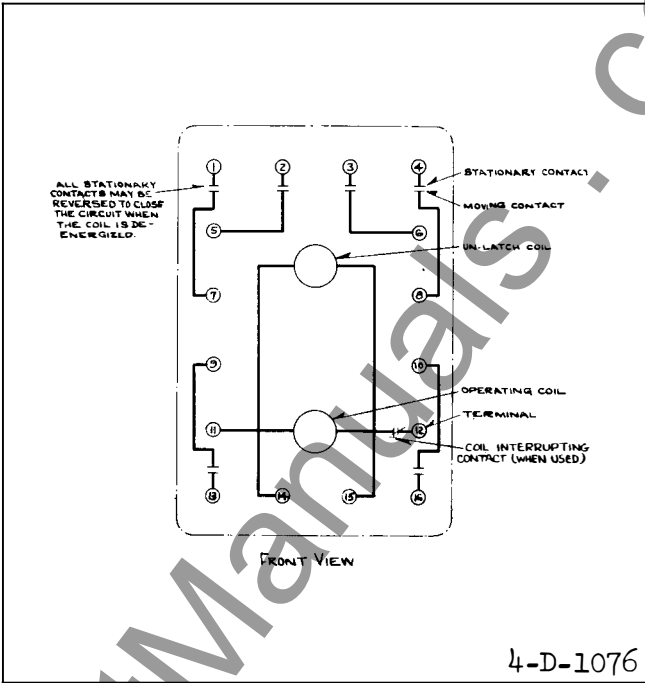


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage. If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. The time of the d-c relay can be reduced to slightly over 1 cycle if the coil is energized at five times rated voltage and there is not more than one back contact. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30

amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay cannot have more than four circuit-opening contacts if the normal contact pressures and armature travel are maintained.

INSTALLATION

The relays should be mounted on switchboard

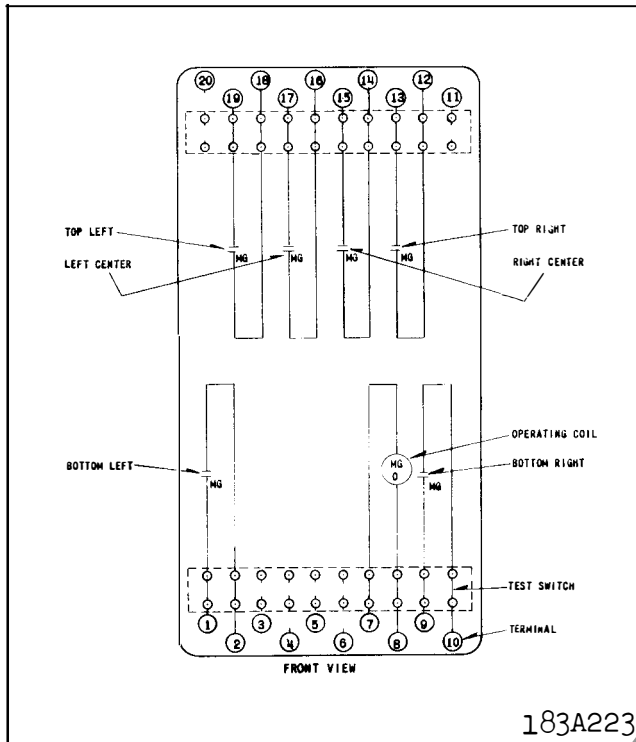


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

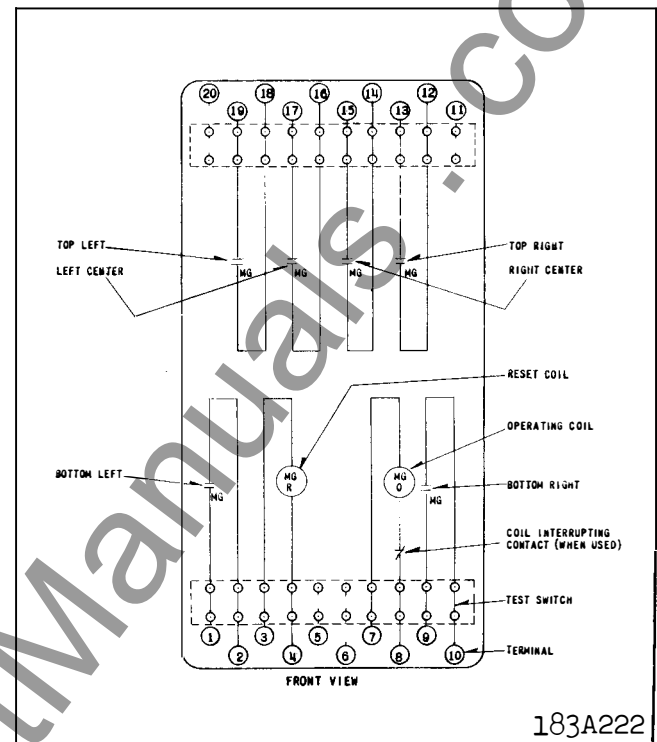


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

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.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of

thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

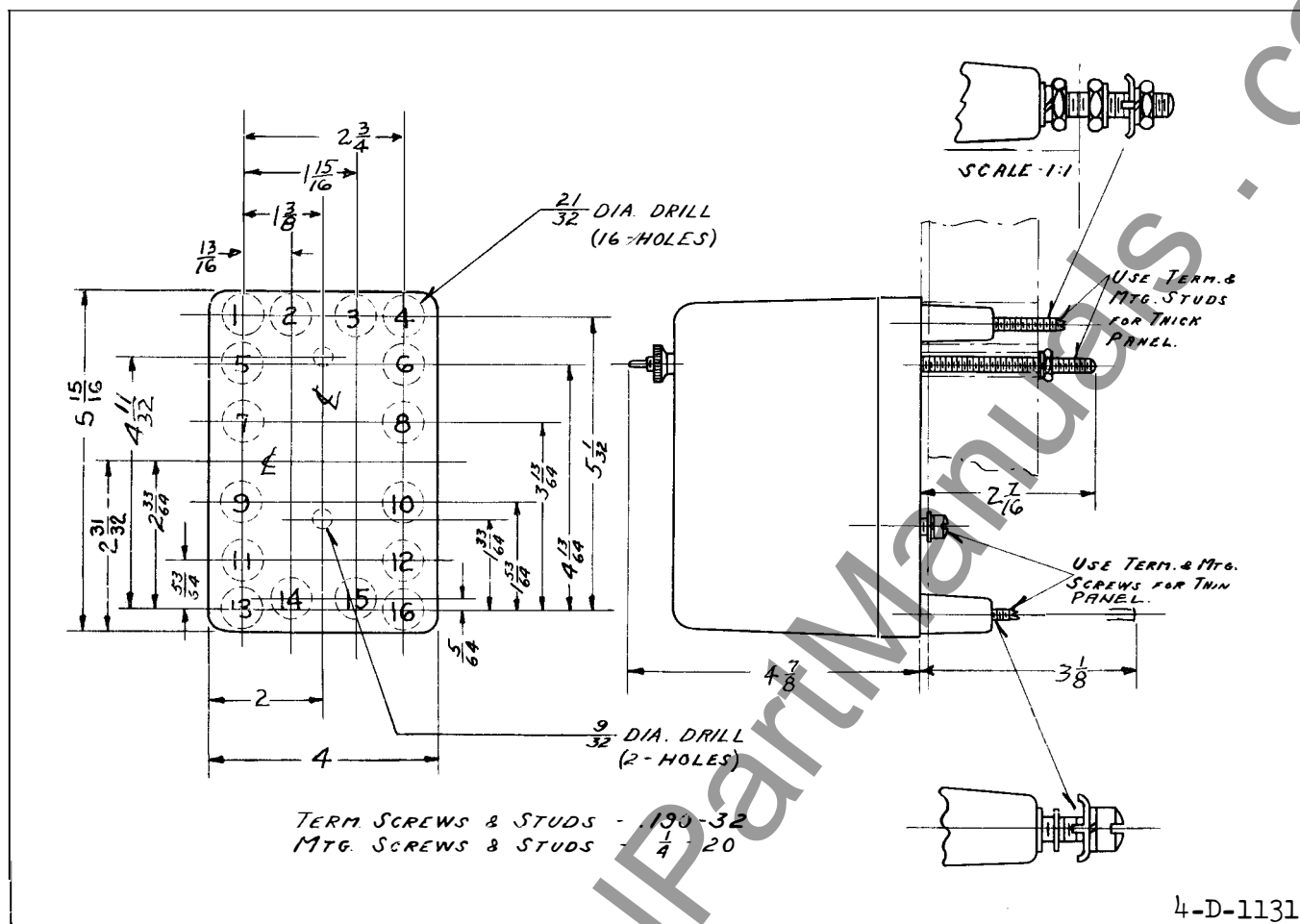


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

maintained.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the

adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, (except 4 turns for d-c relays with coil-interrupting contacts) and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

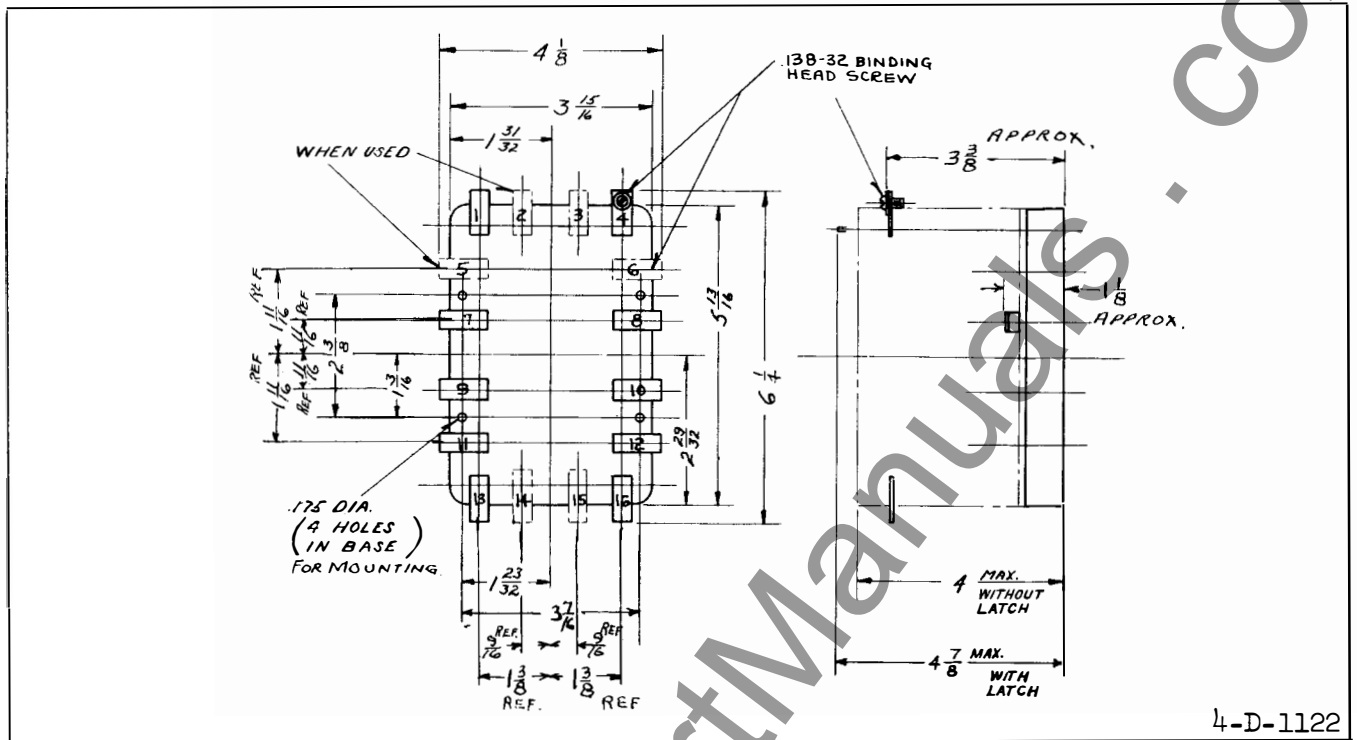


Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

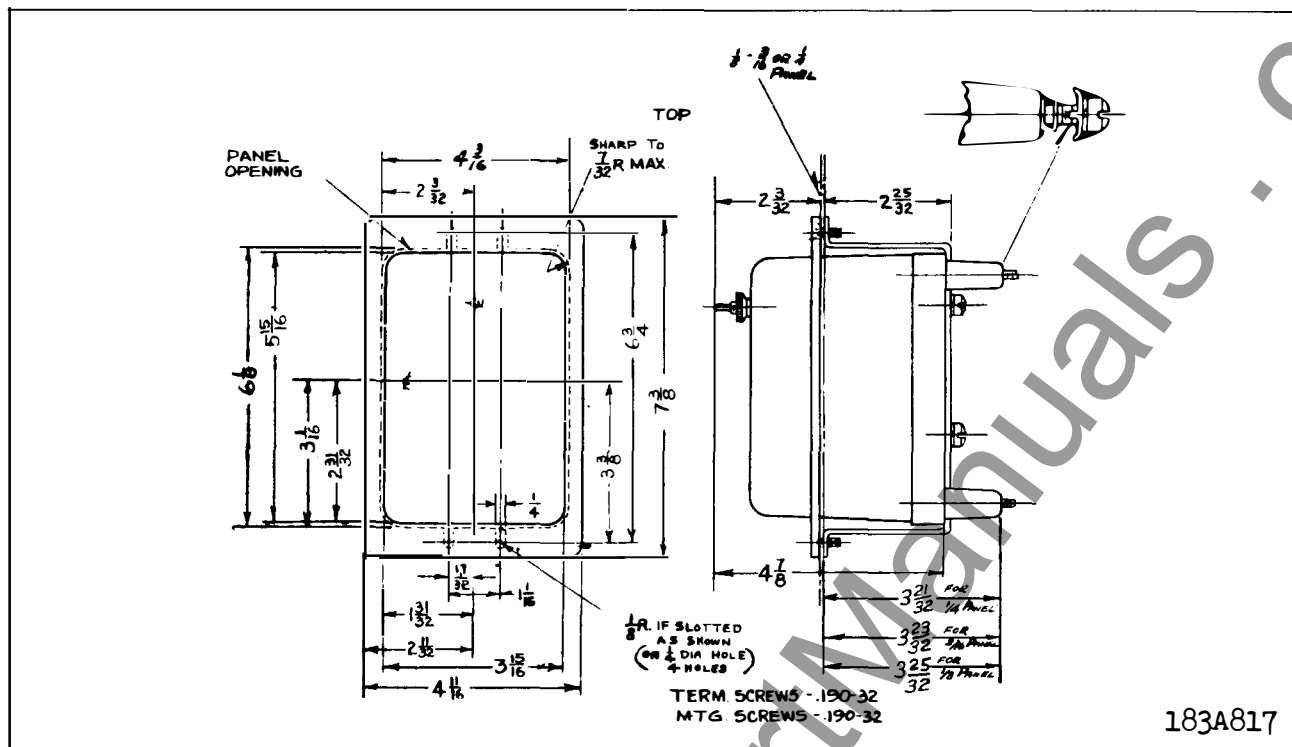
on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about $1\frac{1}{2}$ turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the

impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the arma-



* Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

ture is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about $1/8$ " of that position. A pair of tweezers on which the ends are bent at a right angle to the body, or a similar tool, is useful in replacing the upper end of the spring in the groove of the adjusting member. Such a tool is particularly helpful on relays which have an electrical reset assembly.

On latch-type relays the latch screw is adjusted so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .010 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .005 inch, and should not be more

than about $1/64$ ". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 5 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to

strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil-interrupting contact, the following points must be observed to assure satisfactory operation. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is only .005 inch. With the armature in this position the coil interrupting contact should be open by about 1/16 inch. This gap is adjusted at the factory by varying the number of slotted shims used between the relay base and the contact supporting bracket. The two main contacts at the lower end of the base should be assembled as circuit-opening contacts, and the main armature restraining spring should have 4 turns tension (see 3rd paragraph of this section) for DC as well as for AC relays. It is necessary also that the L-shaped spring which carries the moving member of the coil-interrupting contact have its sides approximately straight before assembly with

the supporting bracket, and that the angle between the sides be approximately 80°.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

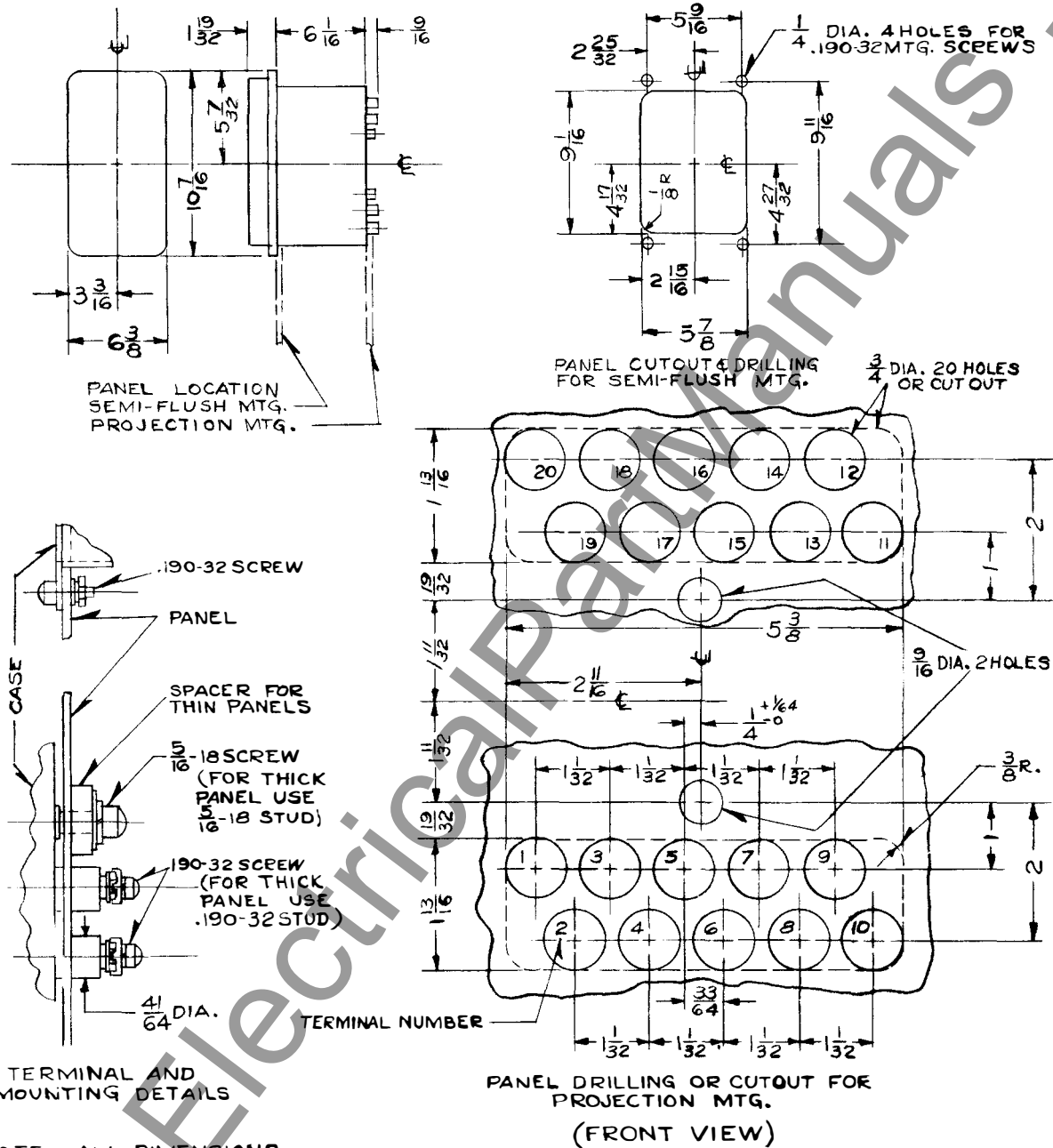
Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	15	35.5	19	96.5
D-C	7.8	cold--	7.8	cold--
D-C	6.5	hot --	6.5	hot --

△ Rated voltage is 120 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66	cold--	68	cold--



183A158

Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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WESTINGHOUSE ELECTRIC CORPORATION
RELAY DEPARTMENT

NEWARK, N. J.

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INSTALLATION • OPERATION • MAINTENANCE INSTRUCTIONS

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see "ADJUSTMENTS AND MAINTENANCE") it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

- * An operating coil cutoff contact can be supplied with the electronic-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit)

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1B

*Denotes change from superseded issue.

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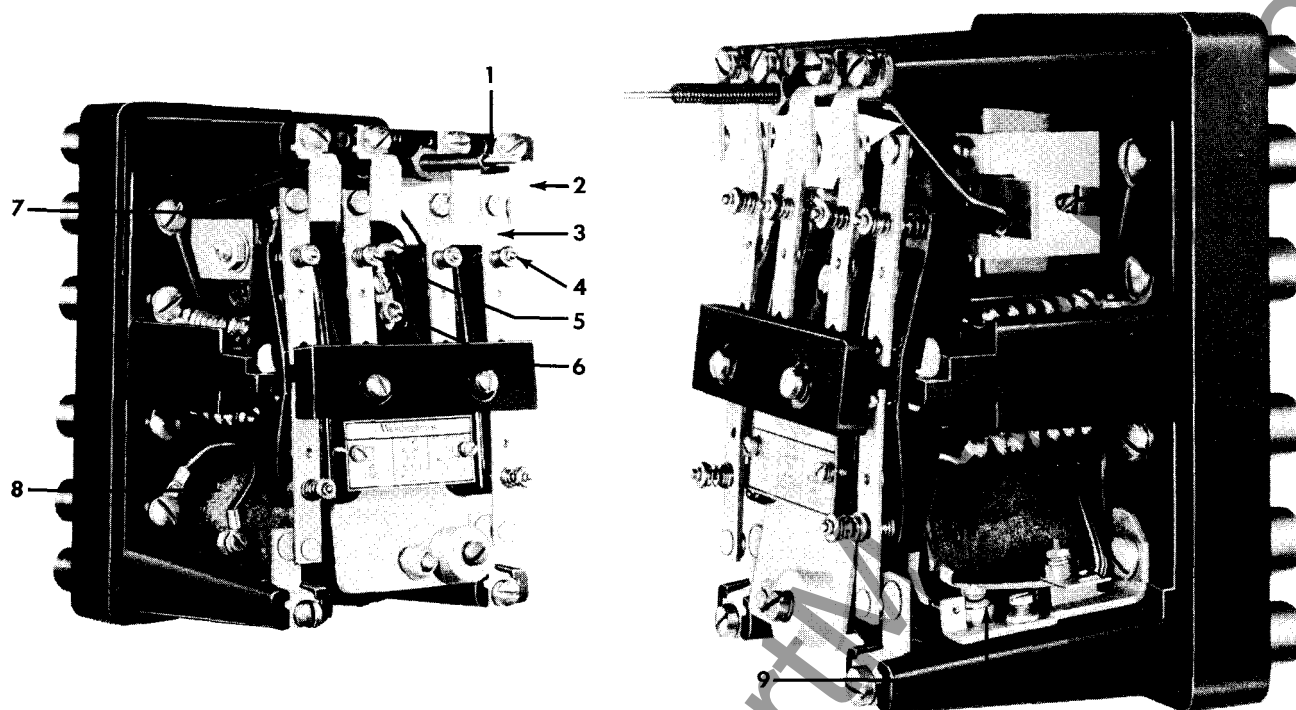


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

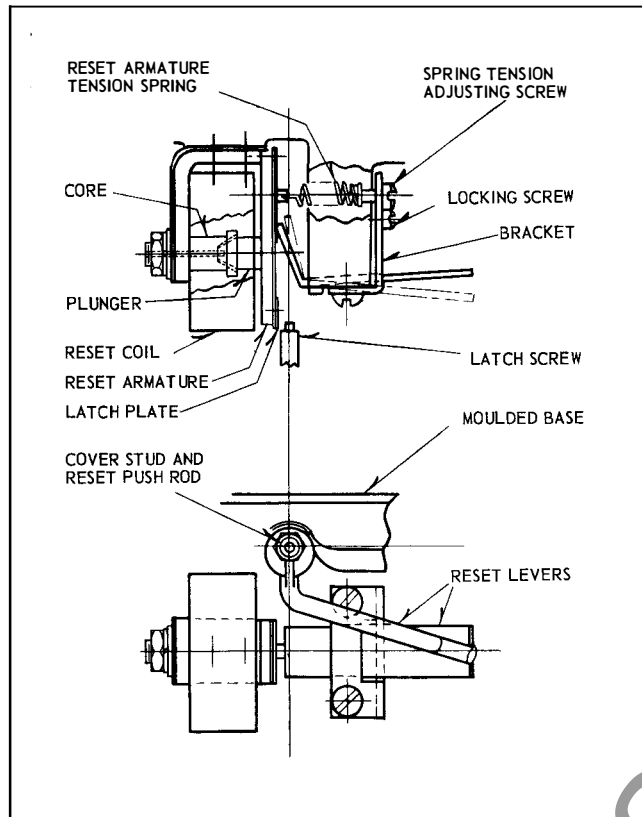


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

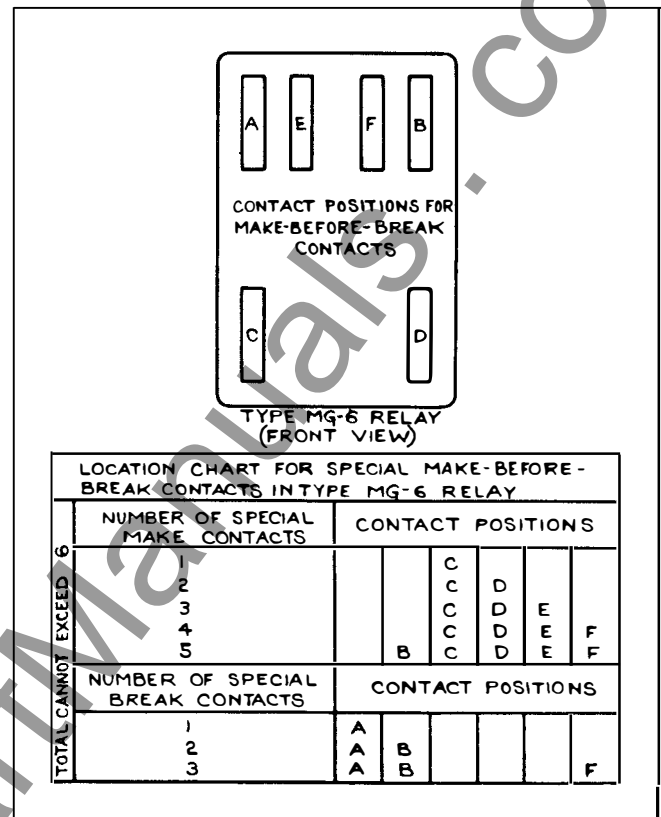


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

TYPE MG-6 RELAY

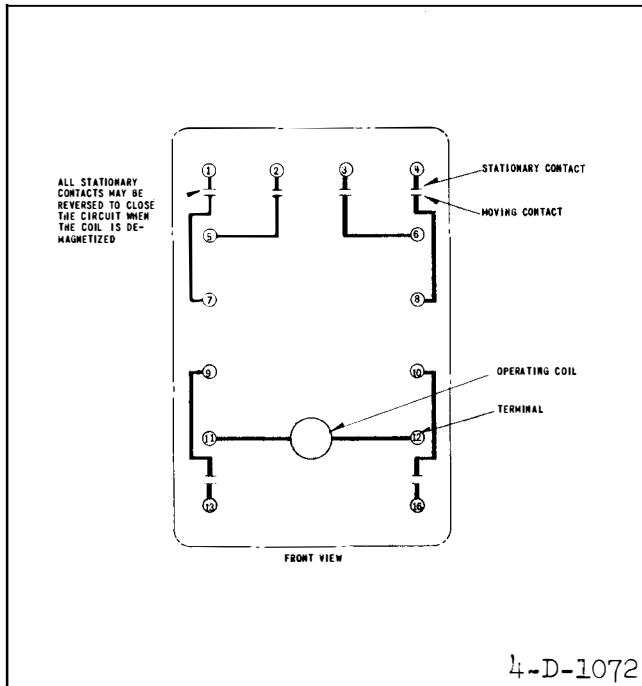


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

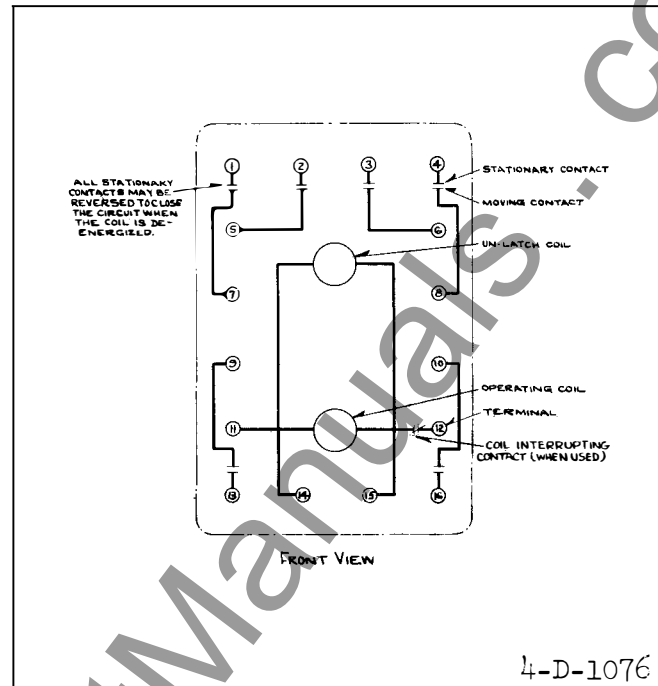


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles of 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

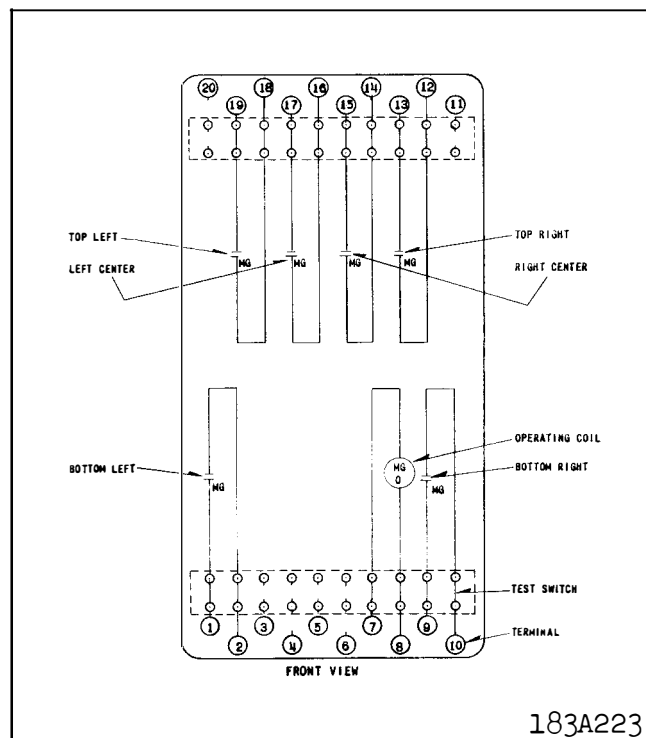


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

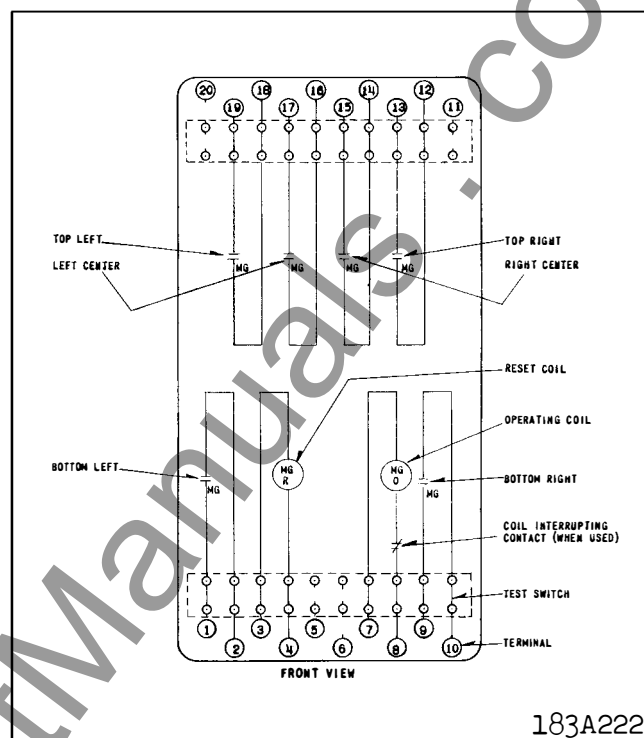


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any
 * combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

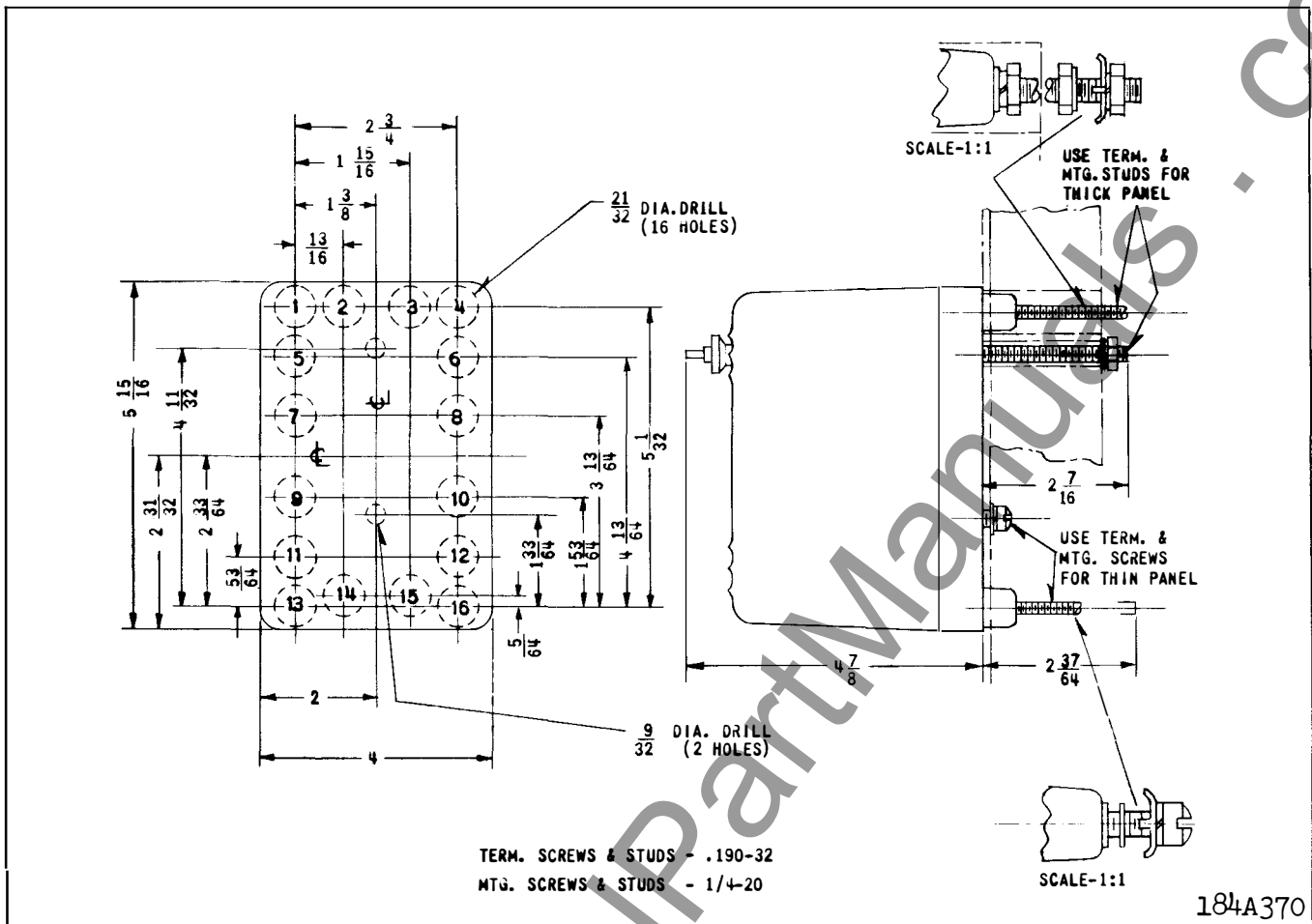
INSTALLATION

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 elec-

trical 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.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be



* Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

* maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is 7/16" above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with

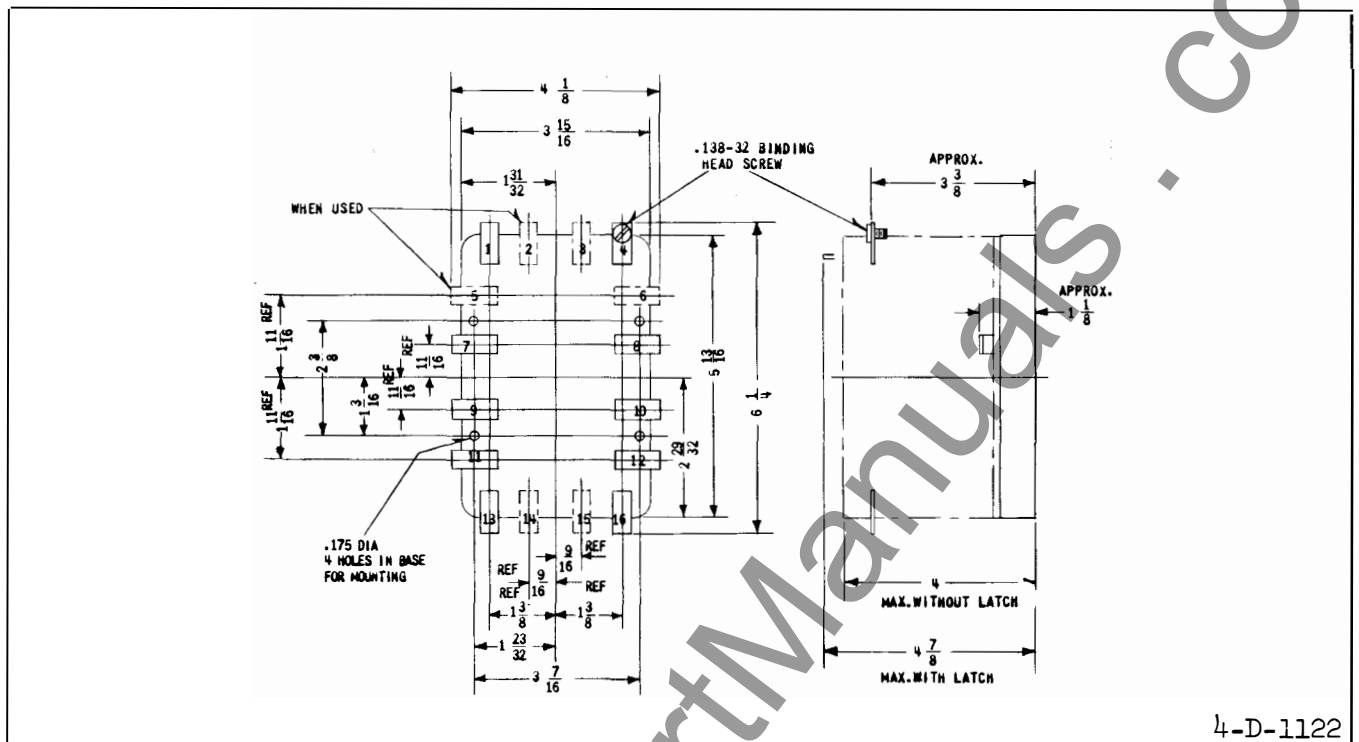


Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

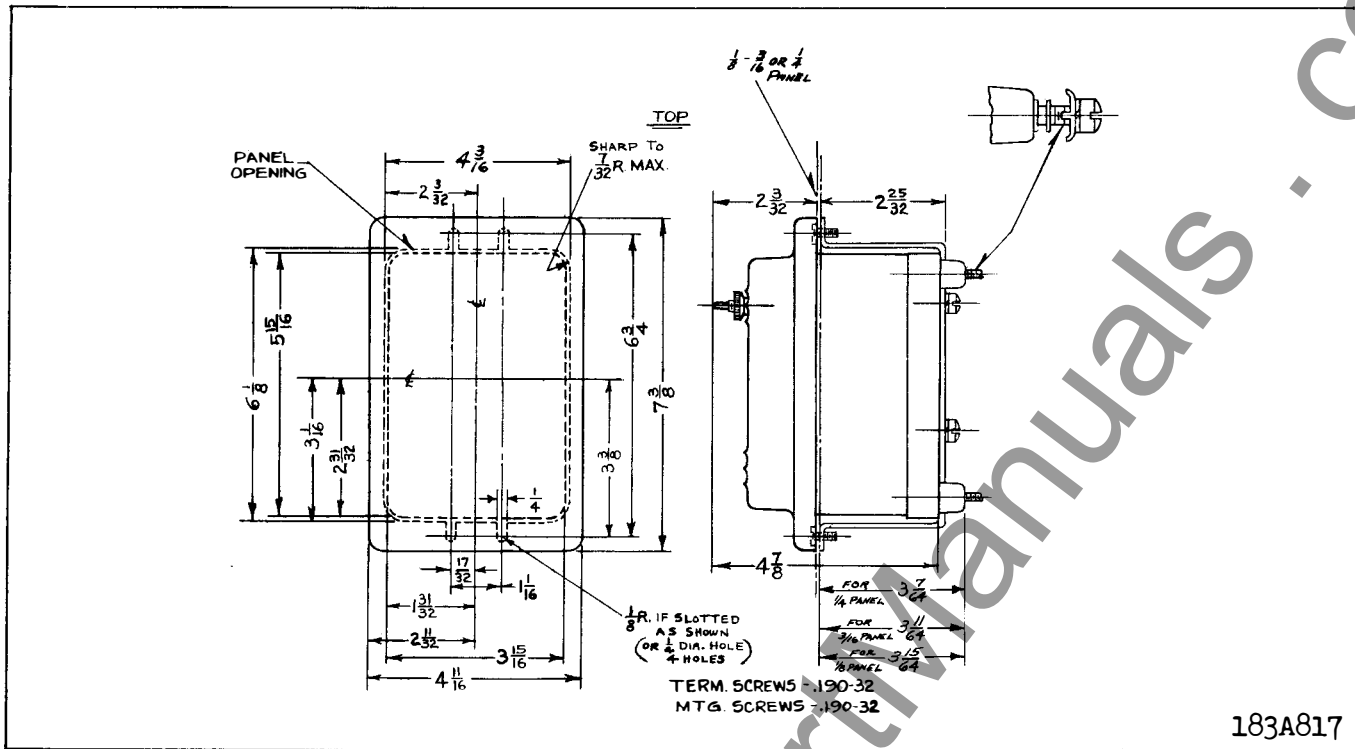
all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the
 * adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The

positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments



specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .010 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .005 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 5 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

- * If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .020 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .005 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	15	35.5	19	96.5
D-C	7.8	cold--	7.8	cold--
D-C	6.5	hot --	6.5	hot --

Δ Rated voltage is 120 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66	cold--	68	cold--



WESTINGHOUSE ELECTRIC CORPORATION
RELAY DEPARTMENT

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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit

- * closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

- * An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit)

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig.1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1B

*Denotes change from superseded issue.

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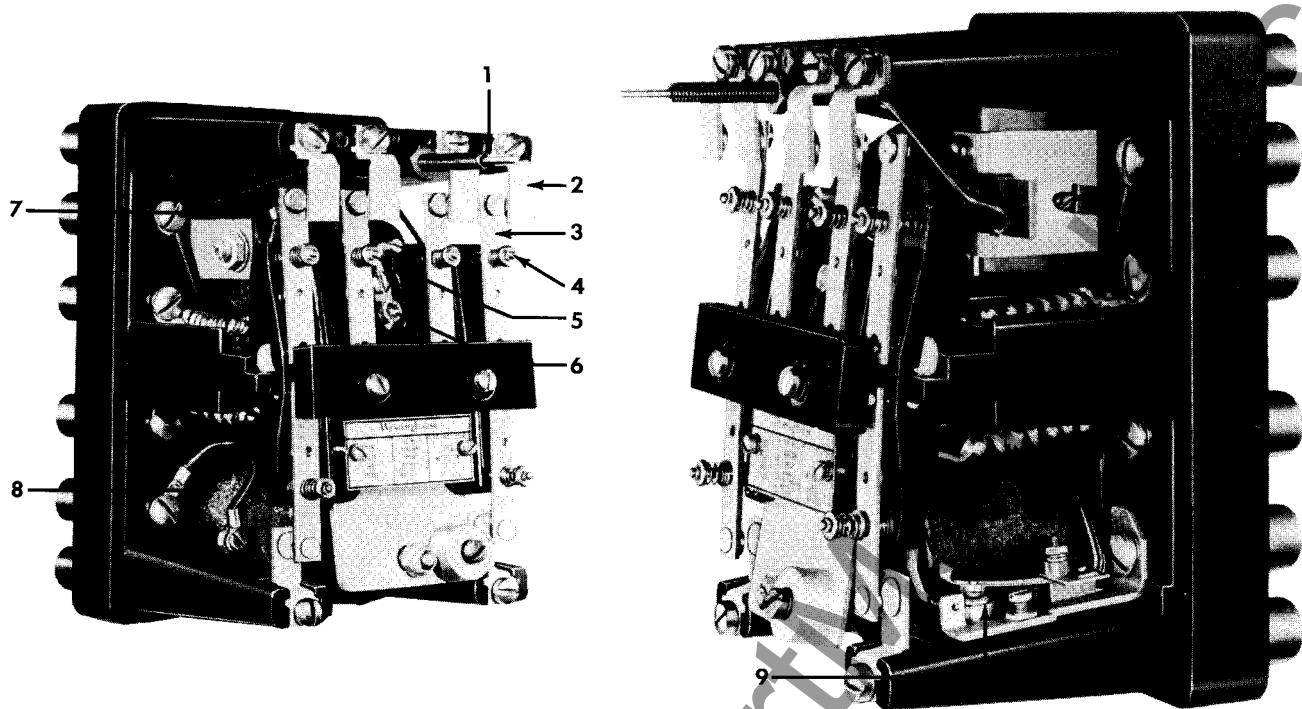


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

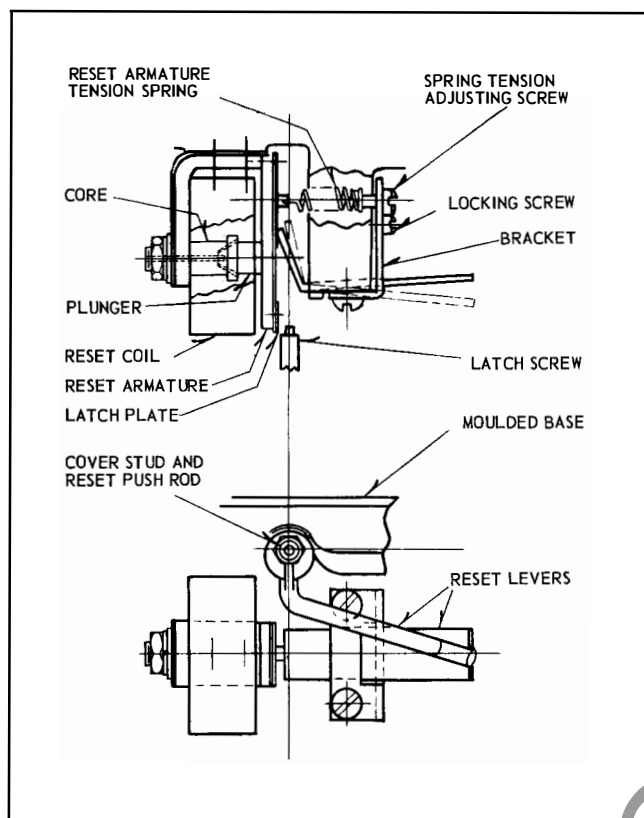


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

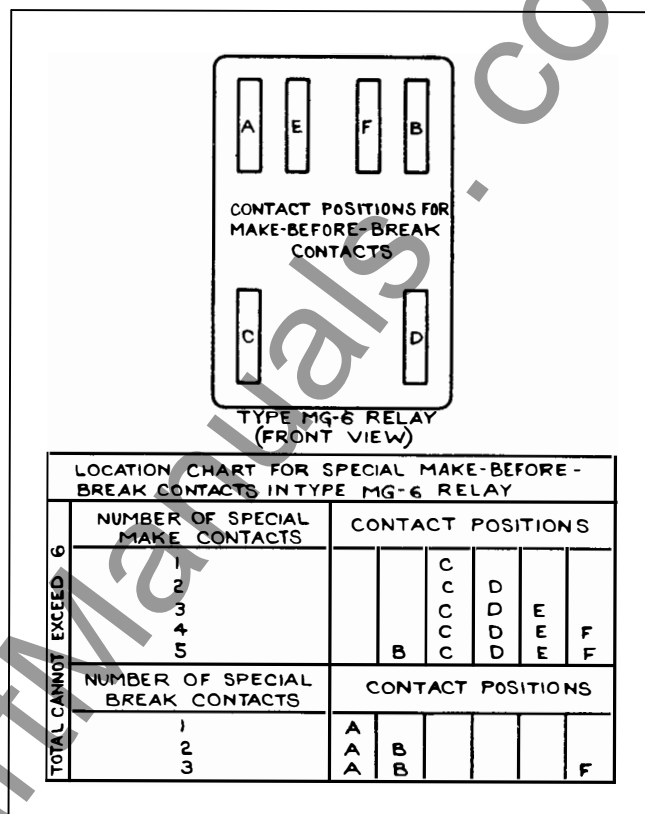


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

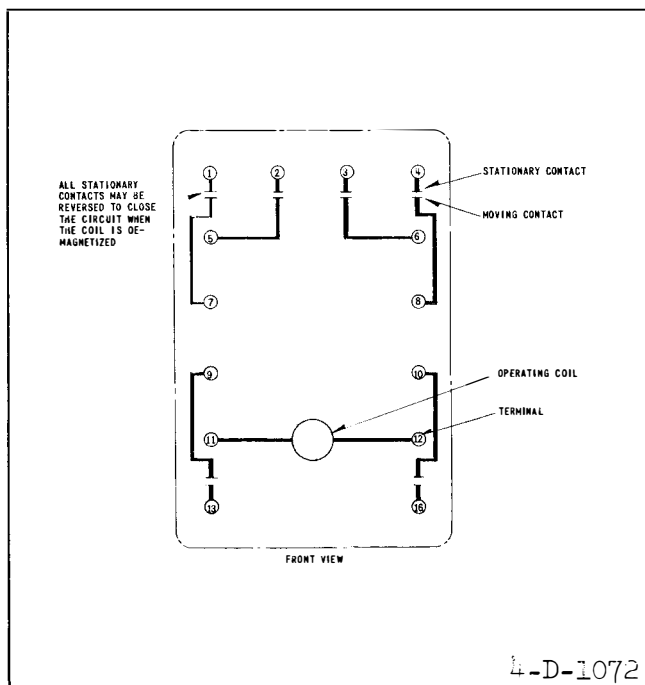


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

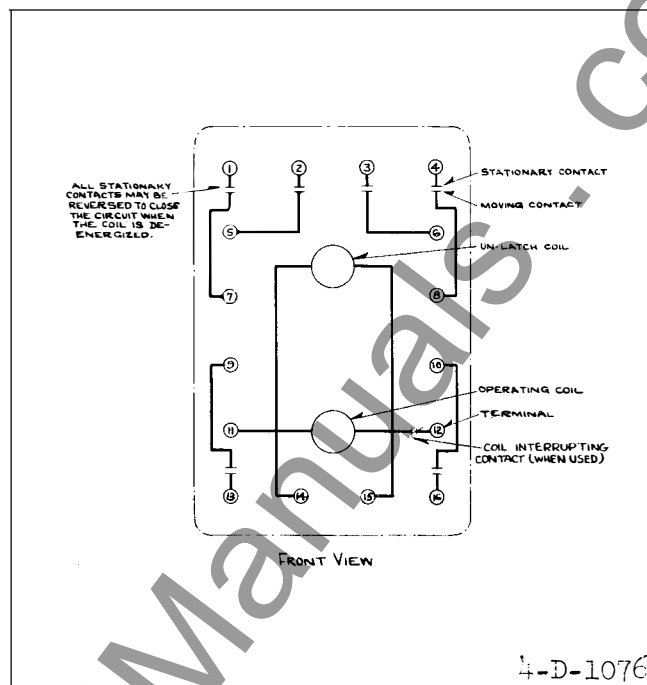


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles of 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

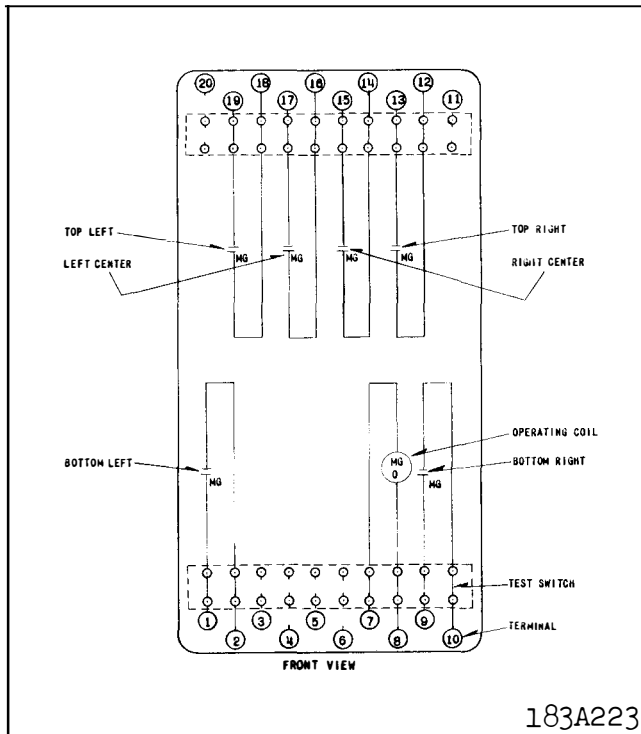


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

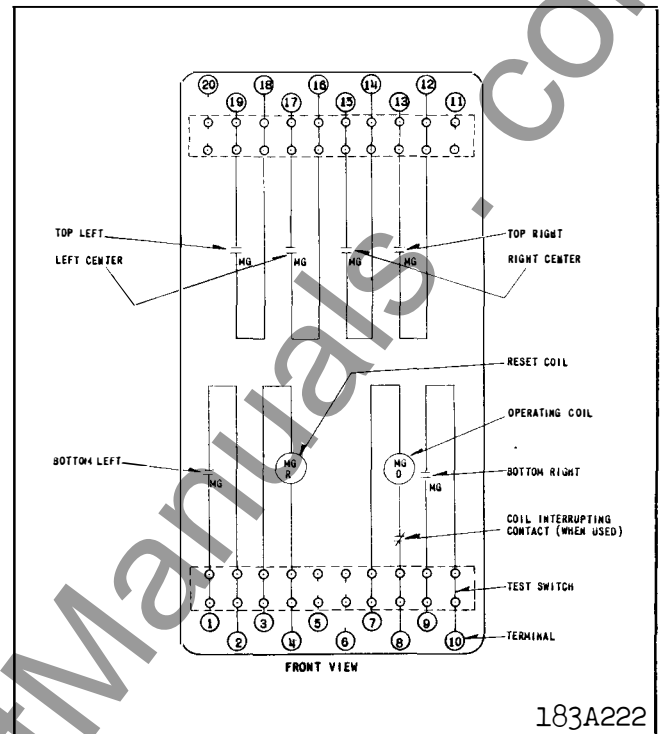


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any
 * combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

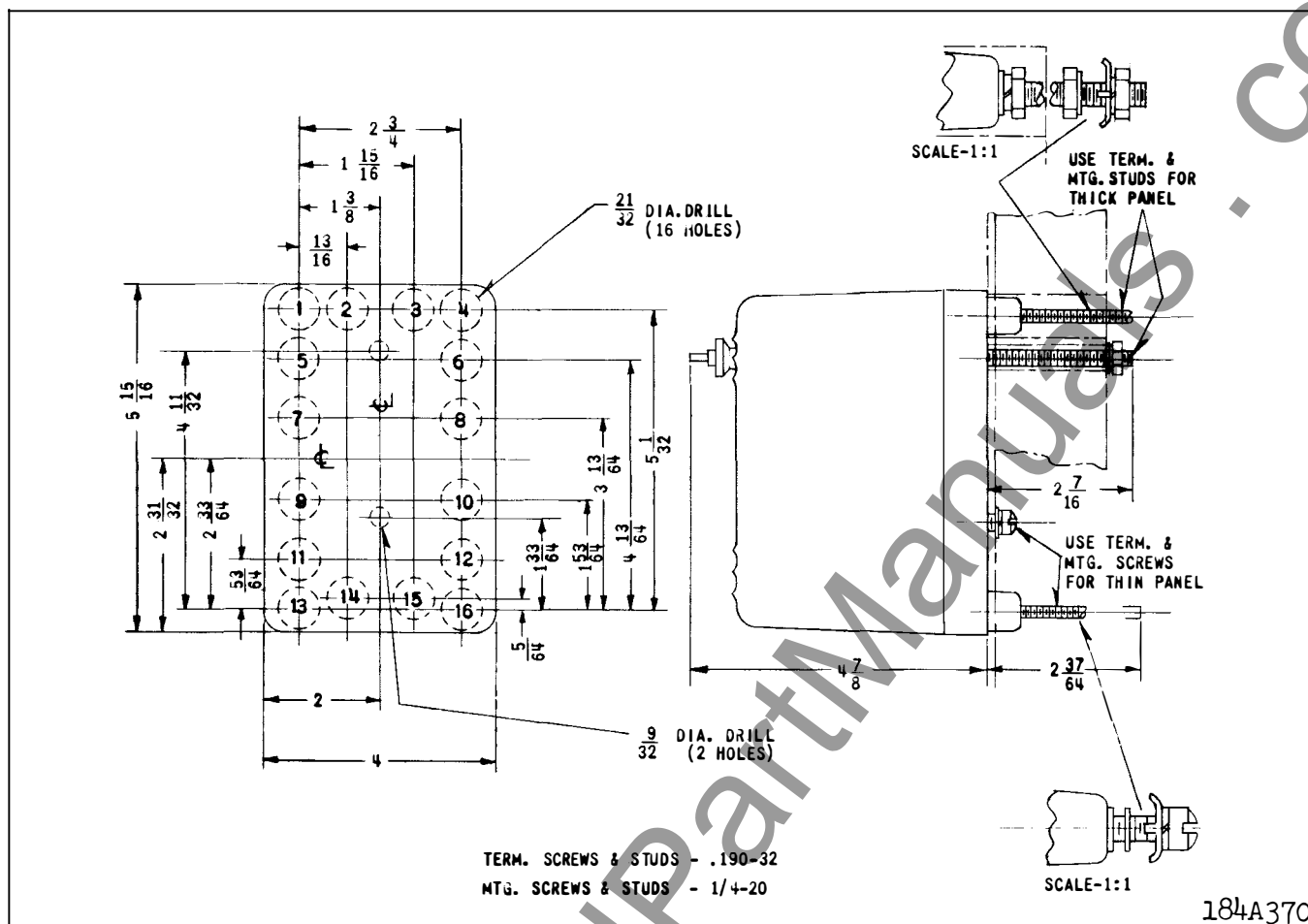
INSTALLATION

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 elec-

trical 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.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be



* Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

mounted by four screws through the sides of the base as indicated in the drilling plan.

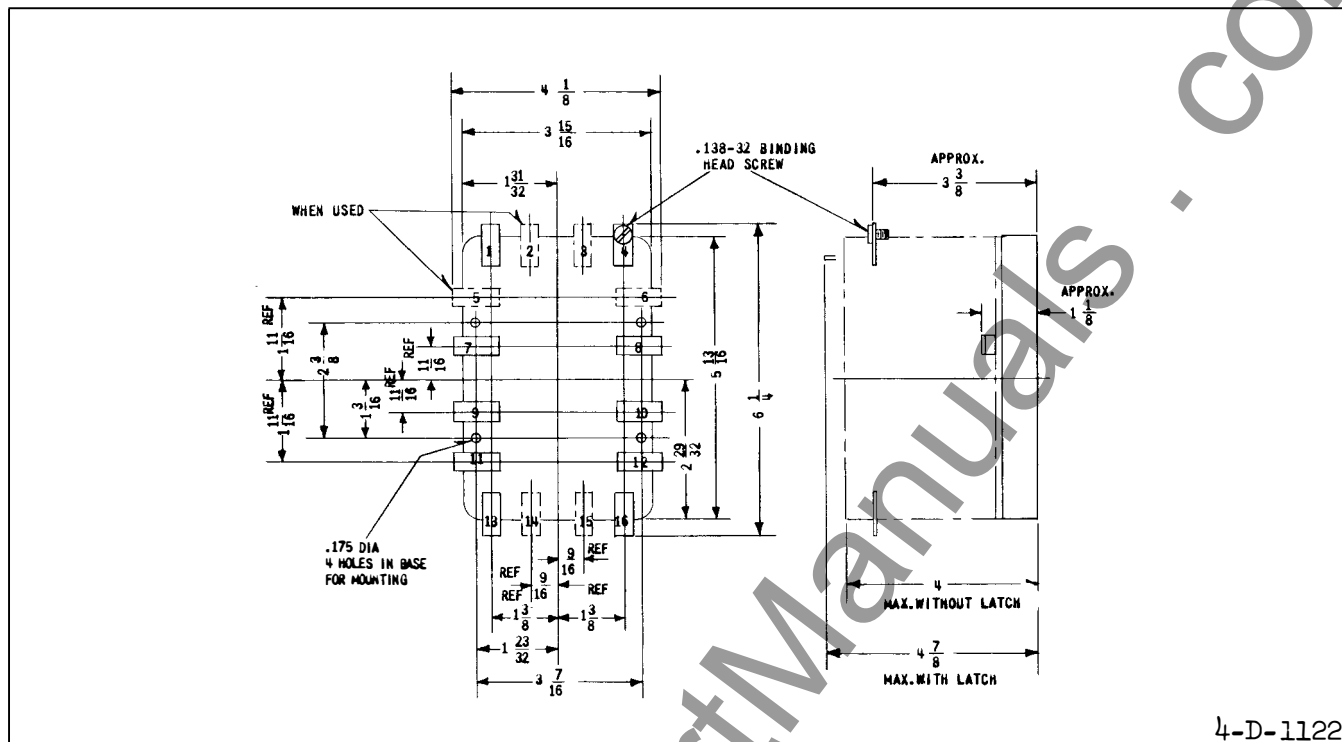
ADJUSTMENTS AND MAINTENANCE

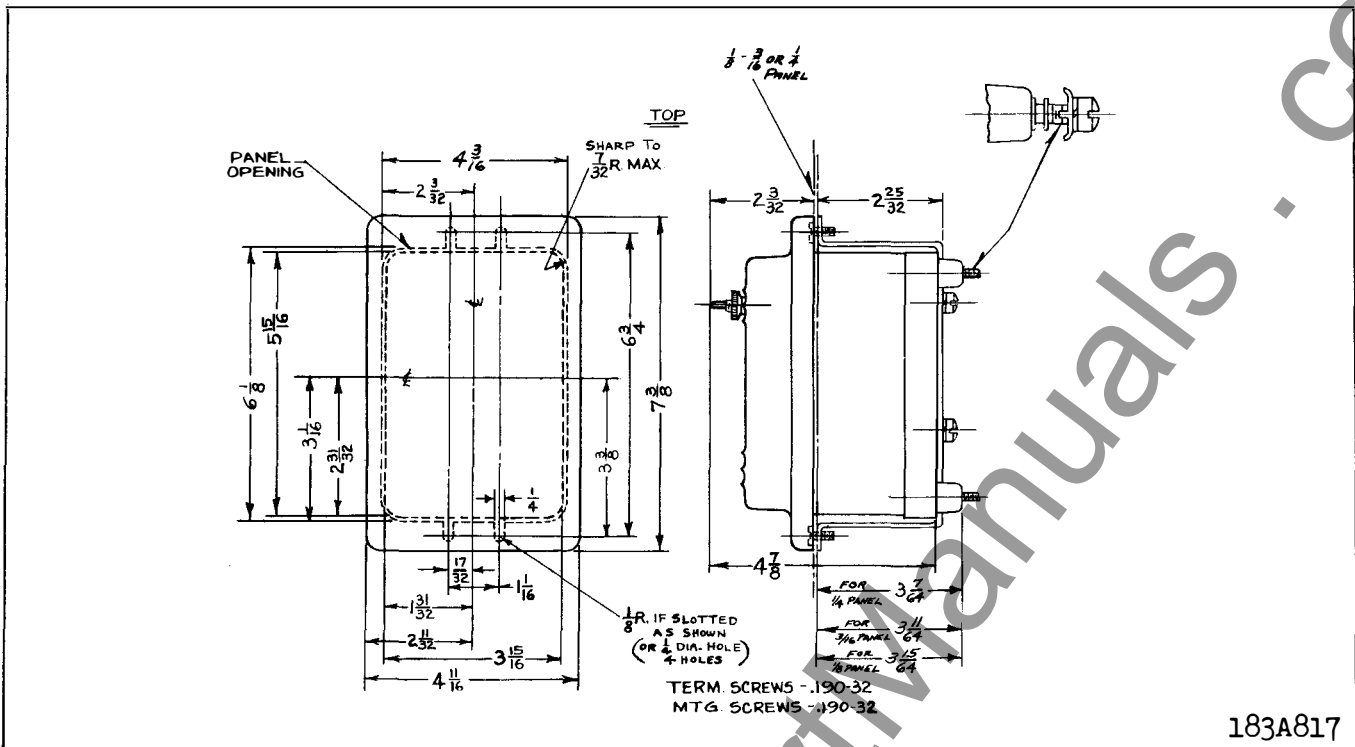
The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

* maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is 7/16" above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with





specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .010 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .005 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 5 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

* If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .020 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the * electromagnet is .010 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	15	35.5	19	96.5
D-C	7.8	cold--	7.8	cold--
D-C	6.5	hot --	6.5	hot --

Δ Rated voltage is 120 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66	cold--	68	cold--

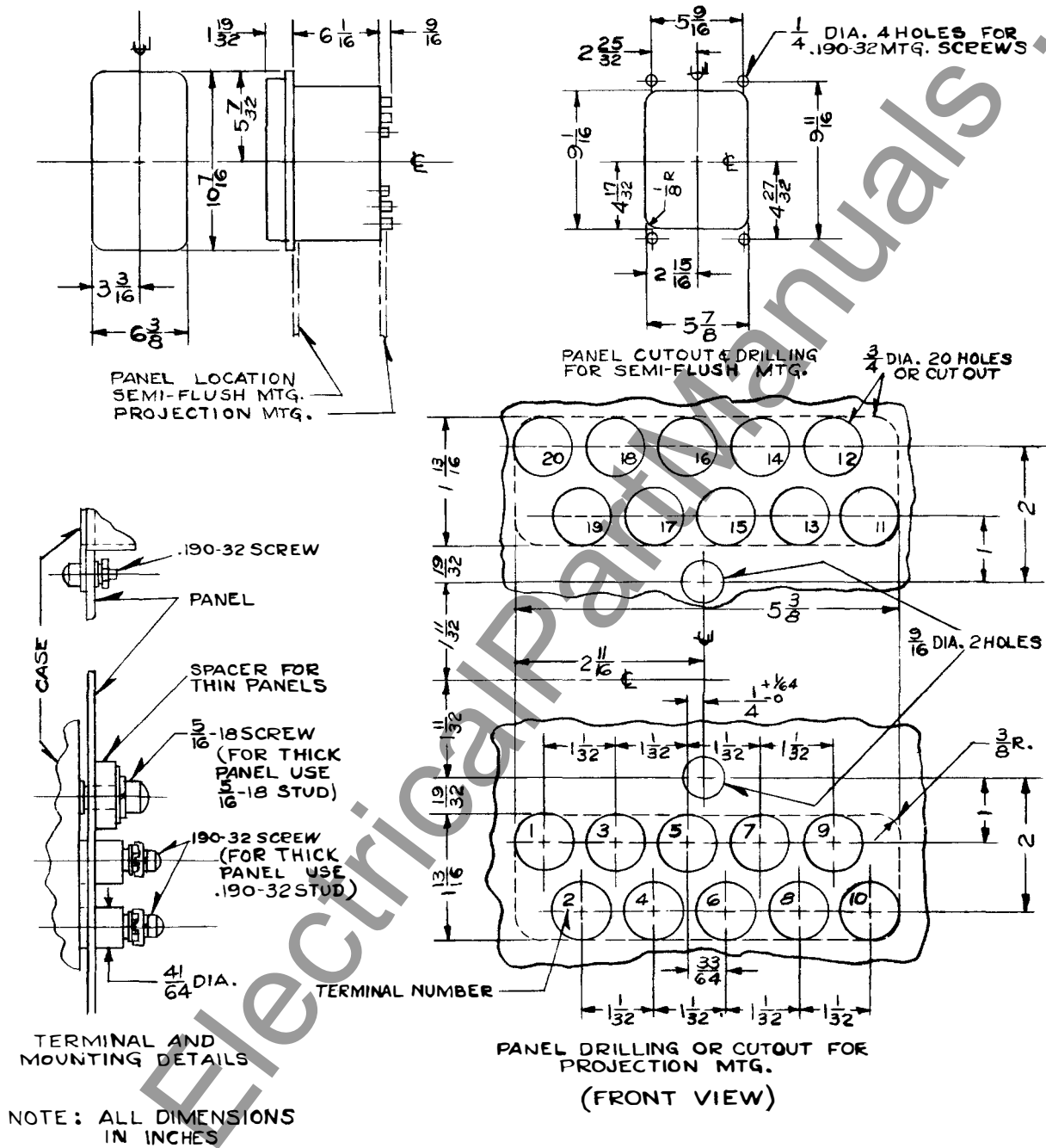


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay In Type FT22 Case.

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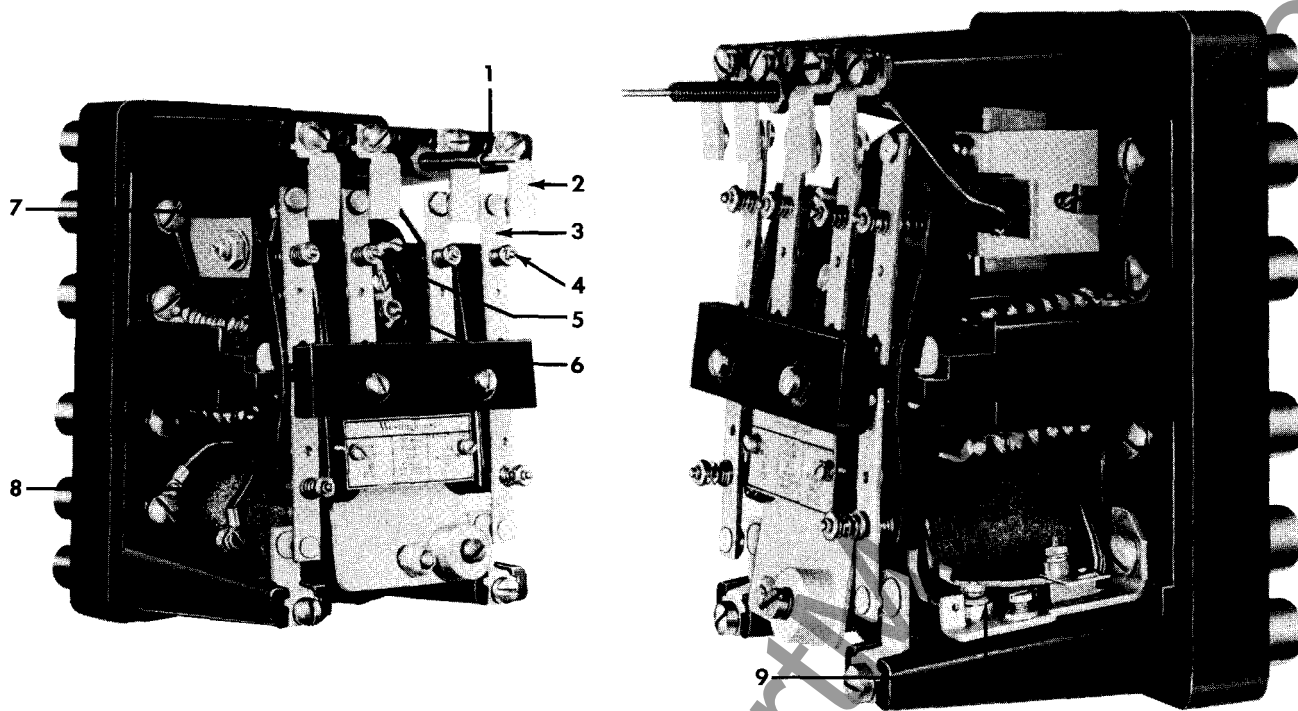


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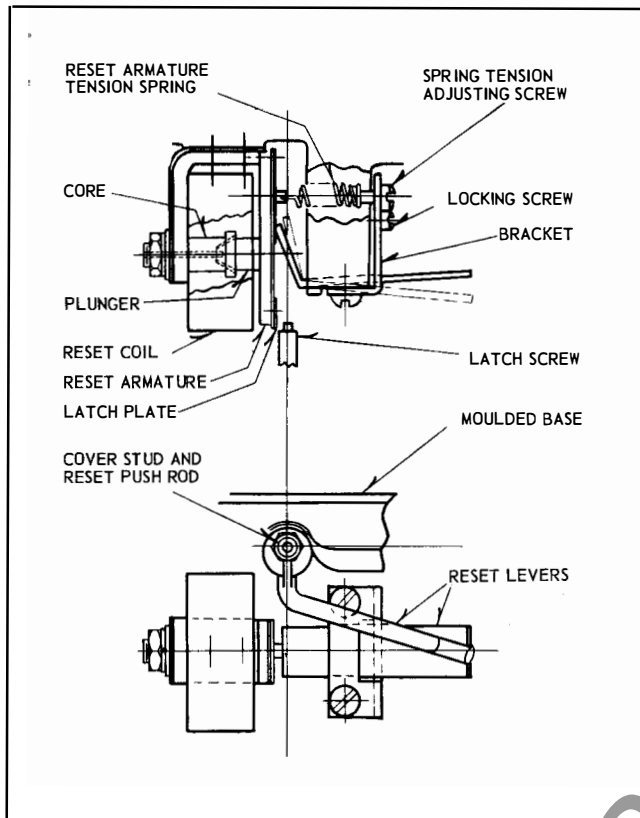


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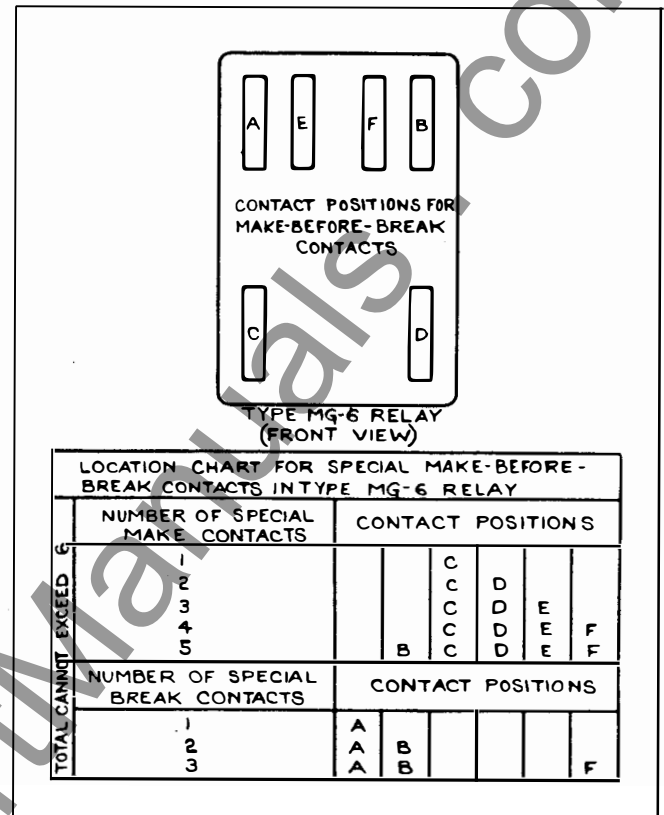


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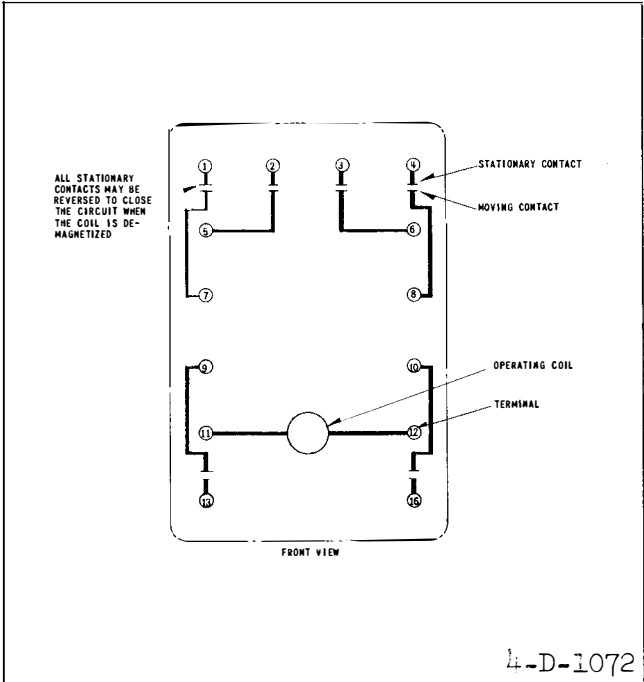


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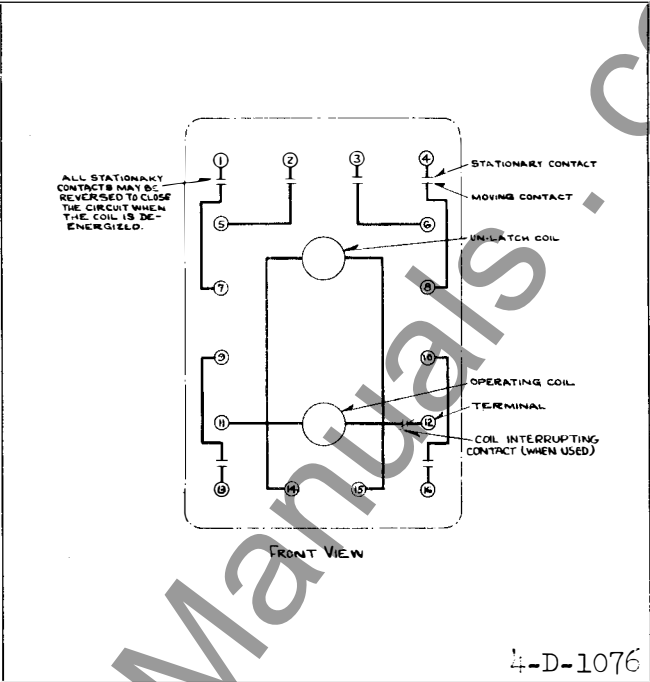


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles of 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

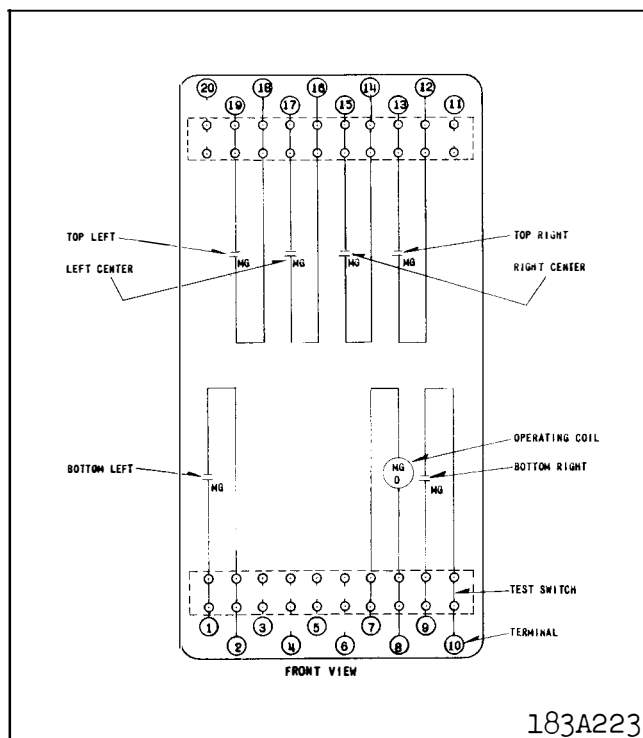


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

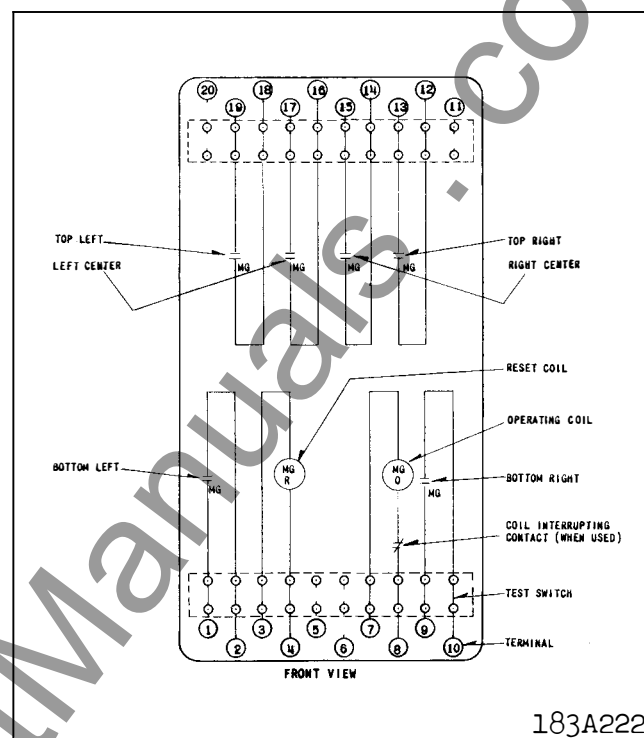


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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 elec-

trical 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.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be

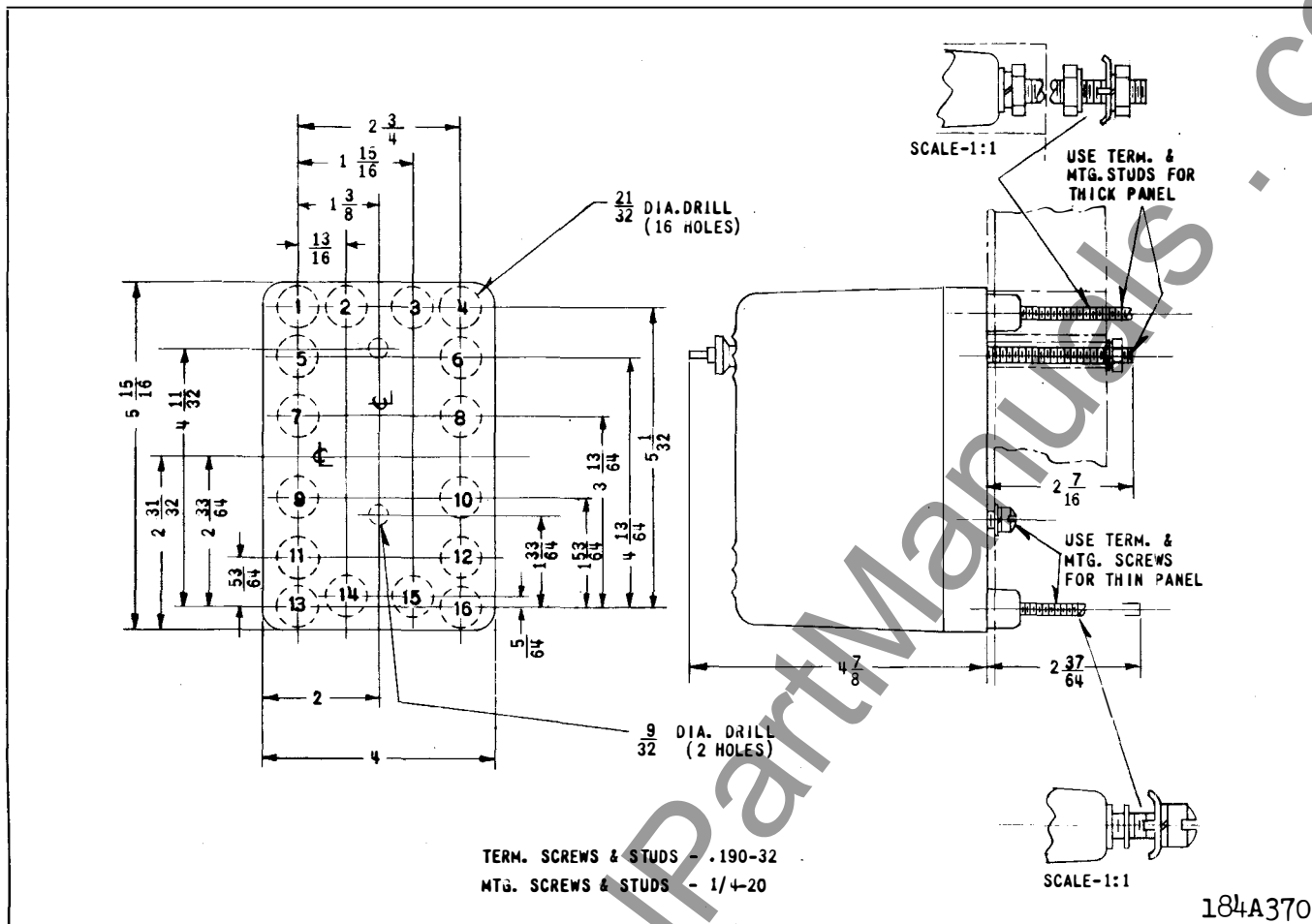


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

* maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is 7/16" above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with

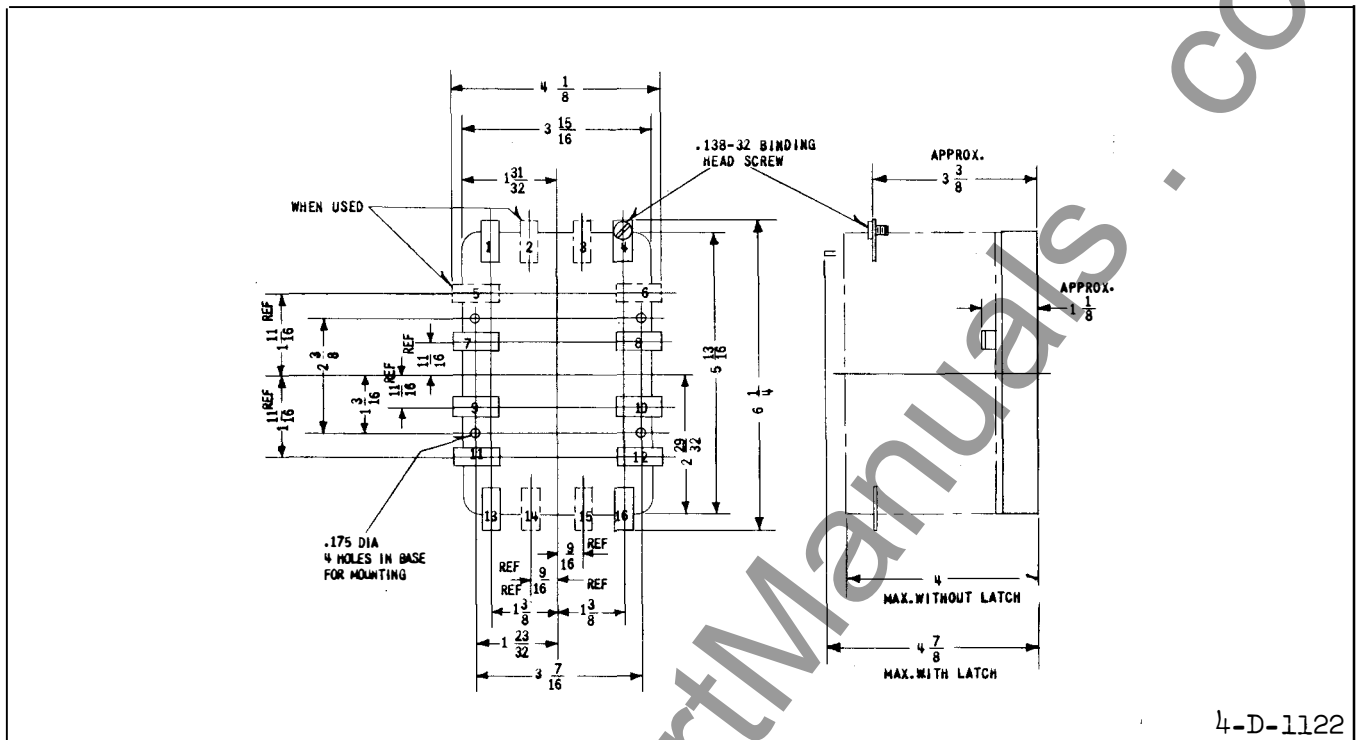


Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The

positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

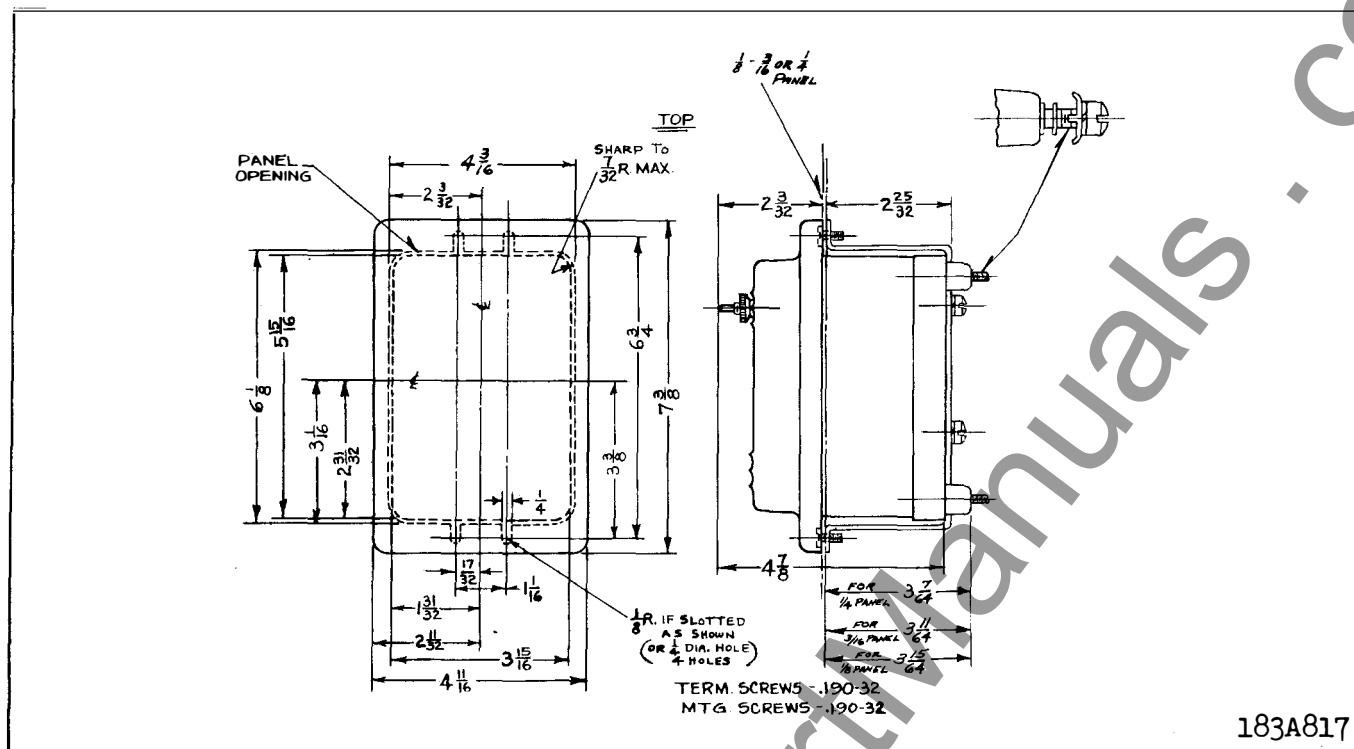


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .010 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .005 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 5 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .020 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

△ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	

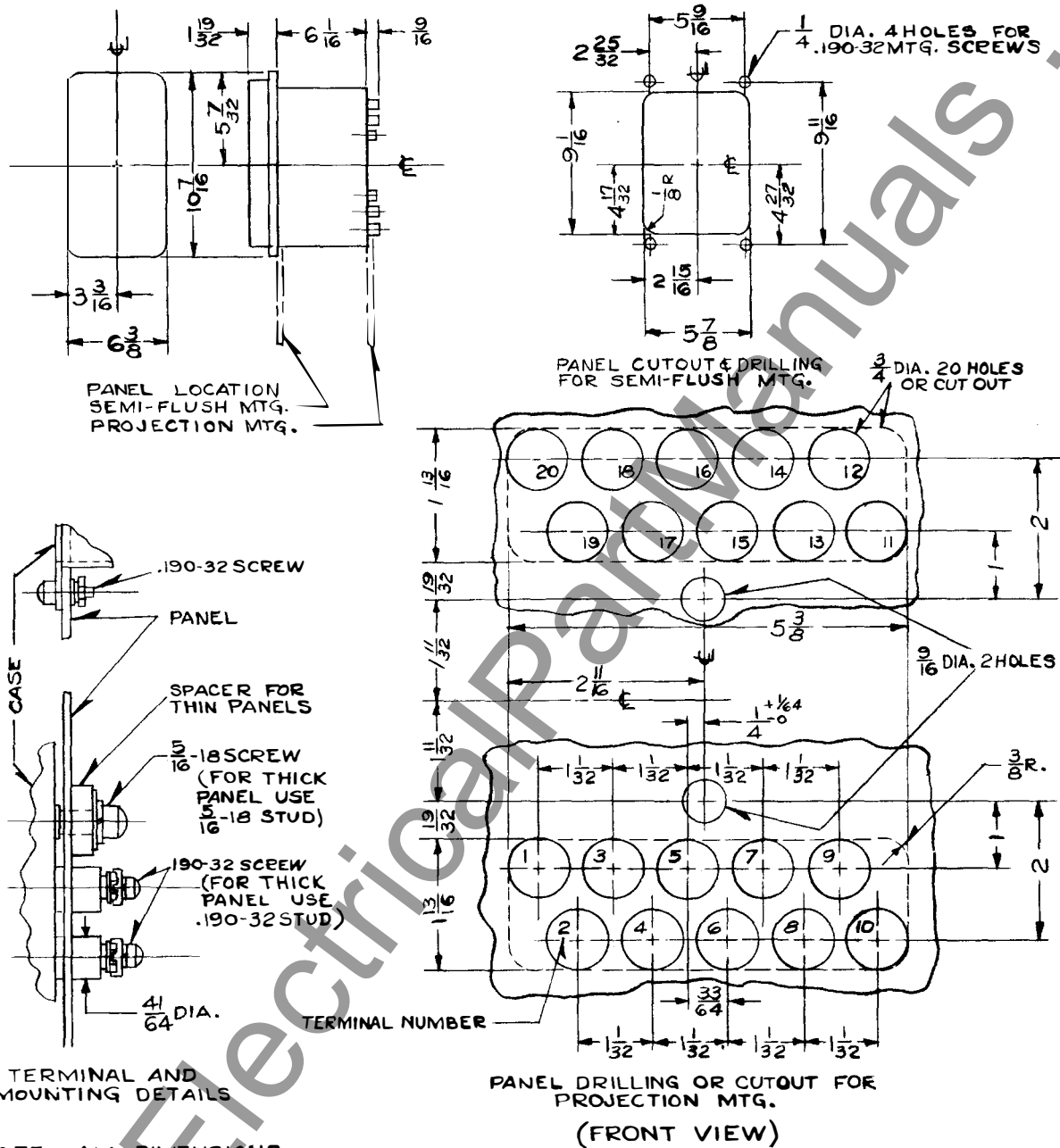


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay In Type FT22 Case.

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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE” it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1E

*Denotes change from superseded issue.

EFFECTIVE JANUARY 1968

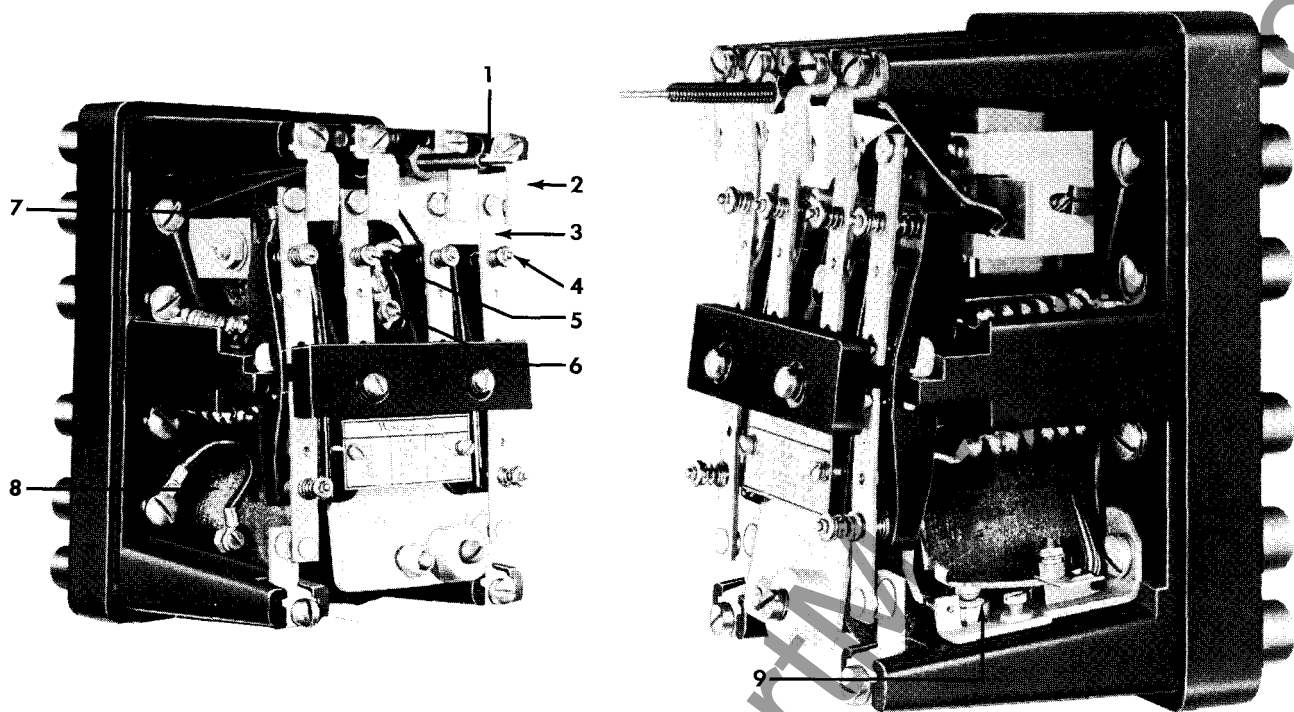


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

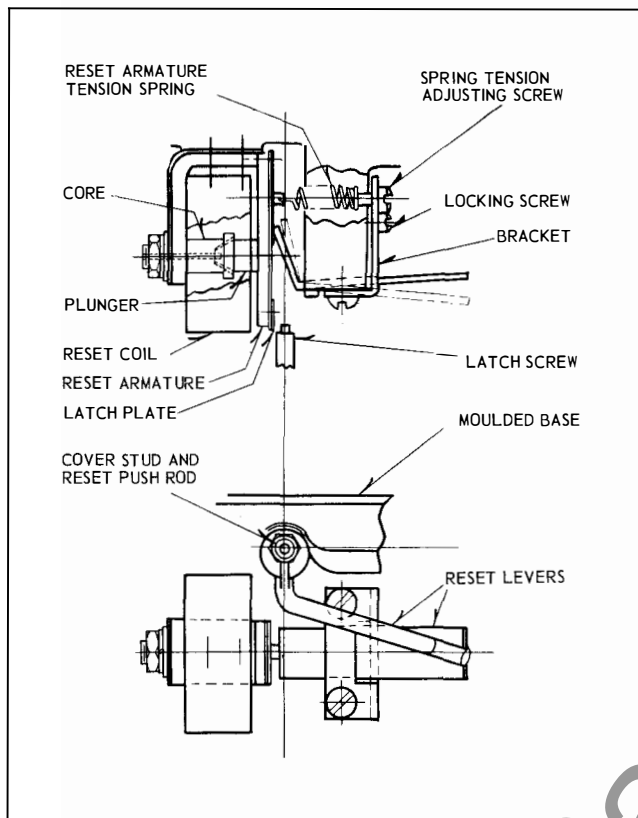


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

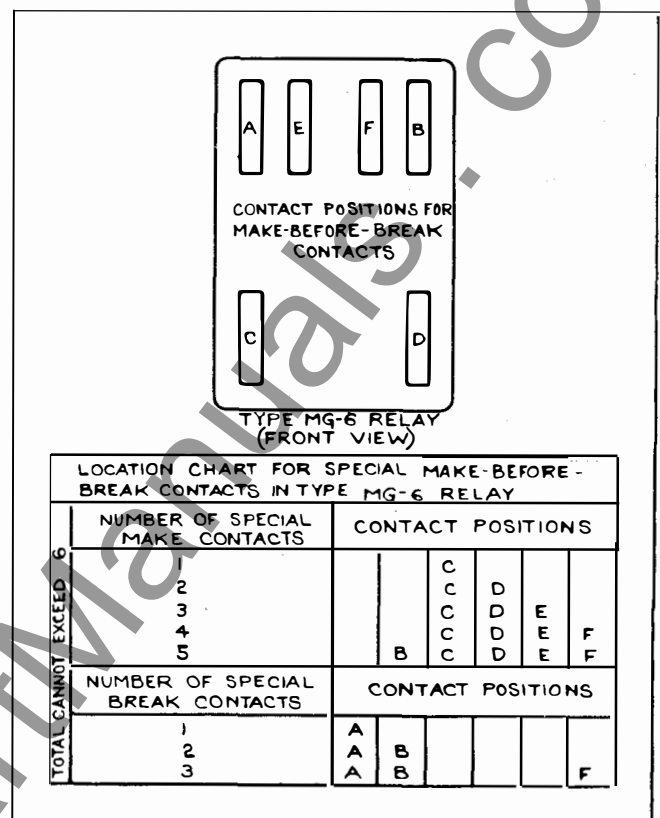


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

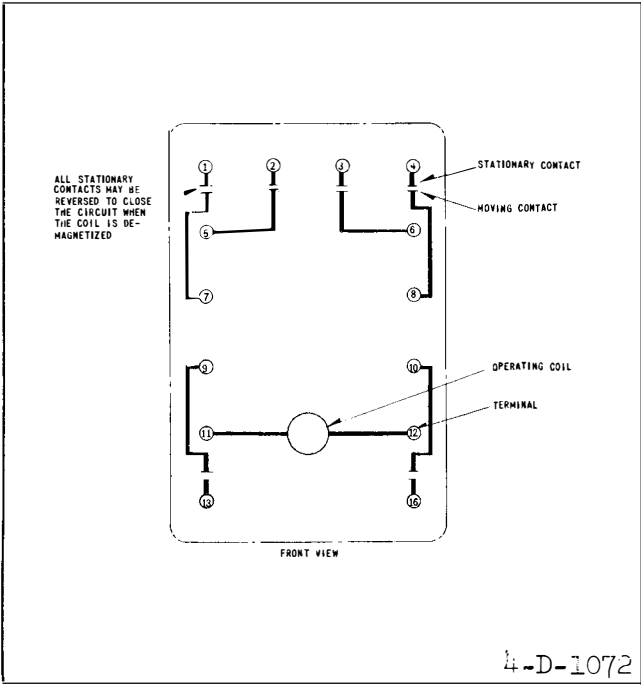


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

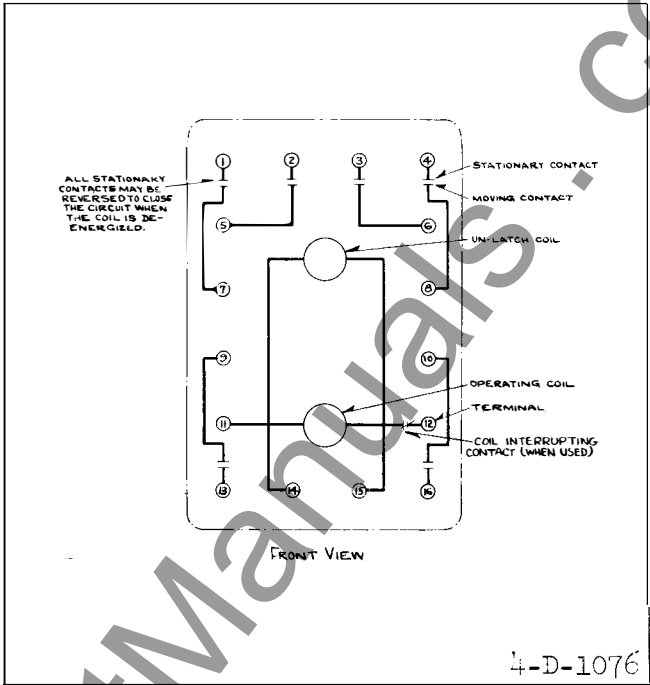


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

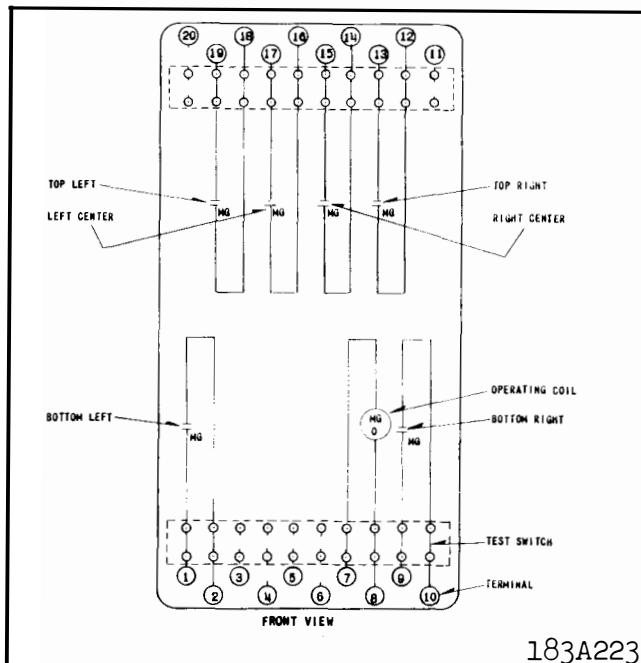


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

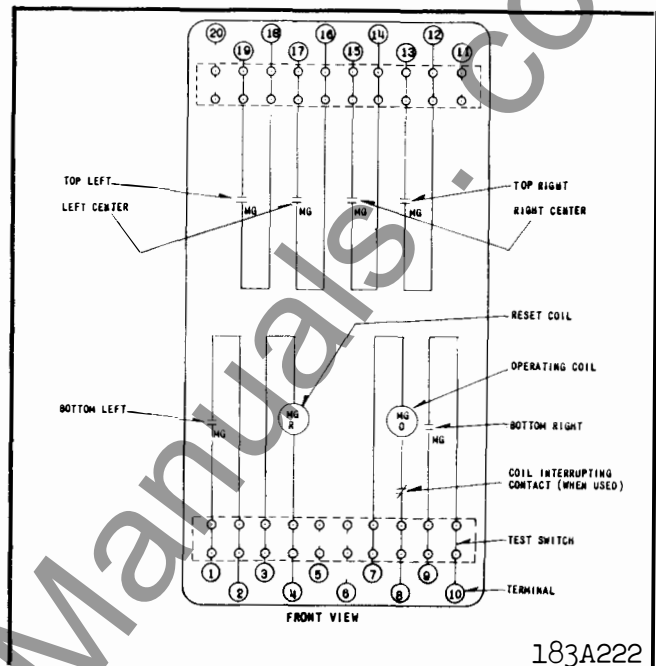


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

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

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

*

Coil Resistance (at 25° C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208

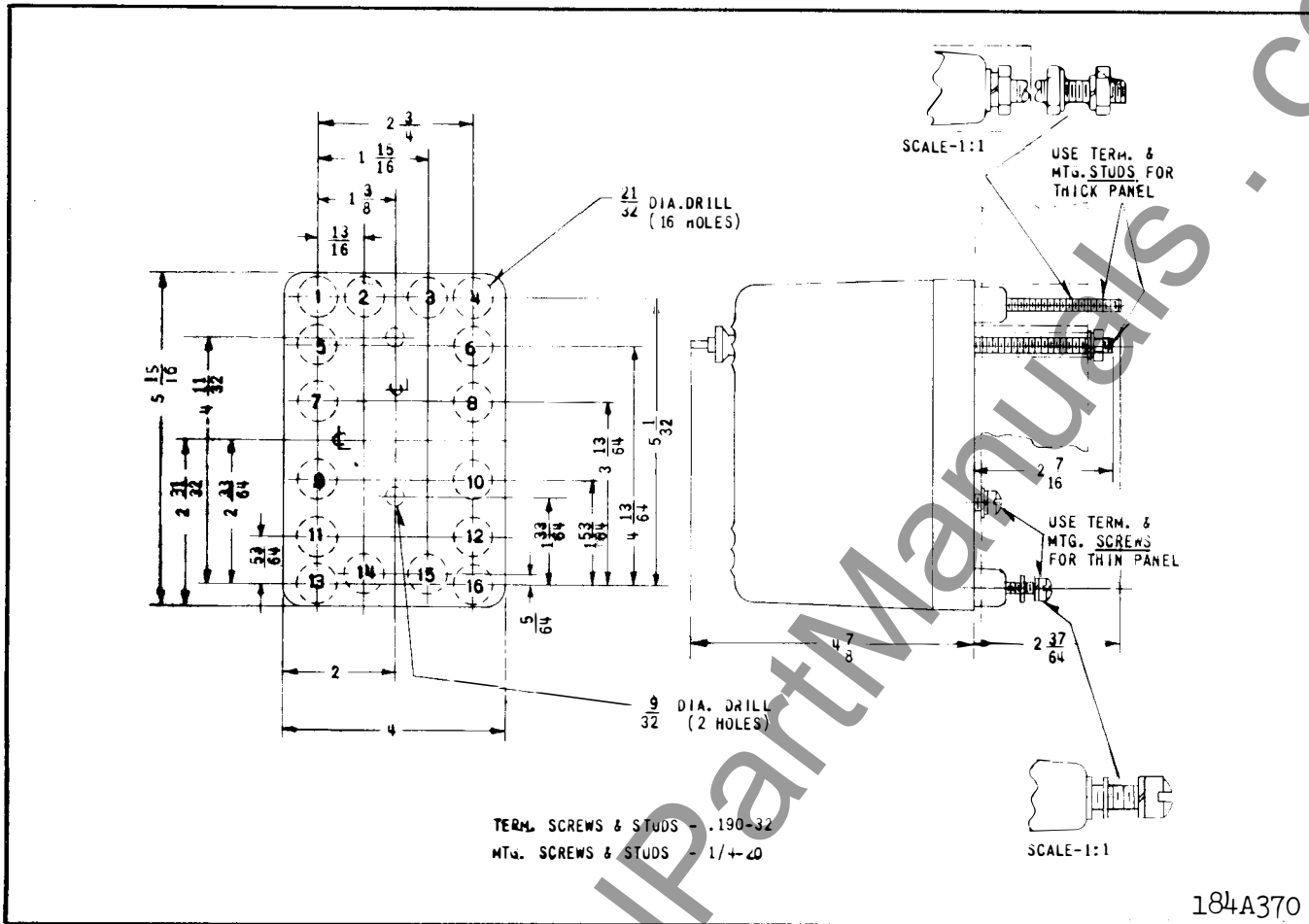


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

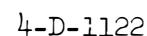
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately 1/16" follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about 1/16". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

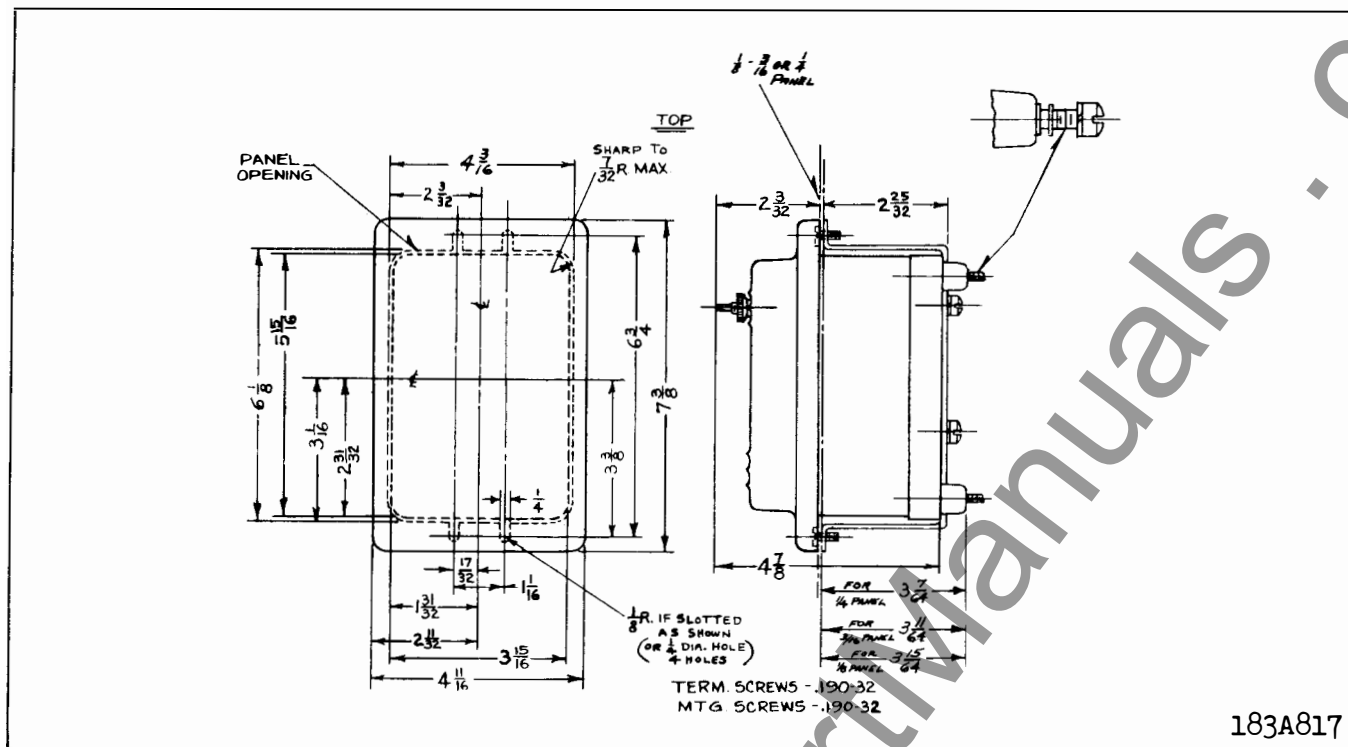


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand
 * edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the *electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

△ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	

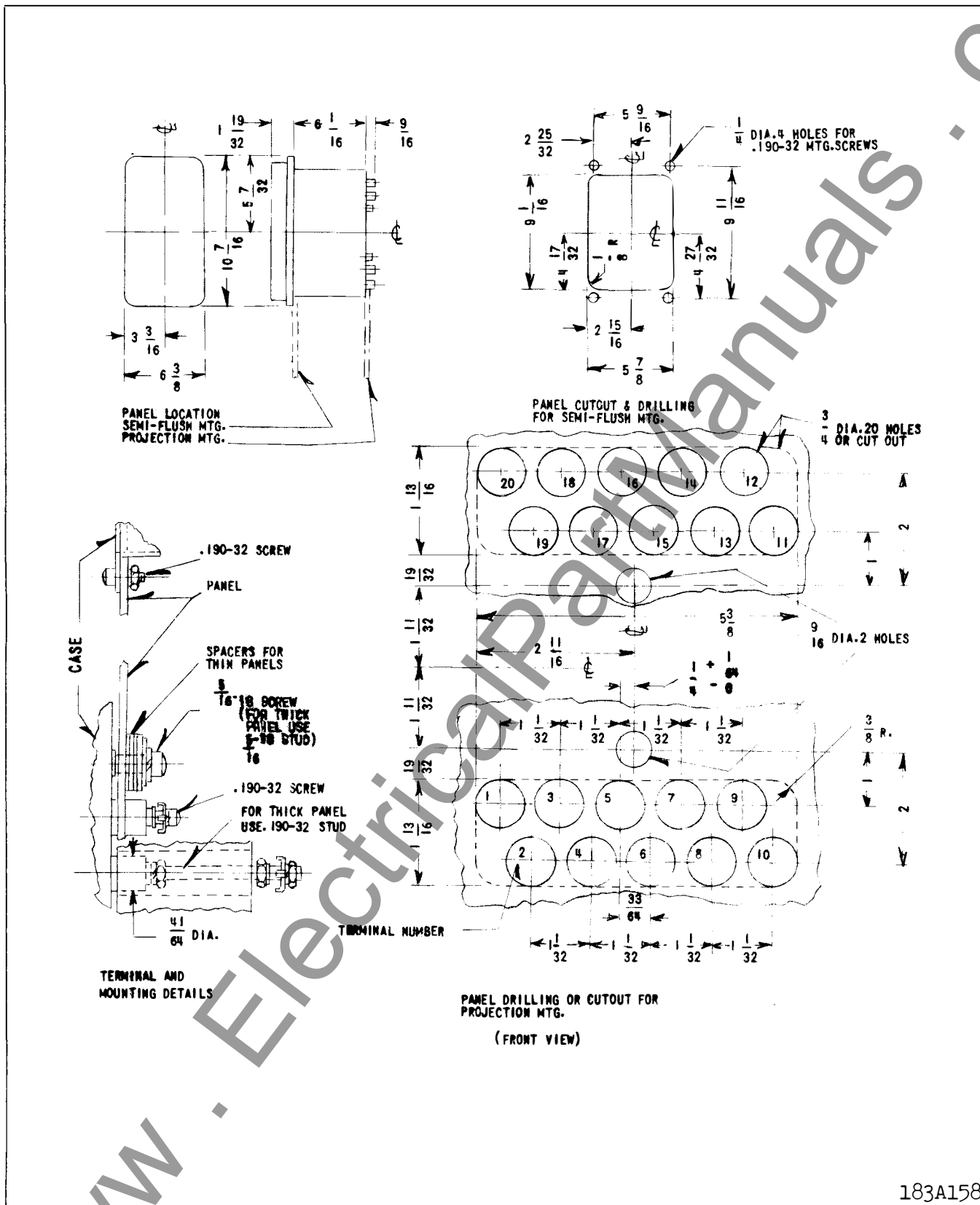


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION

NEWARK, N. J.

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INSTALLATION • OPERATION • MAINTENANCE INSTRUCTIONS

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see "ADJUSTMENTS AND MAINTENANCE") it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.)

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1F

*Denotes change from superseded issue.

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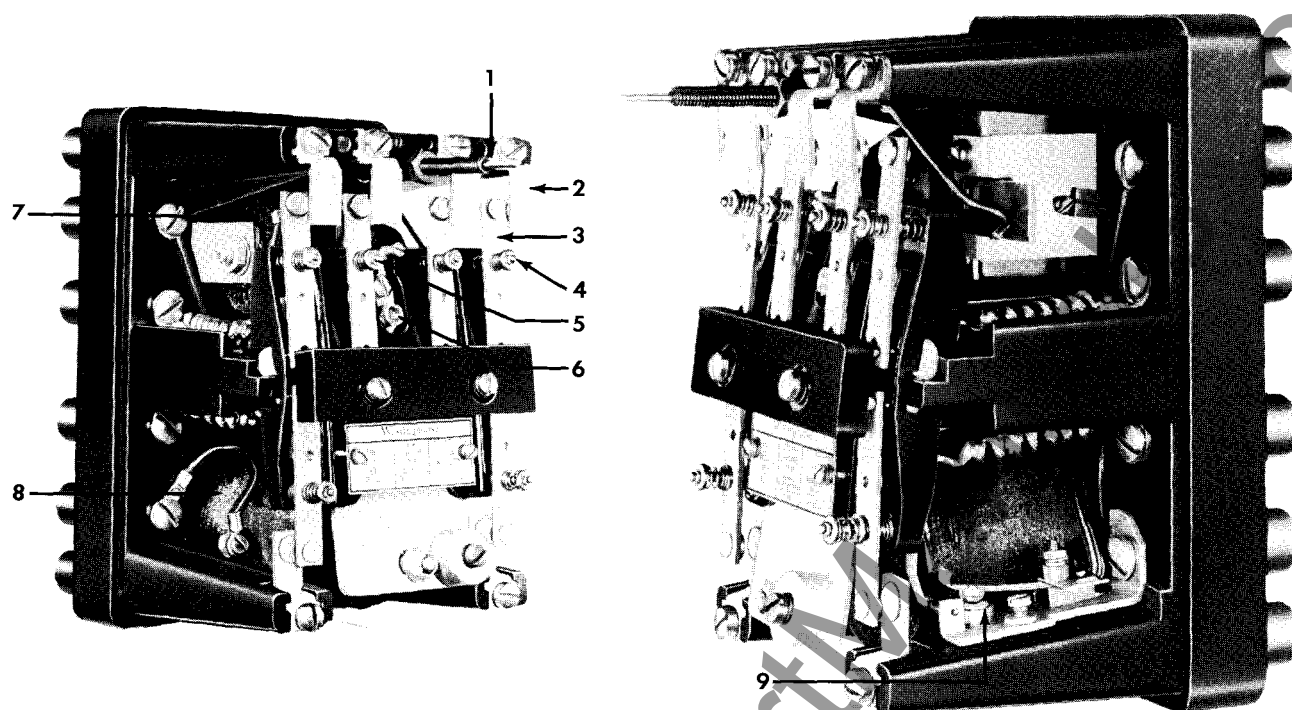


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

* The stationary contacts consists of large silver buttons which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

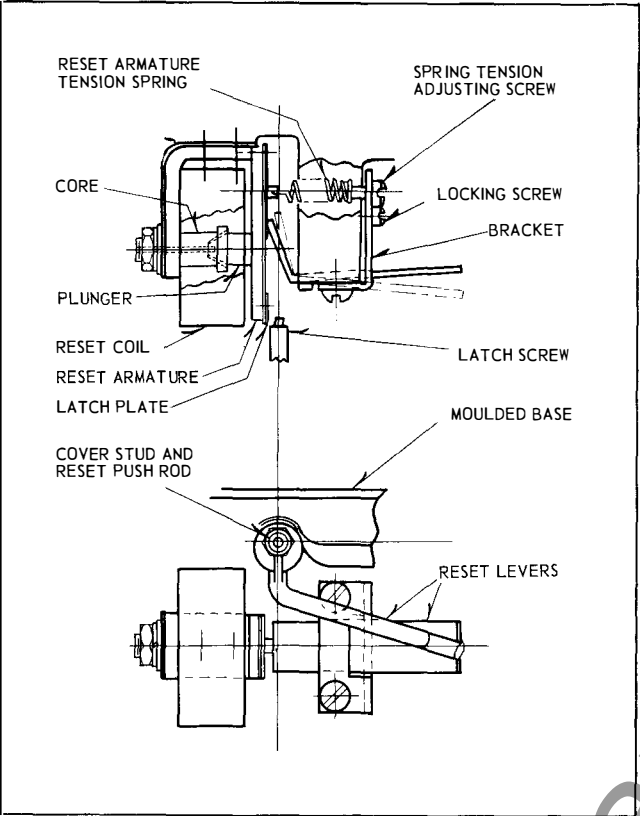


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

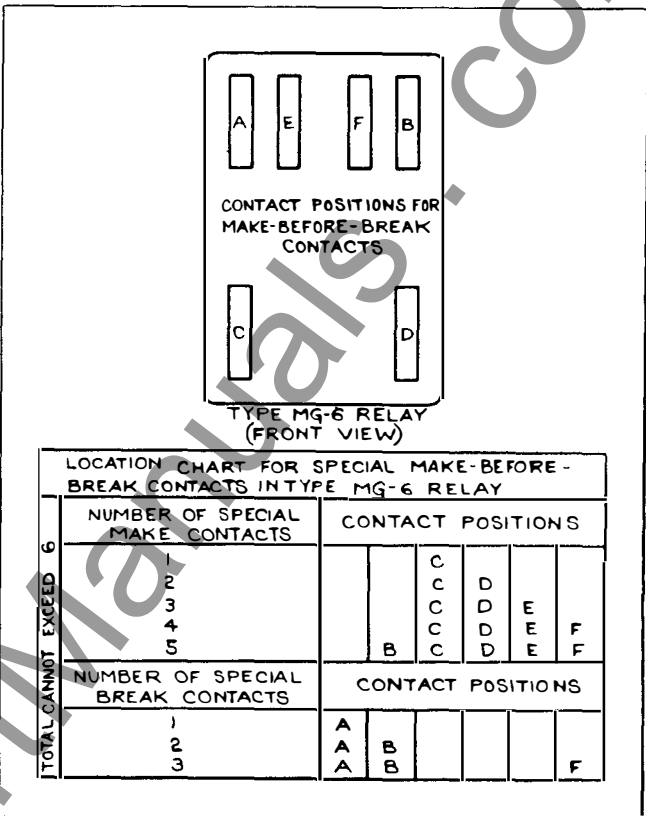


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

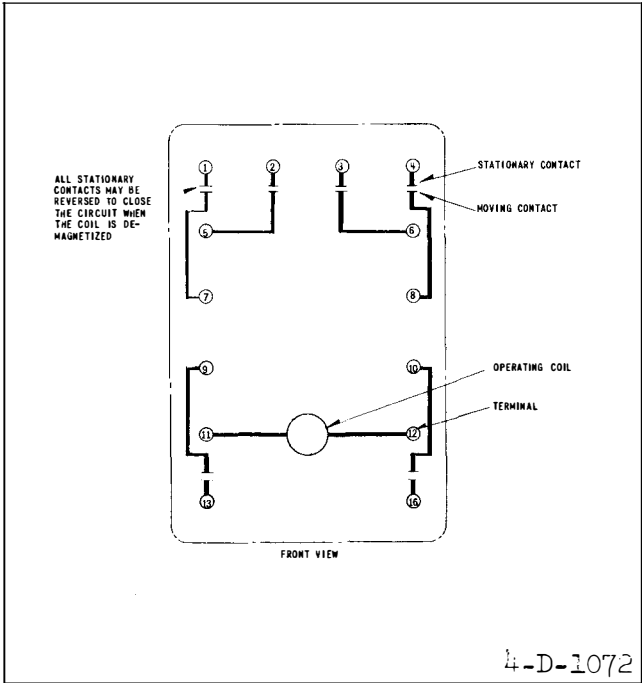


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

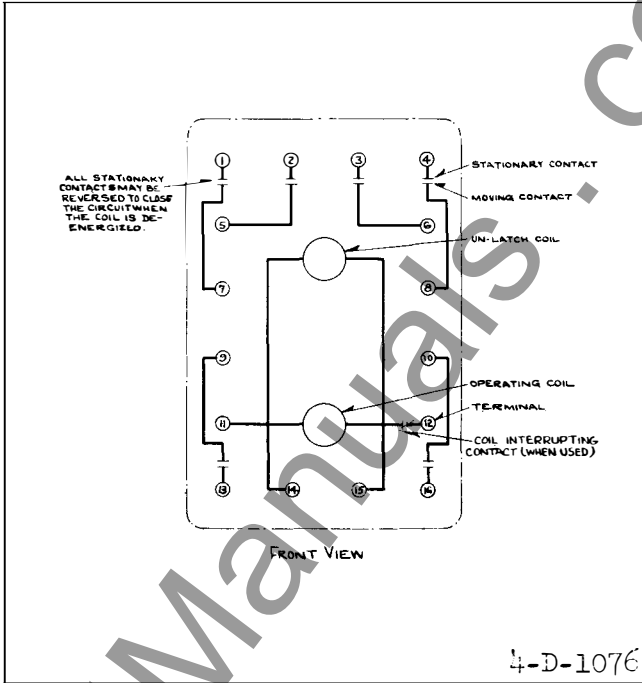


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

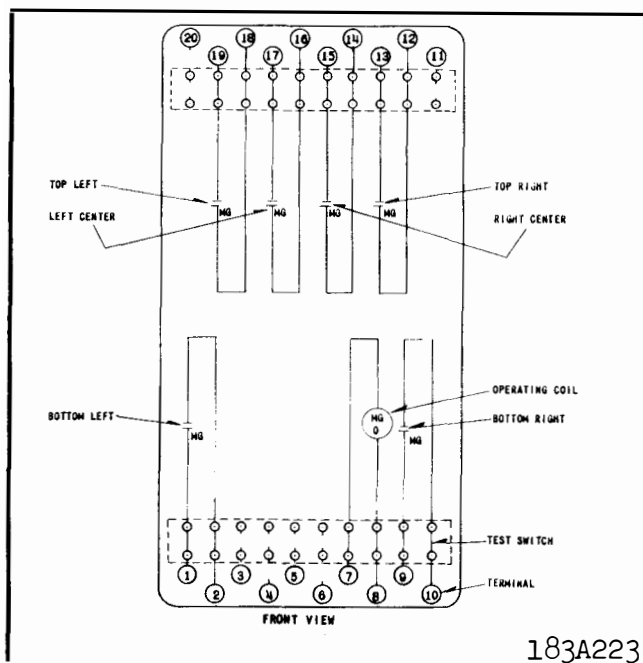


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

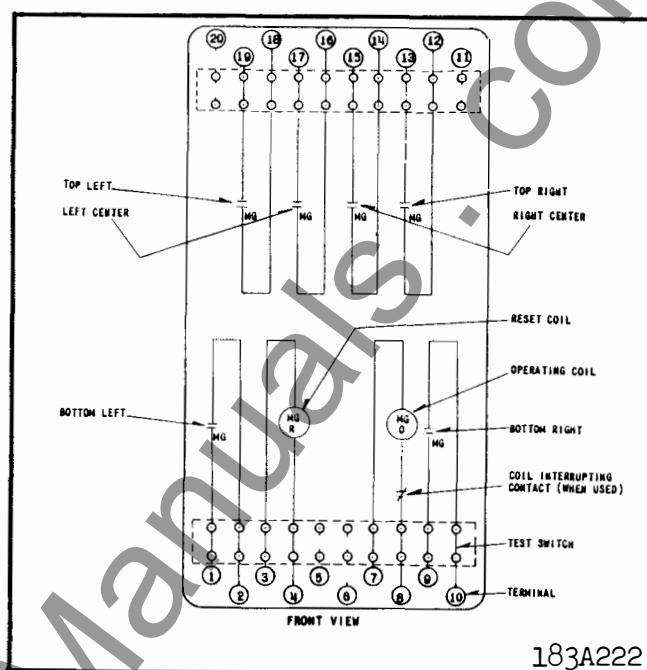


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

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

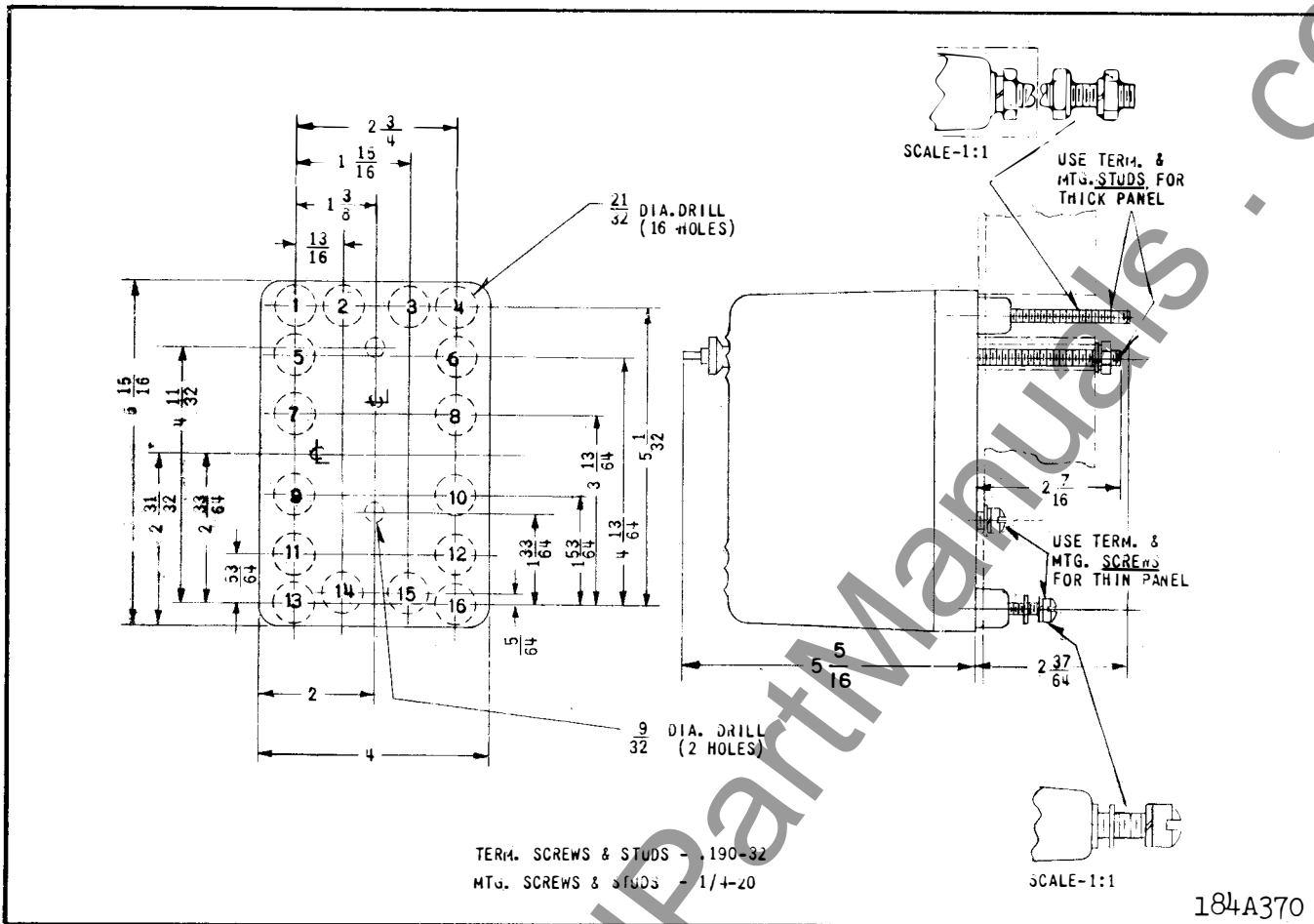
The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

Coil Resistance (at 25° C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208



* Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

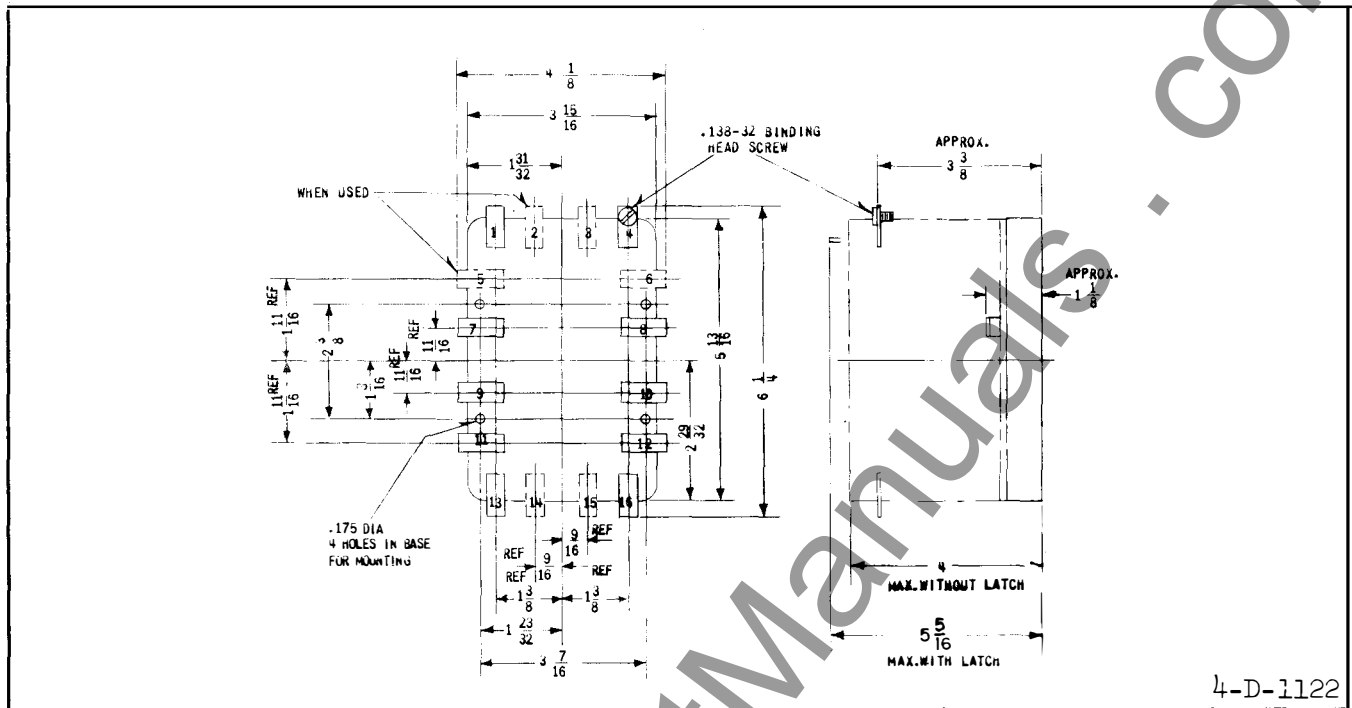
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



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* Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

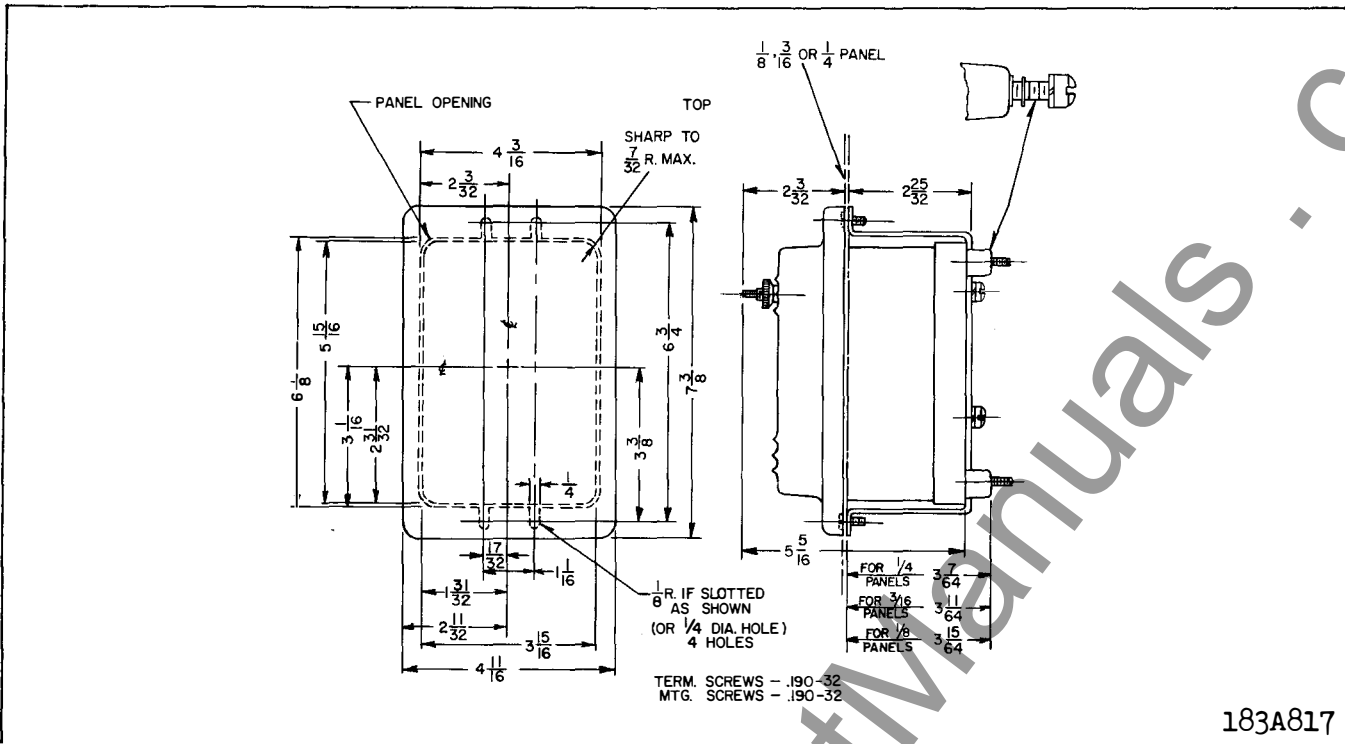
- * when the armature is in contact with it, the lower edge of the armature is $7/16''$ above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32''$ for the make contacts and $1/16''$ for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8''$ for the make contacts and $3/32''$ for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16''$ follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16''$. With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments



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* Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about $\frac{1}{8}$ " of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about $\frac{1}{64}$ ". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

- * A small amount of silicone oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be re-applied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

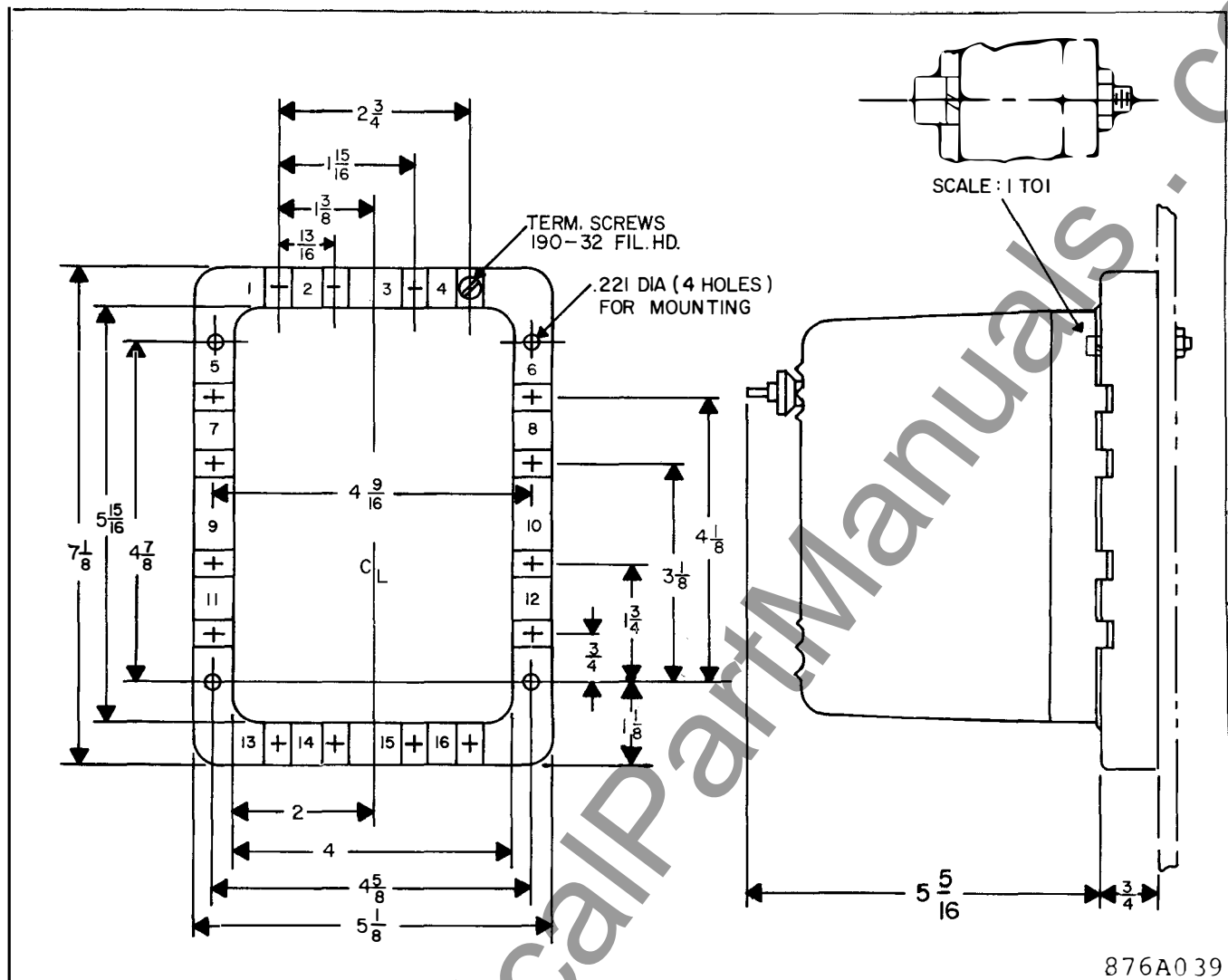
Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

△ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	



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* Fig. 11. Relay Type MG-6 Front Connected with Cover Outline and Drilling Plan

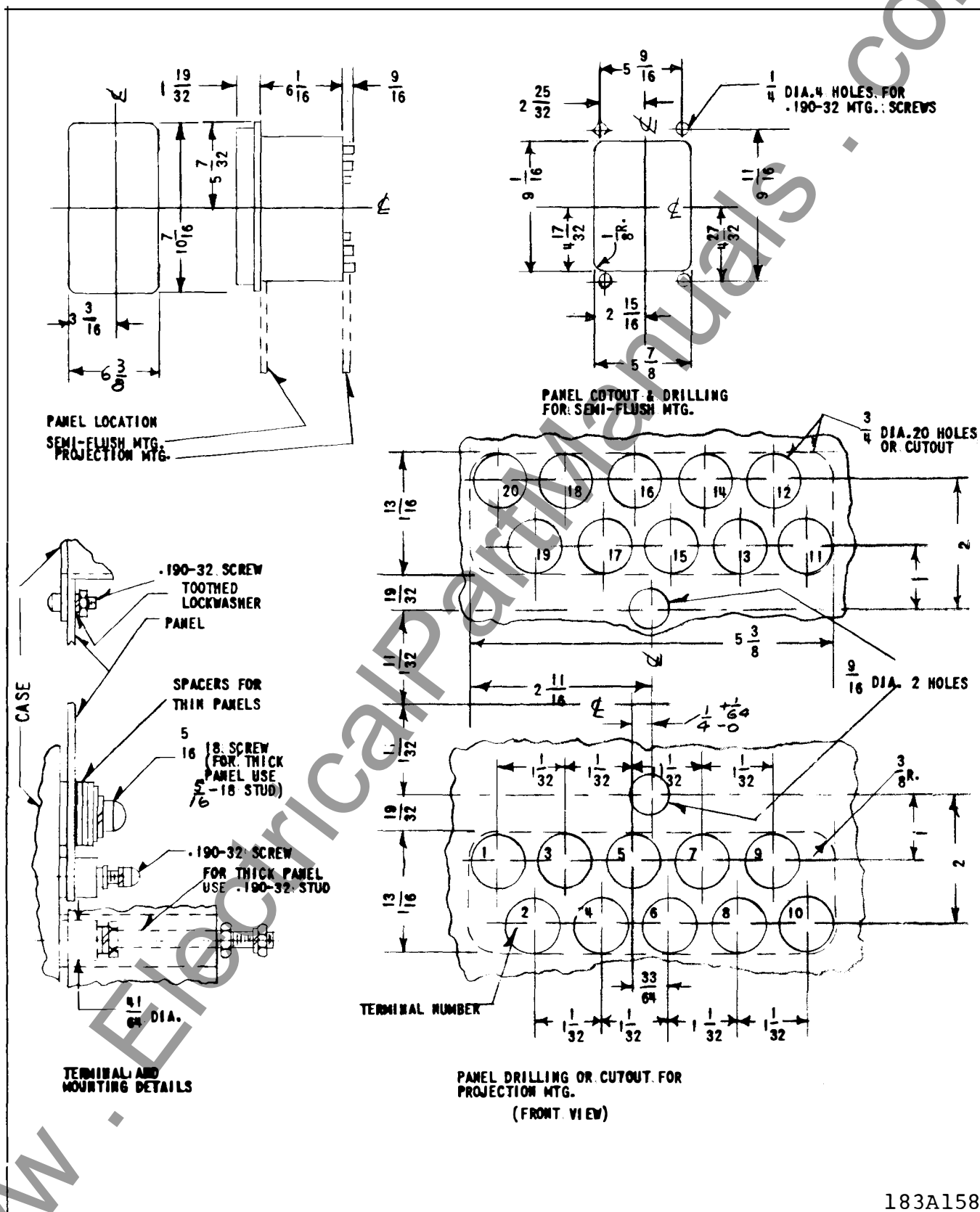


Fig. 12. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

183A158



WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION

NEWARK, N. J.

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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPES SC, SC-1, SV AND SV-1 RELAYS

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

APPLICATION

The types SC and SC-1 current relays and the types SV and SV-1 voltage relays are applicable where an instantaneous plunger relay of high accuracy is required. These relays are suitable for protective service, and for auxiliary service where some of their special features are desired. They are adjustable over a wide range of voltage or current, are provided with mechanical operation indicators, and have a calibrated scale which indicates the pick-up setting. Both contacts can readily be changed from "make" to "break". The volt-ampere burden is low.

The type SC and SV relays have a high ratio of drop-out to pick-up (90 to 98%) and are particularly suitable for fault detector relays. The type SC-1 and SV-1 relays have a lower ratio of drop-out to pick-up. This lower ratio may be desirable in some applications, and it makes possible a plunger pull characteristic which permits the operation of a latching device. The latch is combined with the mechanical operation indicator, and prevents further motion of the moving contacts after the relay has operated.

CONSTRUCTION

The types SC, SC-1 and SV and SV-1 relays operate on the solenoid principle. A U-shaped iron frame, mounted on the moulded base, supports the coil and serves as the external magnetic path for the coil. The coil surrounds a core and flux shunt. The upper end of the core is threaded and projects through the upper side of the frame, to which it is fastened by a nut. A tube threaded on the outside at its lower end is assembled in the core, and the threaded end extends below the core. A Fluorosint® bushing, which is the lower

* The Polymer Corp.

bearing for the plunger shaft, is assembled in the lower end of this threaded tube. It is held in place by two split spring sleeves, one above and one below the bearing. The split sleeves must be compressed to insert them in the tube and they will remain at any position in which they are placed. The bearing for the upper end of the plunger shaft is a Fluorosint® bushing which is pressed in the upper end of the core. This bearing is visible when the plunger is in the energized position. The plunger itself does not touch the walls of the tube in which it moves.

A flux shunt which surrounds the core is screwed on the tube, and its lower end projects below the relay frame. The position of this shunt determines the pick-up setting of the relay. The lower end of the shunt is beveled and knurled, so that it can be grasped by the fingers and turned to change the setting. A calibrated scale plate is mounted adjacent to the shunt. A groove just above the knurl in the lower end of the shunt serves as an index mark, and the relay pick-up setting is indicated by the calibration scale marking which is adjacent to the groove.

The construction of the plunger, core and flux shunt (which differ in details in the various types of these relays) causes the plunger to float in its energized position, without being held against a stop, even when energized much above the pick-up value. Consequently, there is negligible noise and the contacts are free from chatter, even on heavy overloads and in 25 cycle applications.

The core, shunt and plunger construction also provides the high ratio of drop-out to pickup in the SC and SV relays. This ratio is above 90% for any pick-up setting. In the latch type relays it is necessary for the plunger to rise with sufficient force to operate the latch positively and to deflect the stationary contacts sufficiently to prevent their opening, when the relay is de-energized, due to play in the latch. It is necessary to have a lower ratio of drop-out to pick-up in, order to obtain this characteristic, and this lower ratio may be desirable in some applications where the latch is not required. The plunger

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

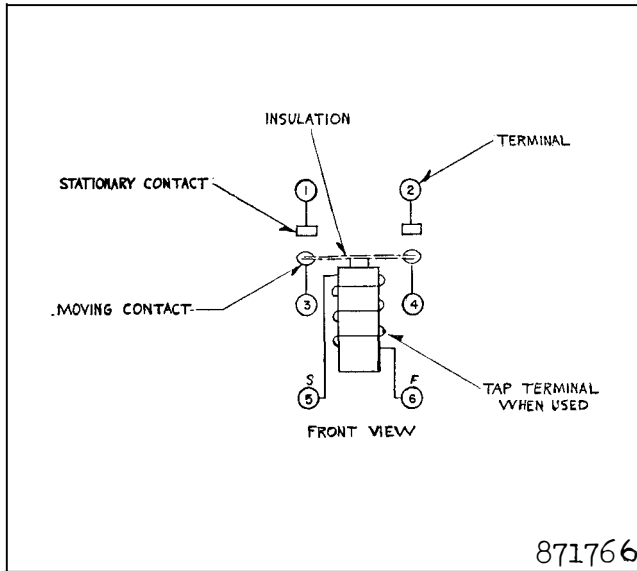


Fig. 1. Internal Wiring of the Relays In The Small Glass Case.

floats in its operated position just as in the SC and SV relays. The drop-out ratio varies somewhat for different shunt positions, but is constant for any one setting.

The shunt is held in any desired position by pressure from a curved arm made of sheet spring steel, which is fastened to the bottom of the coil frame at the rear of the shunt. This spring arm is shaped to extend around the shunt to the front of the relay, and in its normal position it exerts sufficient pressure against the shunt to prevent any creeping of the shunt or undesired change of setting. The front end of the spring arm has a bent-over tab on which thumb-pressure may be applied to move the arm out of contact with the shunt while the position of the latter is being changed.

The stationary contacts are assembled on slotted brackets. These are held in position on the base by filister-head screws which are threaded into the terminal inserts. Lock-washers are assembled inside the moulded terminal bushings between the inserts and the base, as a safeguard against loosening of the screws. By rotating the bracket on its mounting screw and moving it along its slot, the contact assembly can be made either normally open or normally closed. The moving contacts are mounted on a Micarta insulation plate which is secured to the threaded end of the plunger shaft by a nut. The front edge of this insulation plate operates the indicator. The rear portion of the plate is slotted and a post screwed to the frame passes through this slot to prevent the plate from rotating.

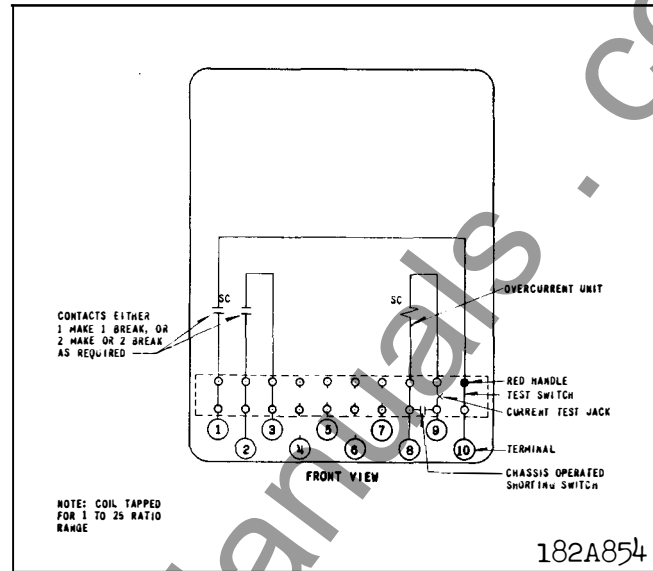


Fig. 2. Internal Schematic of the Single Unit Type SC or SC-1 Relay in The Type FT21 Case.

The moving contacts are double-faced so that they can be "make" or "break" and are connected to the base terminals by flexible leads. All contacts are pure silver. The contacts will carry 5 amperes continuously, and will interrupt 5 amperes at 115 volts A-C, or 1 ampere at 125 volts D-C.

The mechanical operation indicators used on these relays are shockproof, and can be used to indicate on the up stroke or down stroke of the plunger. The indicator is reset by pulling out the knurled stud which projects through the cover nut. The indicator should be reset after each relay operation because otherwise there may be a one or two percent decrease in the operating value of the relay. The operation indicator is assembled at the factory to indicate on the up stroke of the plunger, but by removing the two mounting screws which fasten the indicator to the main frame, turning the indicator bracket around and at the same time swinging the indicator flag 180° about its shaft, the indicator can be set to indicate on the down stroke of the plunger. The rivet weight must be removed from the indicator flag and the latch screen turned around to complete the assembly.

In certain applications, an extremely wide range of current adjustment is desirable, and certain styles of SC and SC-1 relays have been provided with tapped coils to meet this requirement. The coil taps are brought out to a tap block mounted on the lower end of the relay frame or on the relay sub-base, depending on the type of case used. The connector plate on the tap block is marked with the minimum pick-up value of

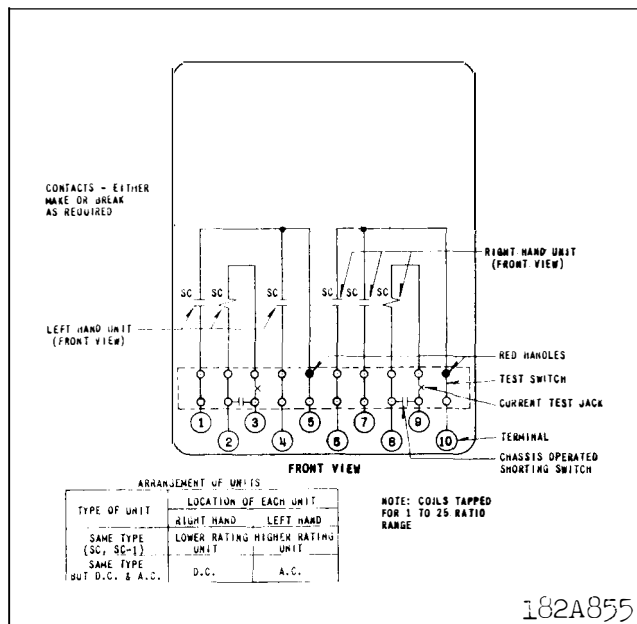


Fig. 3. Internal Schematic of the Double Unit Type SC or SC-1 Relay in the Type FT21 Case.

each tap, and the shunt is adjusted in the usual manner to obtain any pick-up setting between taps. The scale plate is not calibrated for the relays with tapped coils, as there is not sufficient space for marking a scale for each tap. However, the scale plate is supplied in order that a customer may mark on it the individual relay setting or settings if desired.

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

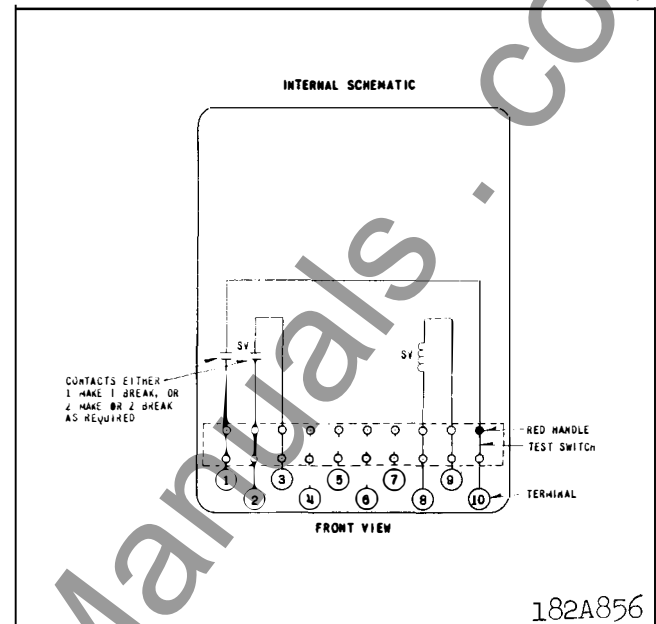


Fig. 4. Internal Schematic of the Single Unit Type SV or SV-1 Relay in the Type FT21 Case.

should not be disturbed after receipt by the customer. If the adjustments have been changed, the relay taken apart for repairs, or if it is desired to check the adjustments at regular maintenance periods, the instructions below should be followed.

All contacts should be cleaned periodically. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and thus impairing the contact.

Several factors may affect the drop-out ratio of the relay. Whatever affects the ratio does so because either the drop-out or pick-up or both are affected. Obviously, incorrect assembly or interchange of parts, such as the use of the SC plunger with the SV core tube, will alter the electrical characteristics. However, the factor most likely to be encountered in service is friction. This may be due to dirt or foreign material between the plunger shaft and its bearings, to excessive pressure of the indicator screen on the indicator, or to leads so mis-shaped that they tend to rotate or tilt the moving contact insulation plate with appreciable force.

In order to remove the plunger and shaft assembly, it is necessary to remove the setscrew and nut at the top of the shaft. The spool-shaped bushing assembled on the upper end of the plunger shaft has a portion of

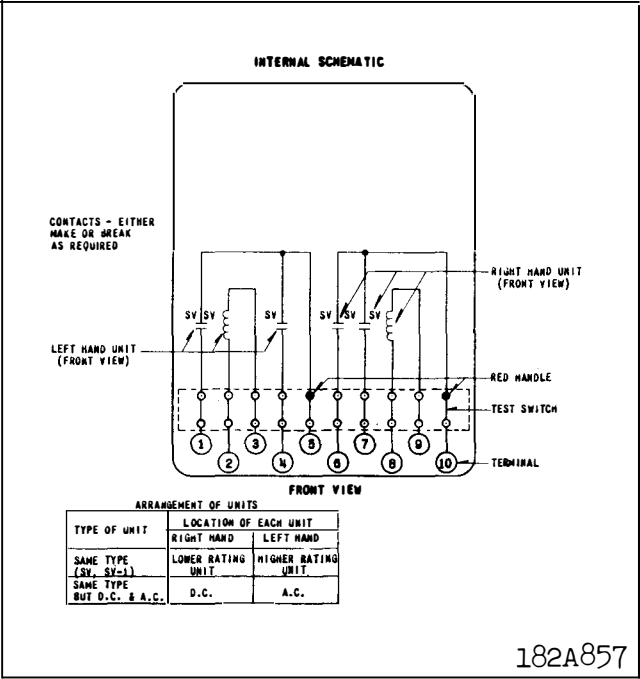


Fig. 5. Internal Schematic of the Double Unit Type SV or SV-1 Relay in the Type FT32 Case.

its center section machined off so that the shaft is exposed at this point and can be prevented from turning by gripping shaft and bushing with a pair of long-nose pliers while removing the set screw and nut. Then by pressing down with the fingers on the upper end of the shaft, the lower split sleeve which retains the lower bearing will be forced out of the threaded tube, the bearing will drop out freely, and the upper split sleeve will be forced out far enough to permit grasping it for removal. The shaft and plunger assembly then can be removed.

The shaft and plunger assembly should be handled carefully to avoid bending the shaft or damaging the bearing surfaces. The shaft should never be gripped on its upper bearing surface, below the spool-shaped bushing, when loosening the nut and setscrew, as this would almost certainly damage the bearing surface. The shaft bearing surfaces should not be cleaned or polished with any abrasive material, as the abrasive particles might become imbedded in the shaft and cause difficulty later. The plunger shaft and bearings may be cleaned by wiping them carefully with a clean, lint-less cloth. This may be moistened with benzene or some other cleaning solvent if necessary. Use no lubricant on the plunger shaft or bearings when re-assembling the relay, since this will eventually become gummy and prevent proper operation. It is recommended that the shaft be clean-

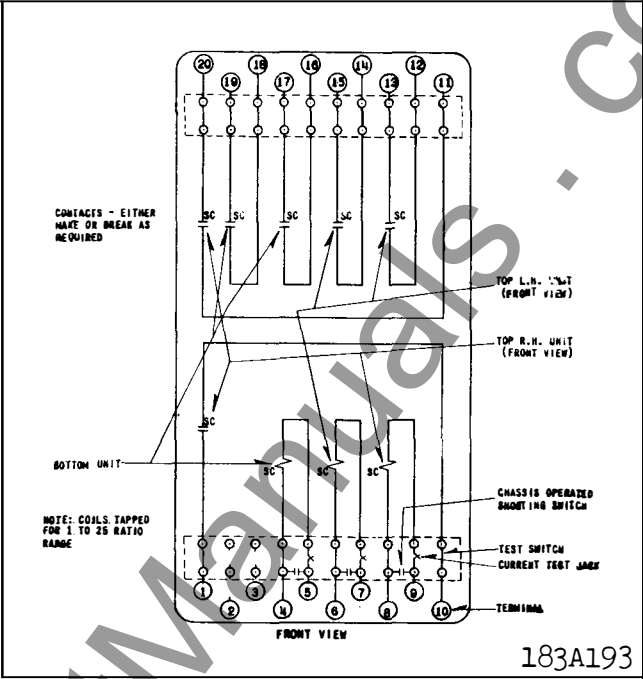


Fig. 6. Internal Schematic of the Three Unit Type SC or SC-1 Relay in the Type FT32 Case.

ed at intervals of approximately two years. When replacing the lower bearing and the split sleeves, the shorter sleeve (assembled below the bearing) should be pushed in until it is flush with the end of the threaded tube.

The mounting holes in the operation indicator screen are slotted so that its position can be adjusted. For relays in which the moving contacts are not latched in the operated position, the screen should be so located that the indicator positively enters the screen opening when the contacts barely touch. For latch-type relays, the screen should be so located that good contact is still obtained when the relay is de-energized. The pressure of the screen against the indicator may be adjusted by bending the screen between its lower end and the large elongated hole. This pressure should be such that the indicator will be held at any further position to which it is moved after entering the screen opening. However, the minimum amount of pressure necessary to obtain this adjustment should not be exceeded appreciably, since the pick-up value, and consequently the ratio, will be affected. The purpose of this pressure is to eliminate indicator rattle which might otherwise occur under certain energized conditions.

The moving contact leads pass through insulation sleeves assembled on the shanks of the terminal clips

CHARACTERISTICS OF TYPES SC AND SC-1 RELAYS

Type	Frequency	Range of Adjustment Amps.	Max. Amps. Continuous	Watts 5 Amps. 60 Cycles	V.A. at 5 Amps. 60 Cycles	Dropout Ratio-AC	Dropout Ratio-DC
SC	DC, 25 to 60 hz.	.5-2	1.5	99	225	90-98%	65-80%
SC	DC, 25 to 60 hz.	1-4	3	28	65	90-98%	65-80%
SC	DC, 25 to 60 hz.	2-8	6	6.9	19	90-98%	65-80%
SC	DC, 25 to 60 hz.	4-16	12	1.5	5	90-98%	65-80%
SC	DC, 25 to 60 hz.	10-40	25	.24	.7	90-98%	65-80%
SC	DC, 25 to 60 hz.	20-80	40	.07	.16	90-98%	65-80%
SC	DC, 25 to 60 hz.	40-160	40	.03	.05	90-98%	65-80%
SC	DC, 25 to 60 hz.	4-100*	10-15-20	1.7-0.6-0.18	5-1-0.2	90-98%	65-80%
SC-1	DC, 25 to 60 hz.	.5-2	1.5	100	210	35-60%	25-40%
SC-1	DC, 25 to 60 hz.	1-4	3	24	60	35-60%	25-40%
SC-1	DC, 25 to 60 hz.	2-8	6	6	16	35-60%	25-40%
SC-1	DC, 25 to 60 hz.	4-16	12	1.5	5	35-60%	25-40%
SC-1	DC, 25 to 60 hz.	10-40	25	.25	.65	35-60%	25-40%
SC-1	DC, 25 to 60 hz.	20-80	40	.07	.16	35-60%	25-40%
SC-1	DC, 25 to 60 hz.	40-160	40	.03	.05	35-60%	25-40%
SC-1	DC, 25 to 60 hz.	4-100*	10-15-20	1.7-0.6-0.18	5-1-0.2	35-60%	25-40%

* Coil has taps on which minimum pickups are 10 and 30 amperes.

CHARACTERISTICS OF SV AND SV-1 RELAYS

Type	Frequency (Cycles)	Range of Adjustment Volts	Max. Volts Continuous	Watts at 115 V. AC (125 V. for DC)	V.A. at 115 V.	Dropout Ratio
SV	60	7-16	16	-	-	90-98%
SV	60	70-160	160	3.4	7.3	90-98%
SV	60	140-320	320	-	-	90-98%
SV	60	280-640	640	-	-	90-98%
SV	50	70-160	180	2.8	6.1	90-98%
SV	25	70-160	200	1.5	2.5	90-98%
SV	DC	50-150	150	4.8	-	65-80%
SV	DC	100-300	300	-	-	65-80%
SV-1	60	7-16	16	-	-	40-80%
SV-1	60	70-160	160	4.1	8.5	40-80%
SV-1	60	140-320	320	-	-	40-80%
SV-1	60	280-640	640	-	-	40-80%
SV-1	50	70-160	180	3.5	7.1	40-80%
SV-1	25	70-160	200	1.4	3.2	40-80%
SV-1	DC	50-150	150	4.8	-	25-40%
SV-1	DC	100-300	300	-	-	25-40%

NOTES:--Standard current relays are calibrated on 60 cycles. This calibration is approximately correct for 25 cycle and DC applications, but there will be discrepancies of 10% to 15% at some points of scale.

Values of watts and volt-amperes in the tables are average for various plunger and shunt position.

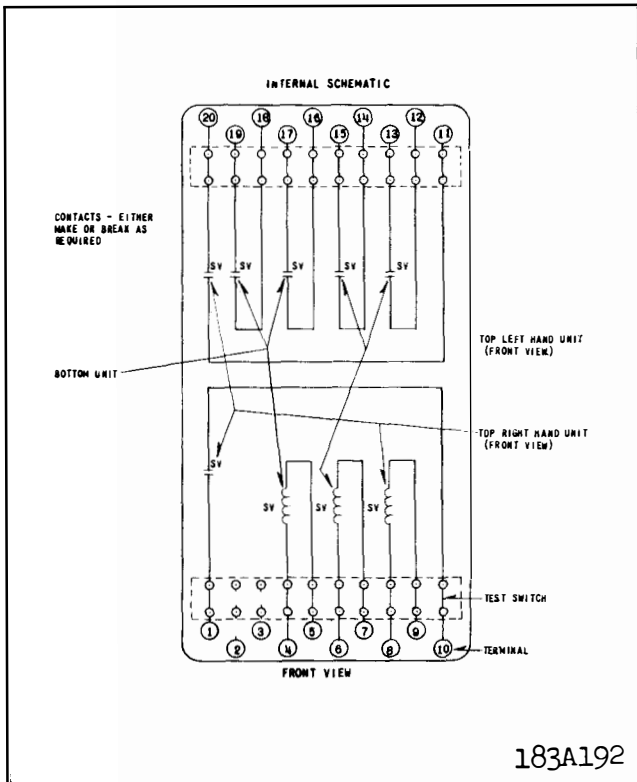
For the SC relay, volt-amperes for pickup at minimum setting are approximately 3.4 and 1.4 for 60 and 25 cycles. Watts at minimum setting are approximately 1.0, .65 and .57 for 60 cycles, 25 cycles and DC respectively. Multiply values by 16 for approximate burdens at maximum setting.

For the SC-1 relay, volt-amperes for pickup at minimum setting are approximately 3.5 and 1.3 for 60 and 25 cycles. Watts at minimum settings are 1.3, .7 and .57 for 60 cycles, 25 cycles and d-c respectively. Multiply values by 16 for approximate burdens at maximum setting.

*The V.A. burdens of the SC and SC-1 relays at 3, 10 and 20 times minimum pickup current are approximately 31, 240 and 770 V.A. respectively.

Dropout ratio varies somewhat with pickup adjustment but will be approximately constant for any given pickup setting. Limits in tables include variables such as friction and other individual relay variations.

Maximum continuous volts given for the SV and SV-1 relays for A-C are for the relay set for minimum pickup. With the relay set for maximum pickup the continuous voltage can be increased 10 to 20%.



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Fig. 7. Internal Schematic of the Three Unit Type SV or SV-1 Relay in the Type FT32 Case.

which are attached to the base terminals. These sleeves are notched at their upper ends, and the notches are toward the center of the relay. The leads are bent at approximately a right angle where they pass out through the notches, which aids in preventing them from coming into contact with the stationary contact brackets. Figure 11 shows properly coiled and assembled moving contact leads.

Although the moving contact leads are very flexible, if the leads have been pulled out of their original shape by handling they may exert sufficient side pressure on the shaft bearing or twisting force against the guidepost to cause appreciable friction and wear. If this condition continues for a long period of time, the resulting wear may affect the relay calibration or the dropout ratio noticeably. In extreme cases the wear may progress to a degree which may occasionally cause failure of the plunger to drop down when the relay is de-energized.

Correct shaping of the leads is not difficult, and they may be checked readily by removing the guide post and the nut at the top of the shaft. The plunger should be held in the raised position, either by energizing the relay or by pressing lightly against the

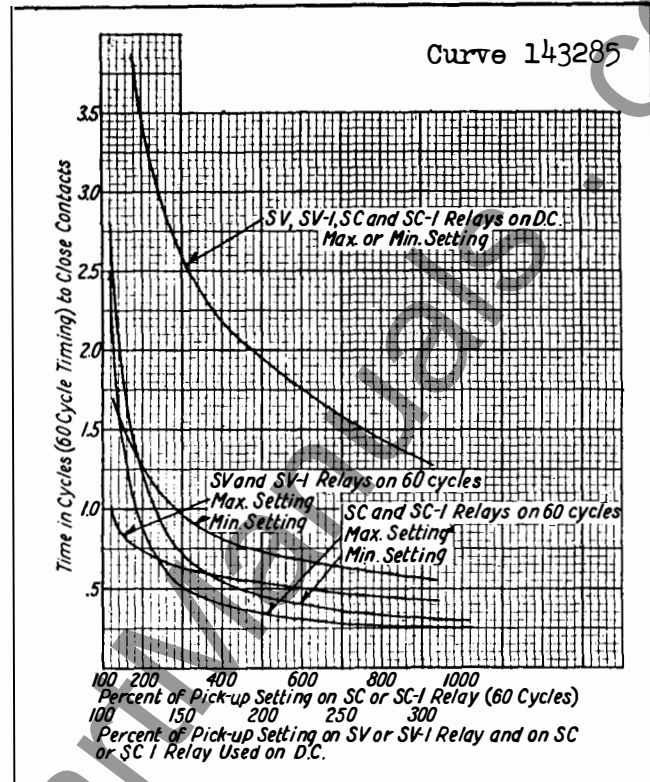


Fig. 8. Typical Time Curves for the Types SC and SV Relays (Using Flux Shunt for Pick-up Adjustment.)

collar under the insulation plate after raising the plunger manually. With the plunger raised, the insulation plate should be oscillated slightly in a horizontal plane by twisting it horizontally and releasing it. If in several trials the plate comes to rest with the center line of the contacts approximately parallel to the base and with its mounting hole fairly well centered with the end of the shaft, if the plate does not tip appreciably, and if the leads have a safe clearance to the stationary contact brackets, the leads are properly shaped.

If this check shows that re-shaping is necessary, it may be possible to obtain sufficient correction by bending the leads sharply where they emerge from the insulation sleeves. One or two pairs of tweezers are tools for re-shaping the leads. If it is necessary to re-coil the leads, they should be wound around a rod having a diameter of approximately 5/32". The coils then should be stretched out just enough to avoid side pull or twisting force on the plunger assembly.

In all relays except the SV-1 relay for A-C, if the stationary contacts are assembled so that they close when the relay is energized, they should be located so that they barely touch the moving contacts when

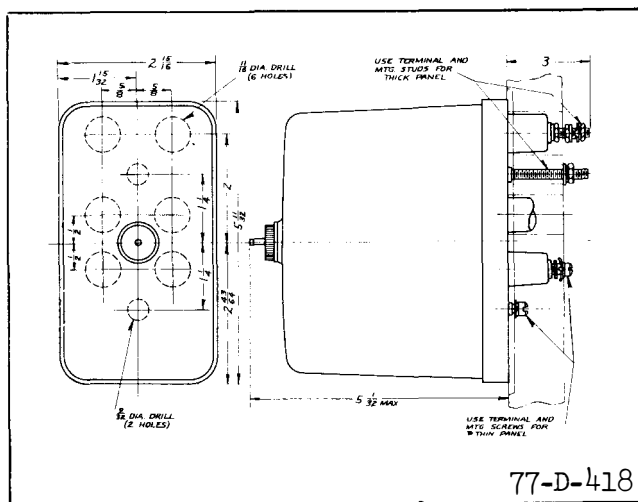


Fig. 9. Outline & Drilling Plan for Single Unit Relays in Small Glass Projection Case.

the latter are $5/32''$ above the de-energized position. The moving contacts can be held in this position while the adjustment is being made by inserting a $5/32''$ spacer between the shaft collar and the top of the core. This dimension should be $3/16''$ on the SV-1 relay for A-C. Both contacts should touch at the same time when the plunger is raised. When the plunger is moved upward against its stop, there should be a slight deflection of the stationary contact stop springs, but this should not exceed $1/32''$. When the stationary contacts are reversed so that they are closed when the relay is de-energized, they should be located so that they just touch the moving contacts when the latter are $1/32''$ above the de-energized position. On some relays it may be found that when the contacts are used in this position the relay may operate at values a few percent below the scale markings. The adjustments specified for the stationary contacts are important. Failure to observe them may cause improper relay operation, either directly or after a period of service. Contact position should not be used as a

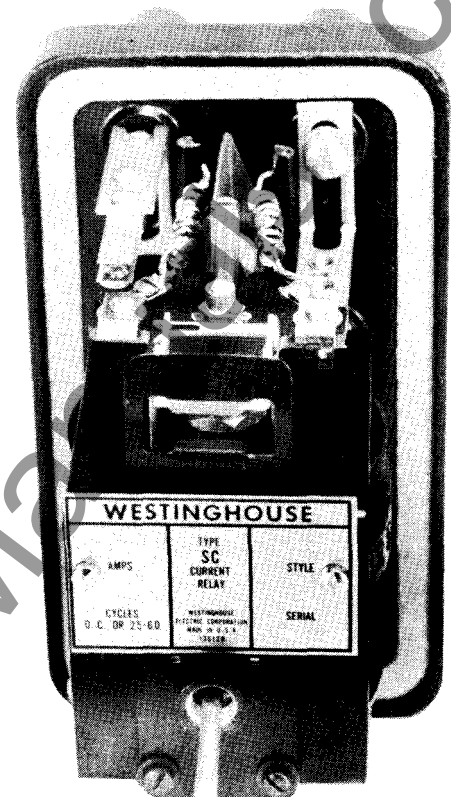


Fig. 10. View of Type SC Relay Showing Correct Shaping of Moving Contact Leads.

means of altering the ratio of dropout to pickup.

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.

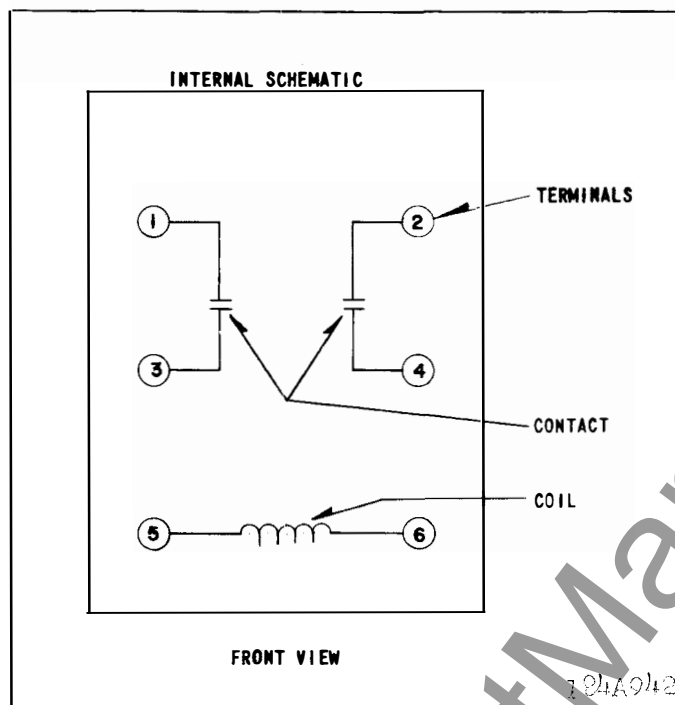


Fig. 11. Internal Schematic for Relays in Front Connected Case.

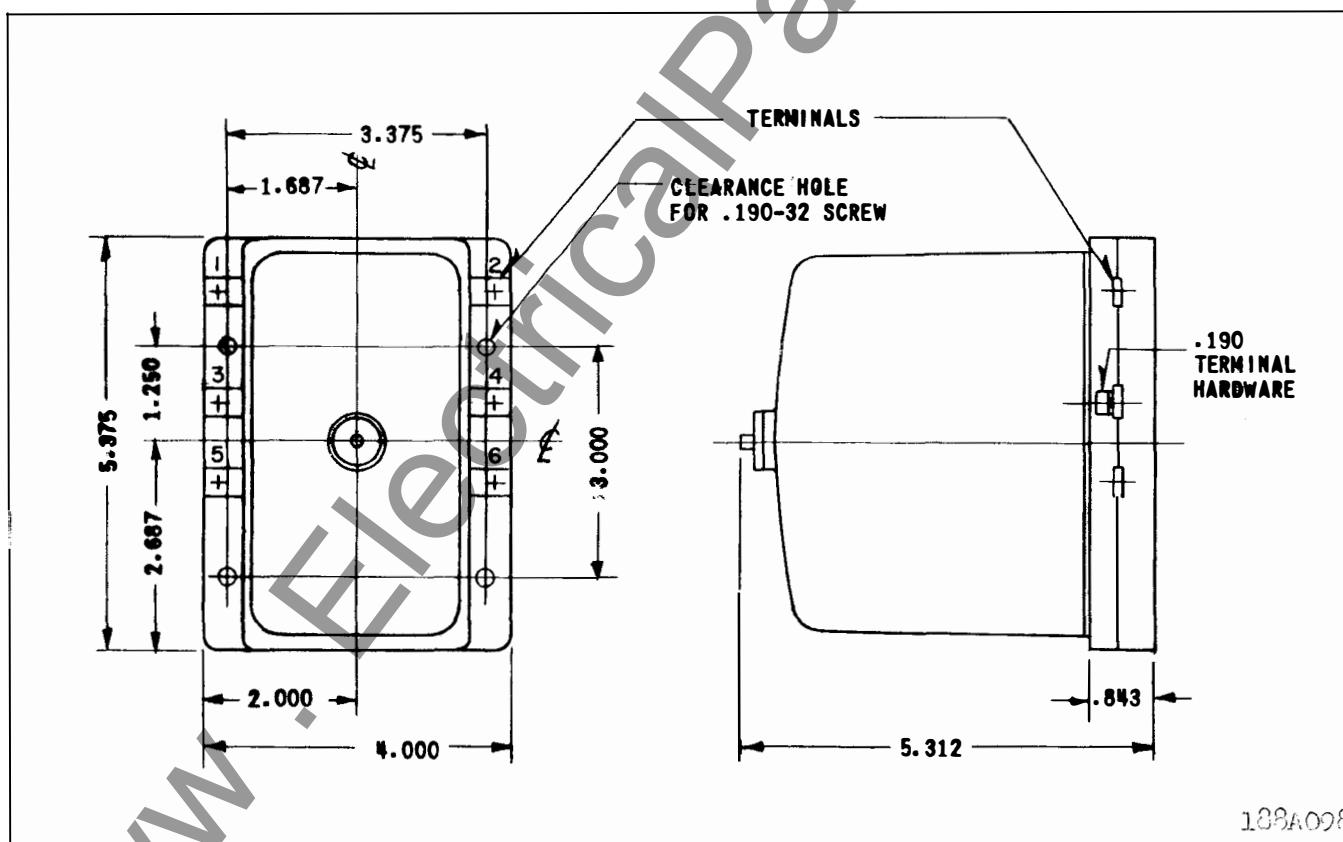
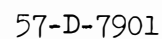
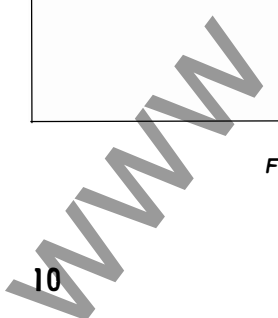


Fig. 12. Outline and Drilling Plan for Relays in Front Connected Case.



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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.)

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1F

*Denotes change from superseded issue.

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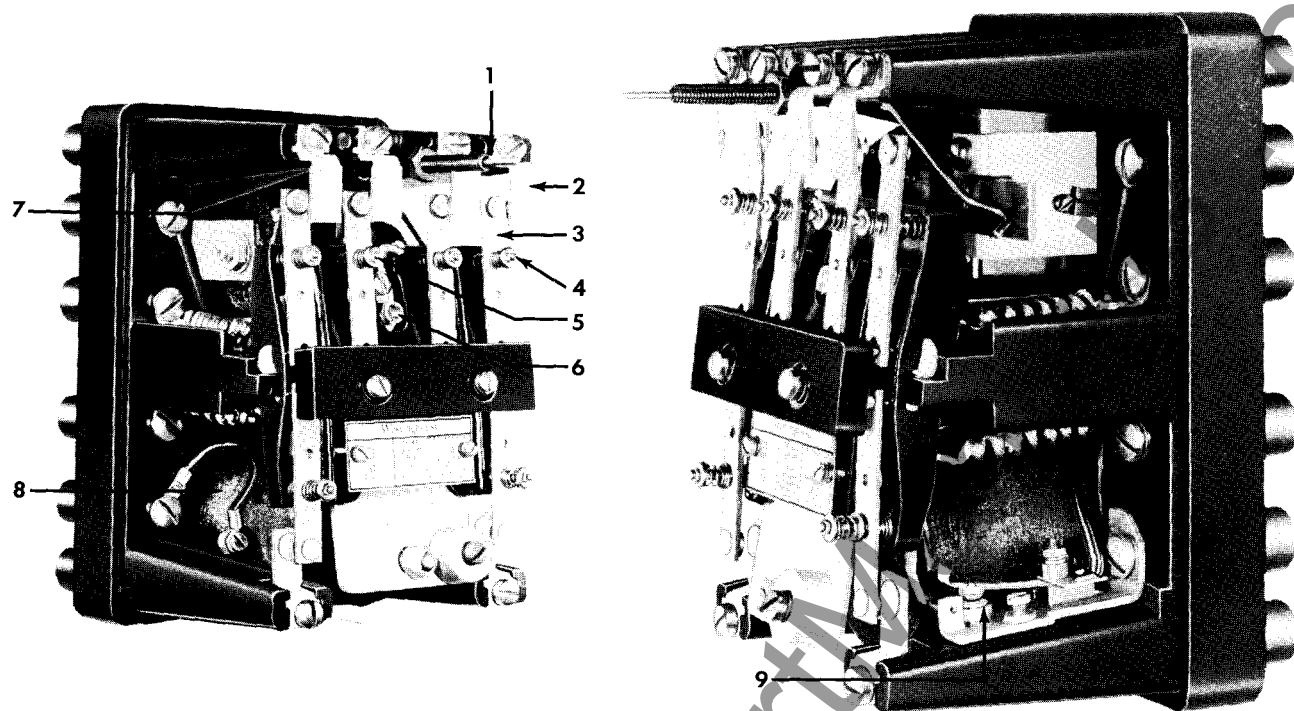


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

* The stationary contacts consists of large silver buttons which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

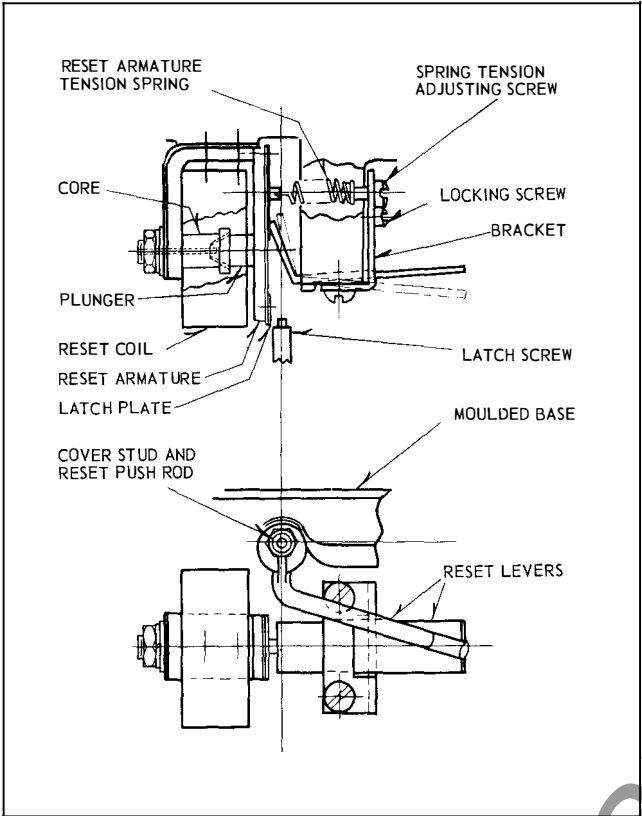


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

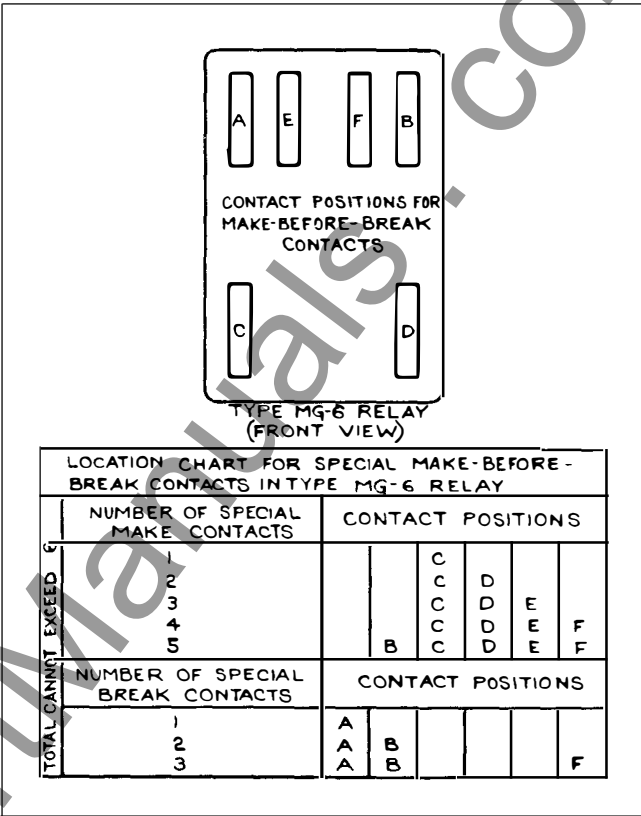


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

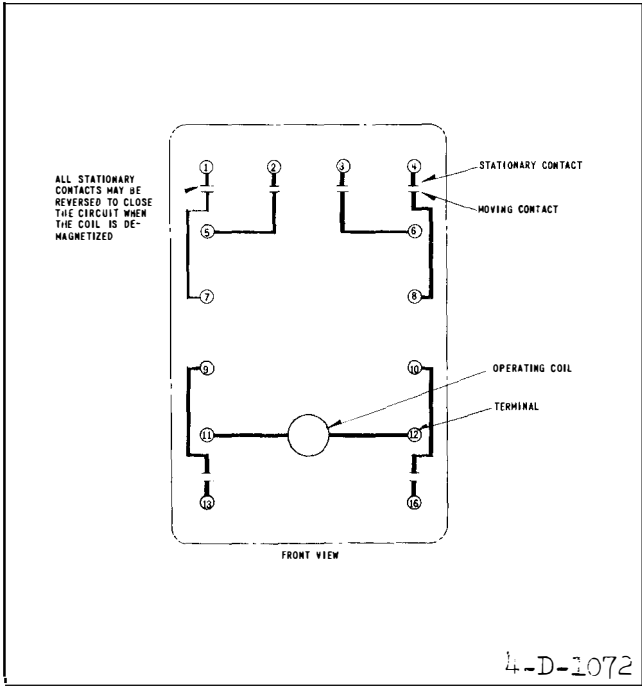


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

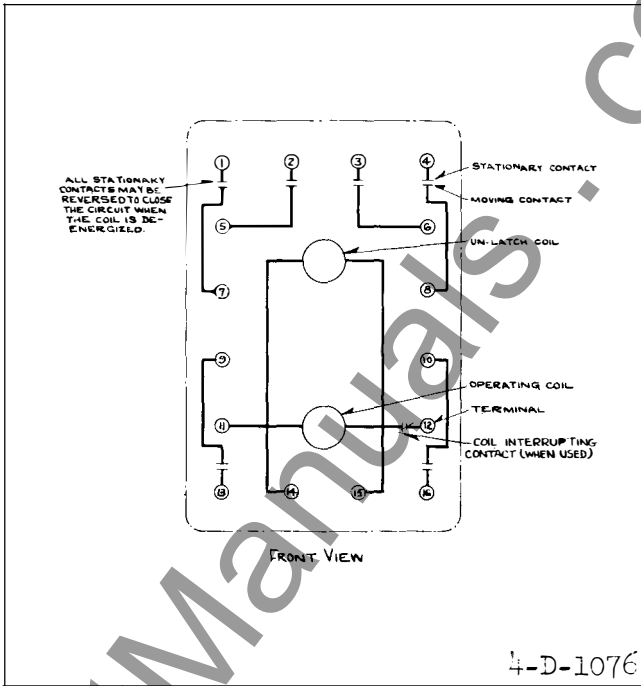


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

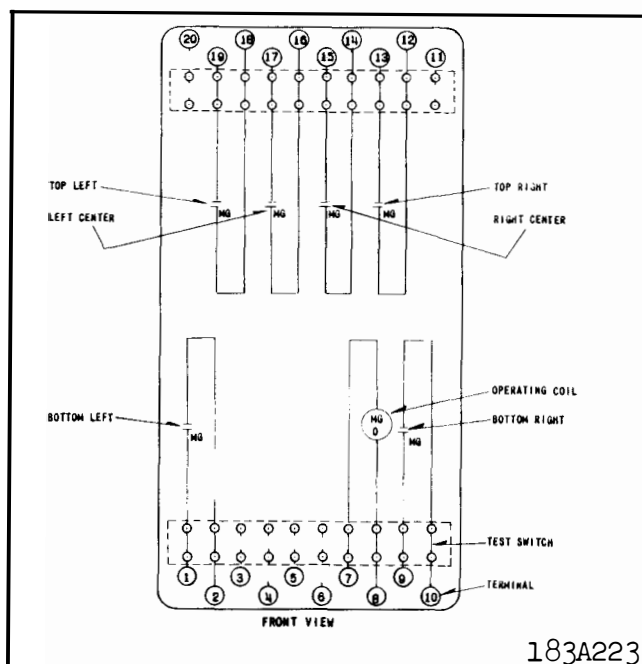


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

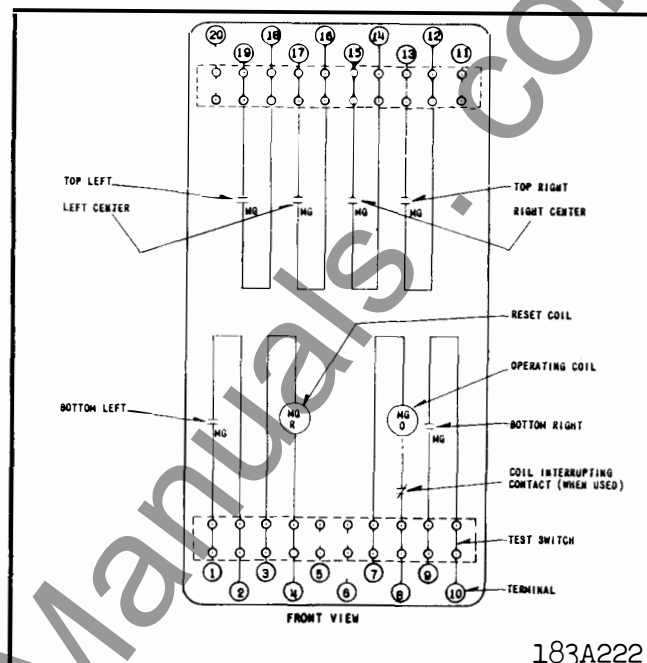
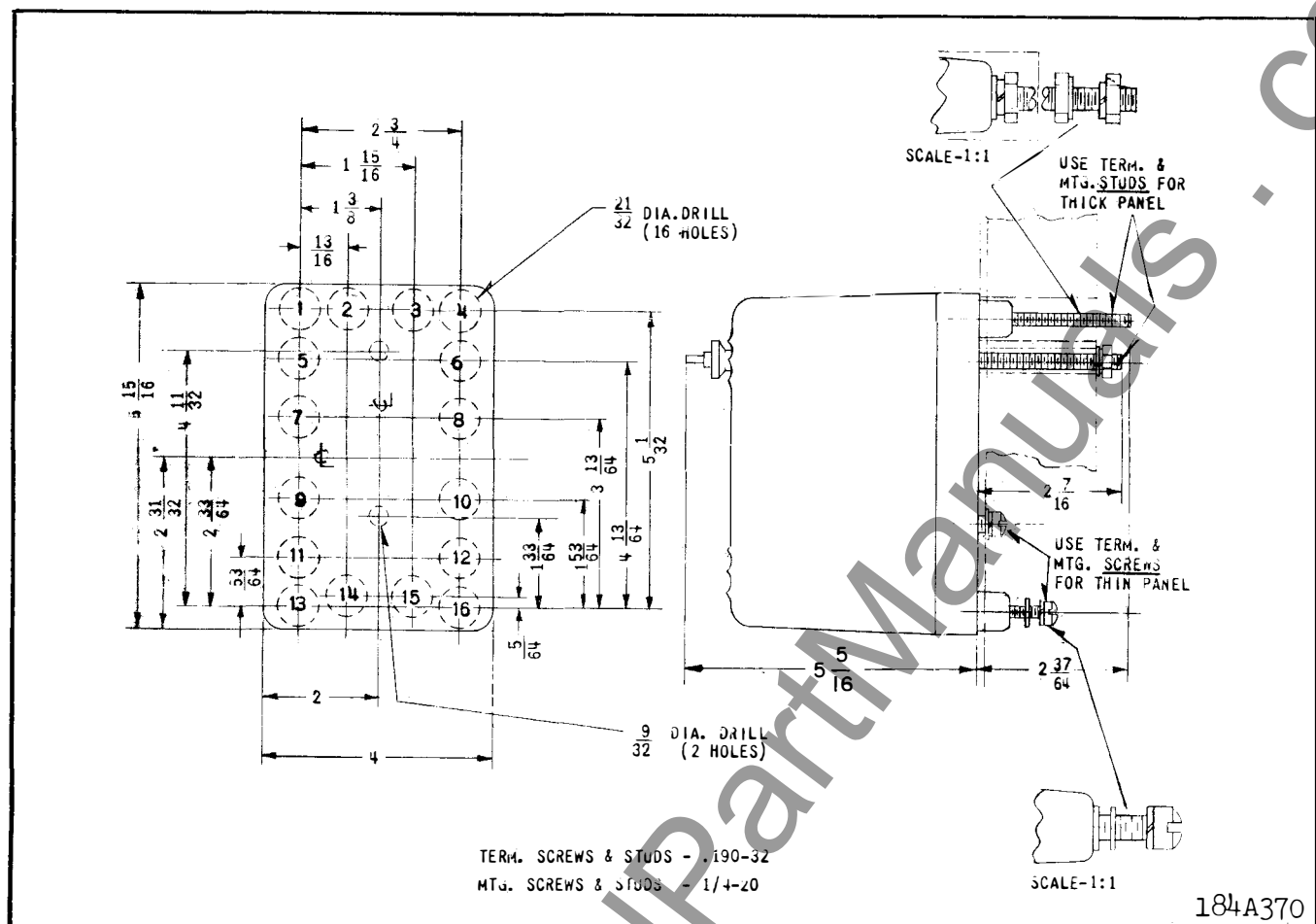


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

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

Coil Resistance (at 25°C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208



* Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

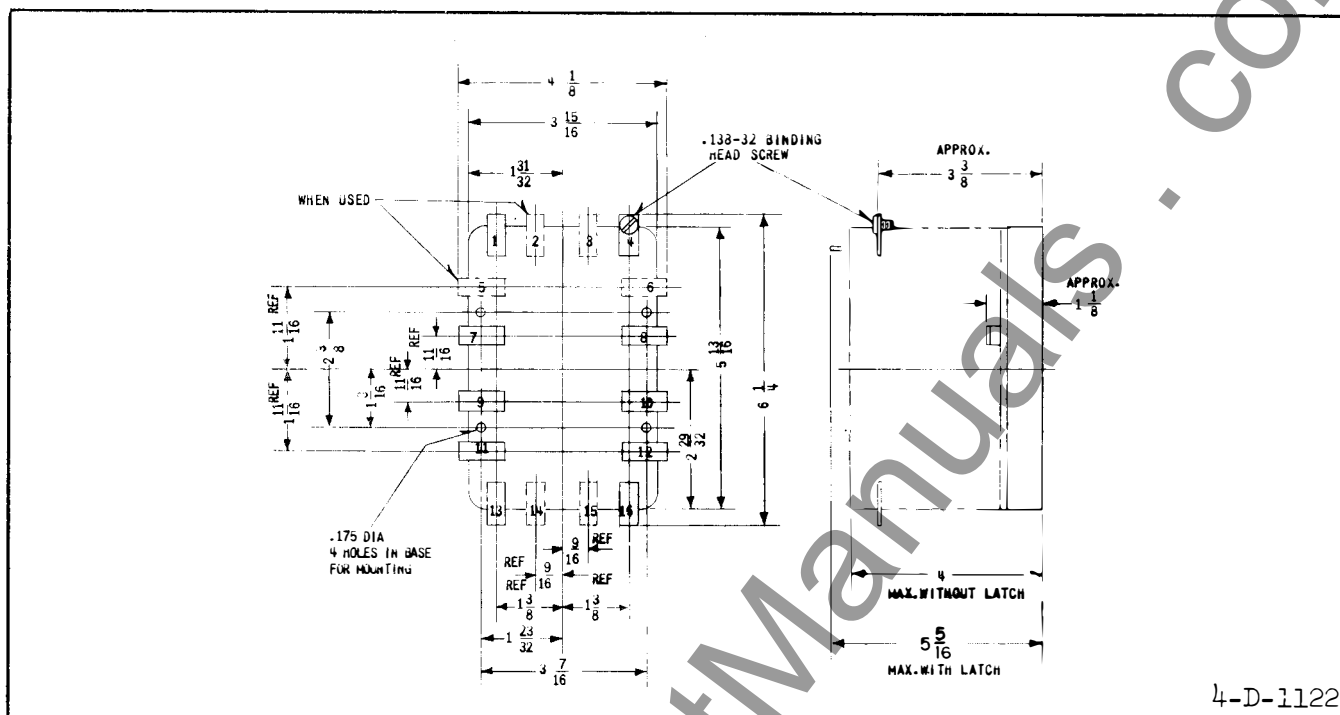
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



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* Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

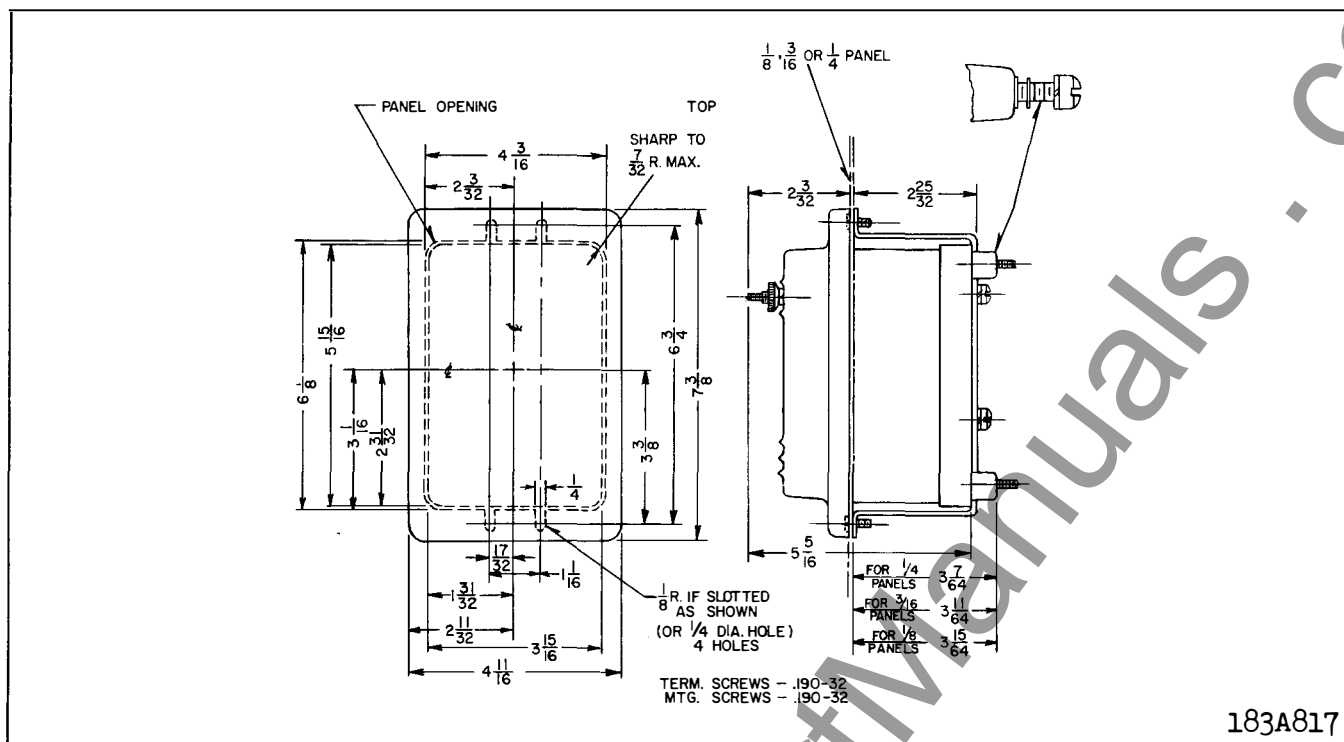
- * when the armature is in contact with it, the lower edge of the armature is $7/16''$ above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32''$ for the make contacts and $1/16''$ for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8''$ for the make contacts and $3/32''$ for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16''$ follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about $1-1/2$ turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16''$. With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments



183A817

* Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about $\frac{1}{8}$ " of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about $\frac{1}{64}$ ". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

- * A small amount of silicone oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be re-applied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

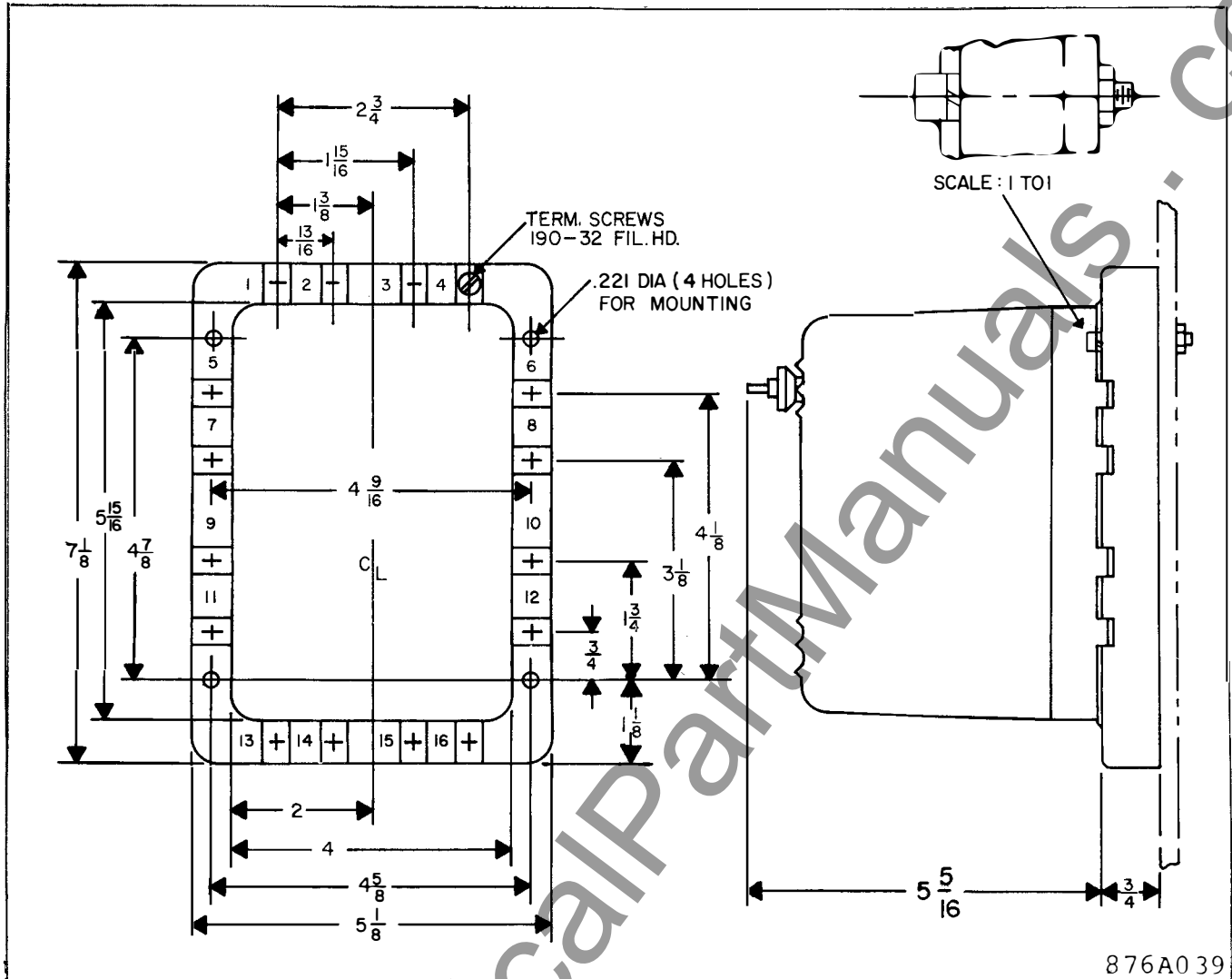
Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

Δ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	



* Fig. 11. Relay Type MG-6 Front Connected with Cover Outline and Drilling Plan

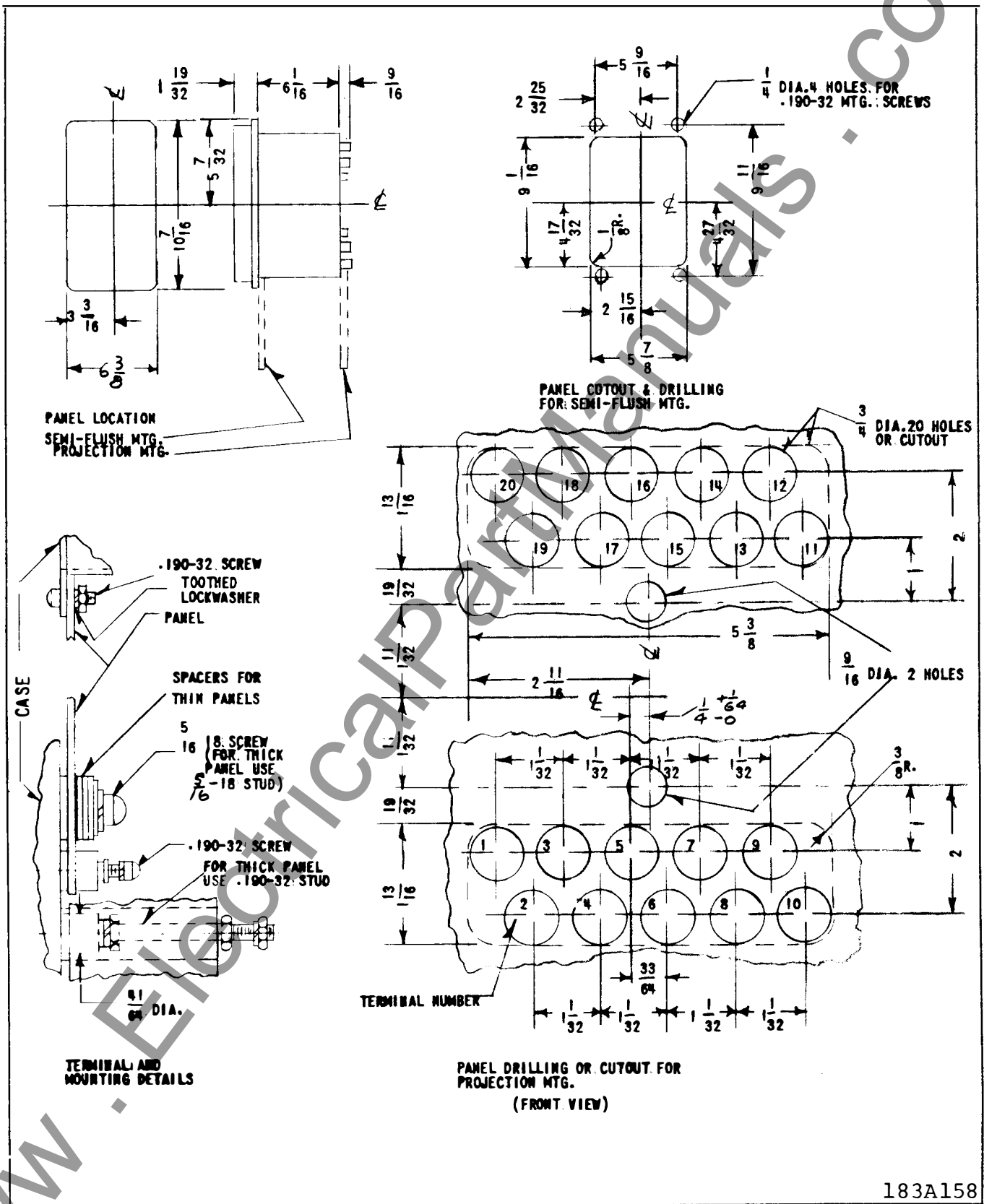


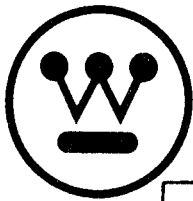
Fig. 12. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.



WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION

NEWARK, N. J.

Printed in U.S.A.



INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring * tension may be required on the dc MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on ac. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on dc, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

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

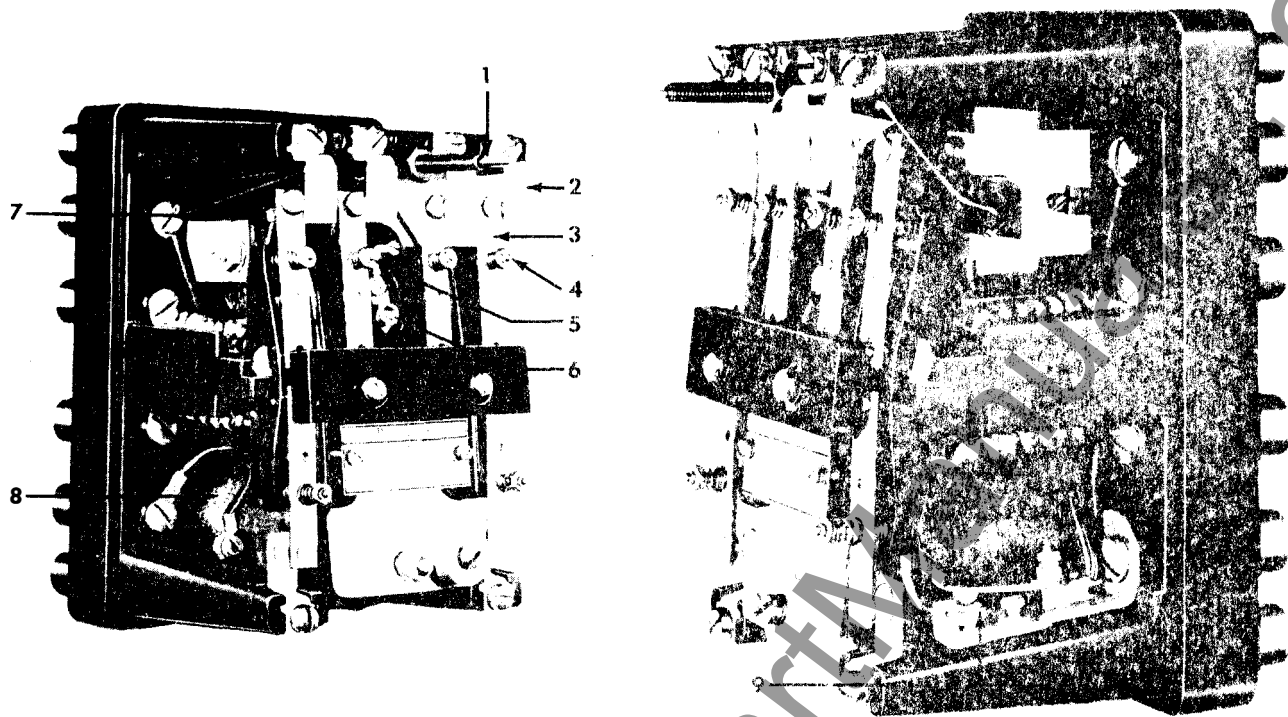


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 - Reset push rod, 2 - stationary contact, 3 - moving contact, 4 - moving contact spring assembly, 5 - latch adjustment screw, 6 - adjusting screw for armature spring tension, 7 - reset coil, 8 - operating coil, 9 - optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

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tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seal by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

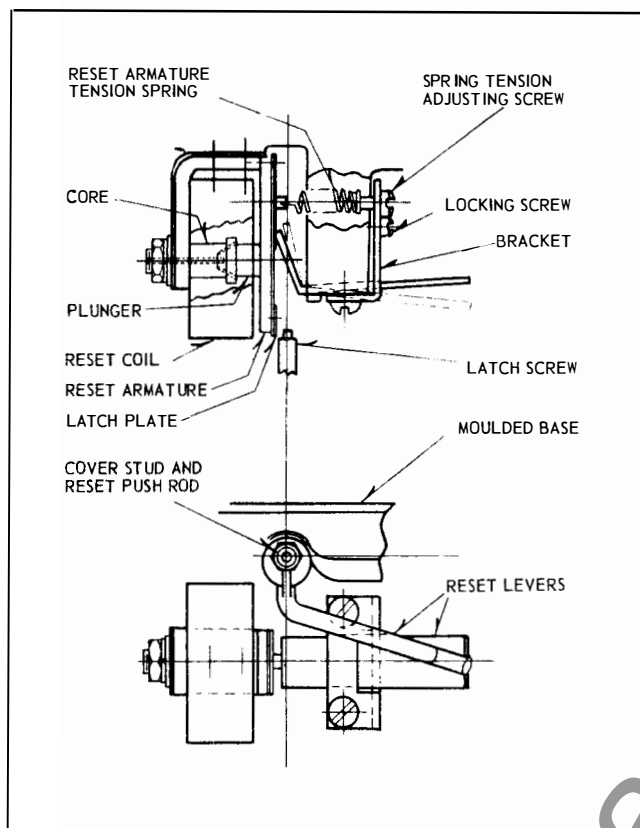


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

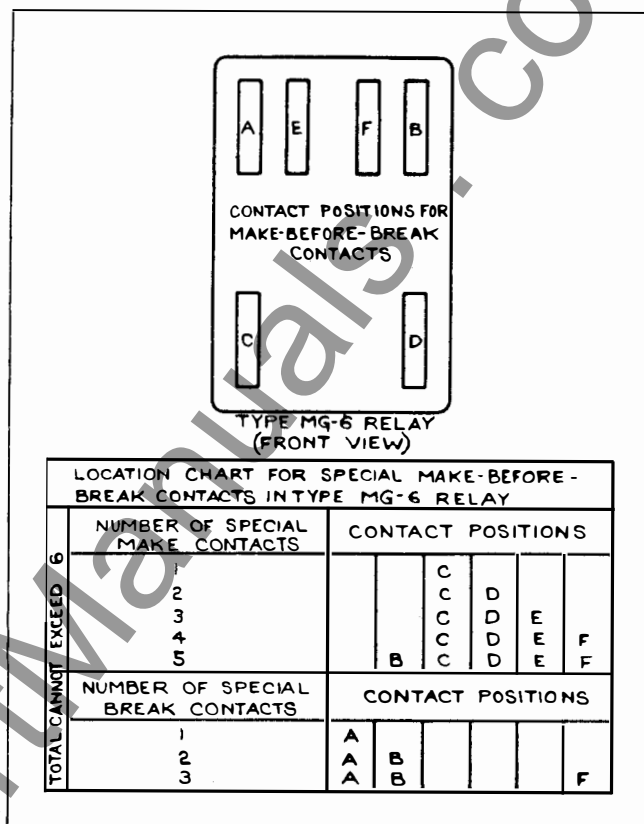


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

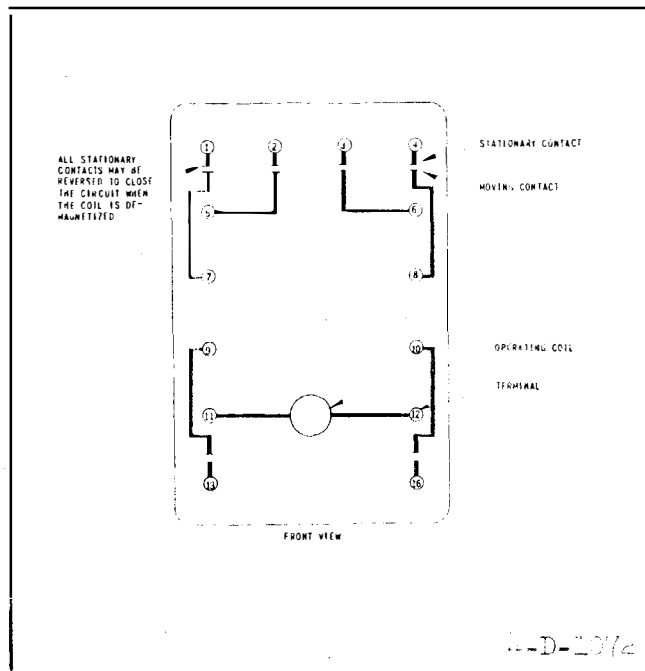


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

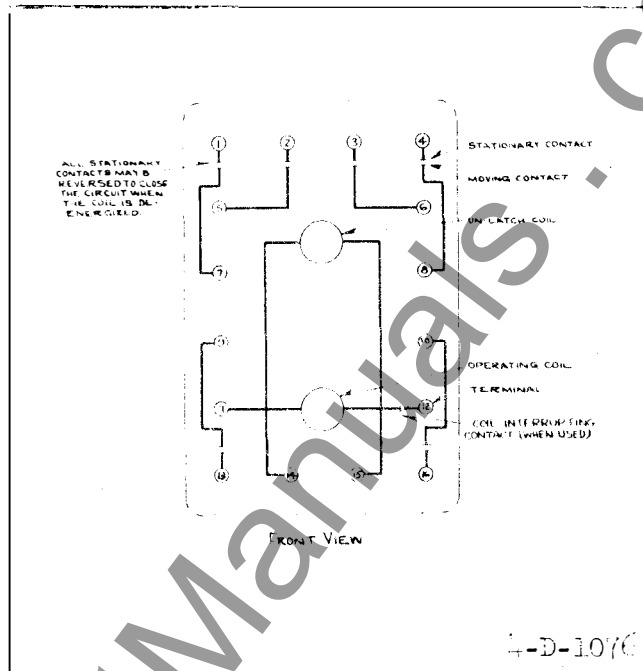


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

- * The type MG-6 relay has an operating time of approximately 2 cycles on ac and 5 cycles on dc (on a 60 hertz basis) when energized at the rated voltage.
- * **50 Hz relay.** The operate and reset coils for 50 Hz MG-6 relay are different than the 60 Hz coils.

- If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on ac, and the coil will stand this voltage safely for over two minutes if 60 hertz or 4 minutes if 25 hertz. (2) The time of the d-c relay can be reduced to slightly

- over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a dc relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated dc voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	* Volts ac
30	115
20	230
15	460
10	575

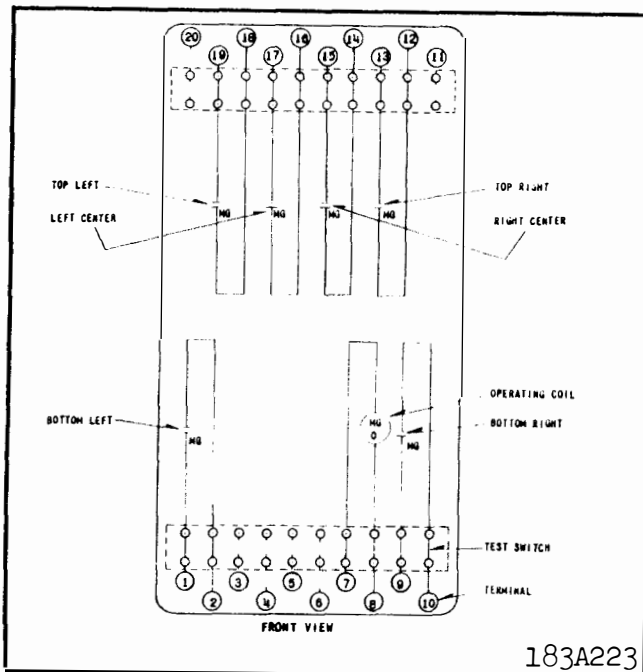


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

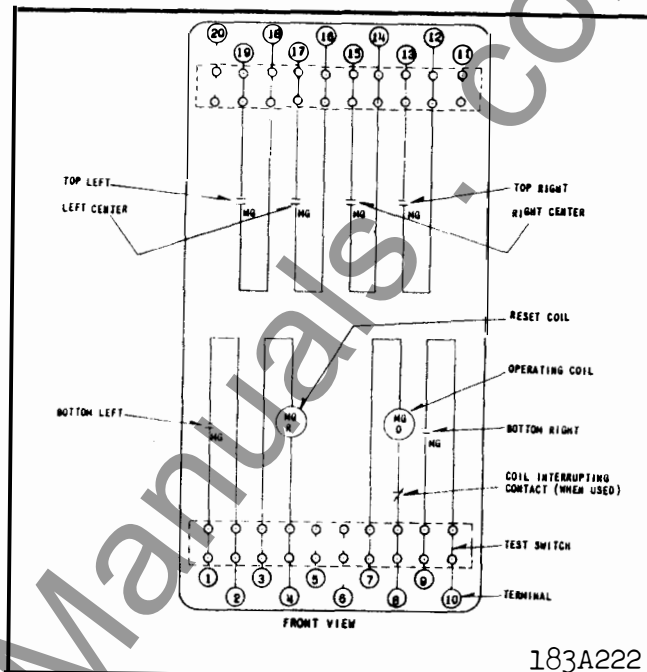


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	* Volts dc
30	12
15	24
10	32
8	48
3	125
1	250

* The type MG-6 relay for ac can be used with any combination of contacts, but the dc relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

Coil Resistance (at 25°C) (± 10%)

* Rating	Operating Coil		Reset Coil
	dc Ohms	Closed Gap Impedance	dc Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 Hertz	19	354	91
208 volts, 60 Hertz	67	1160	322
230 volts, 60 Hertz	75	1410	364
460 volts, 60 Hertz	305	5680	1445
575 volts, 60 Hertz	495	8860	2208
115 volts, 50 Hertz	26	....	138
230 volts, 50 Hertz	105	....	550
460 volts, 50 Hertz	465	....	2200
575 volts, 50 Hertz	660	....	3550

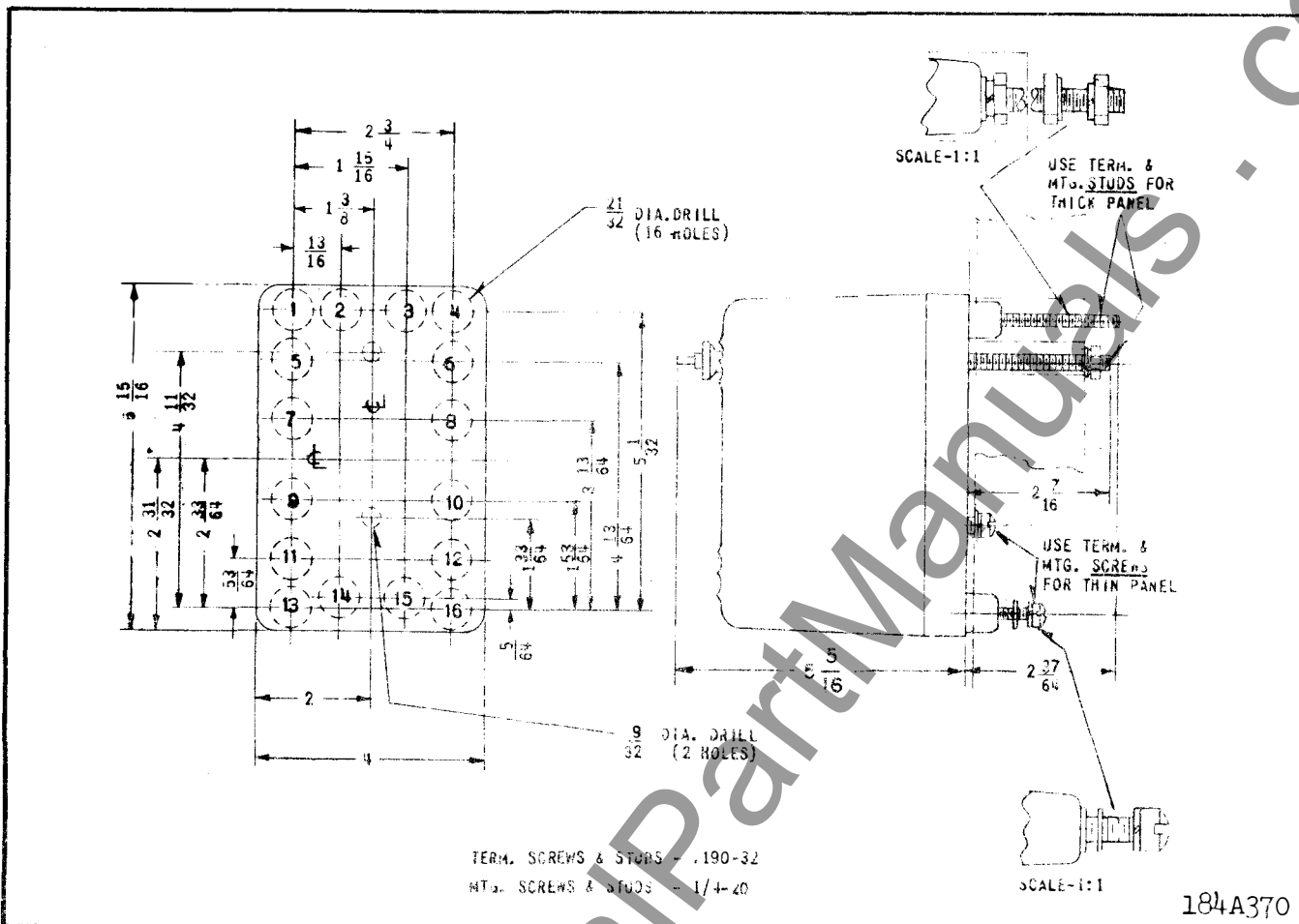


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

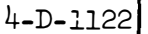
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follow approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



when the armature is in contact with it, the lower edge of the armature is $7/16''$ above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately 1/16" follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about 1/16". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

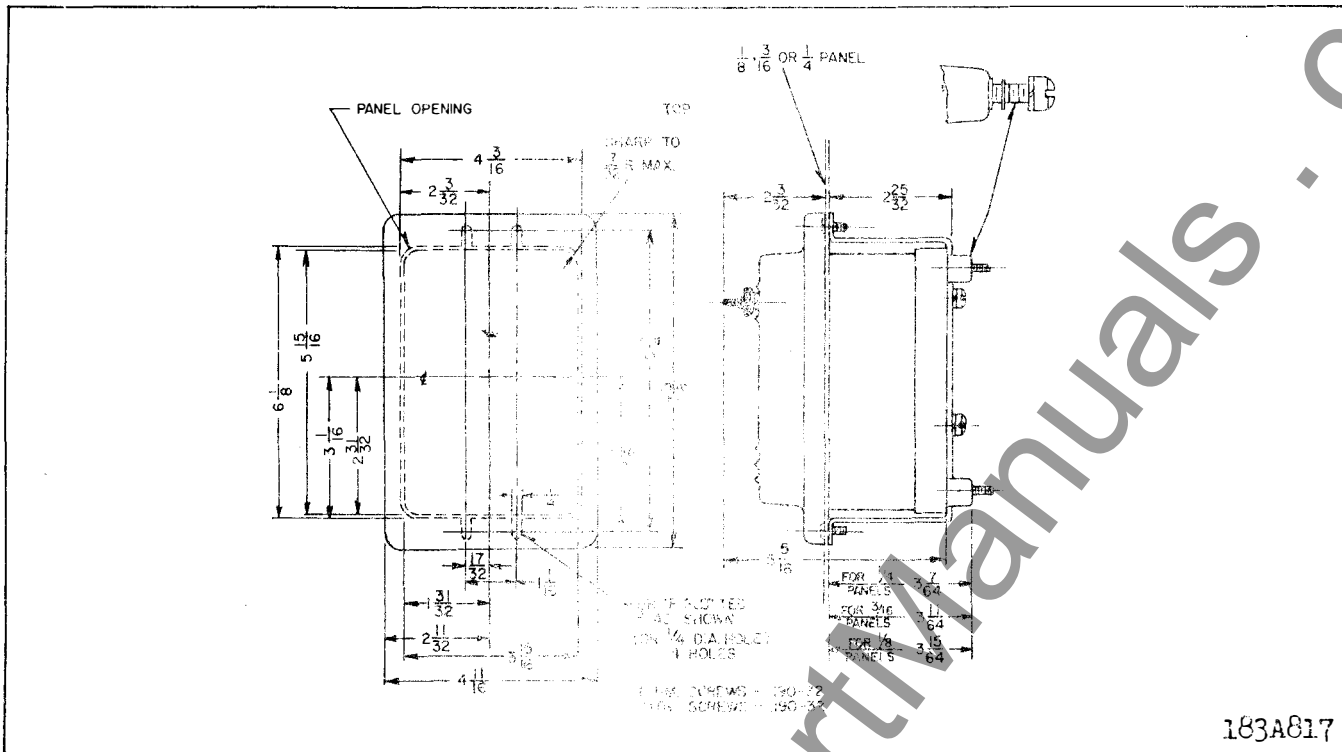


Fig. 10. Outline and Drilling Plan for the Deflagration-Resistant Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts and directly across the line. Of course, if the coil will be shorted only momentarily or if a higher wattage dissipation is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid the torsion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A small amount of silicone oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be re-applied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

* ENERGY REQUIREMENTS

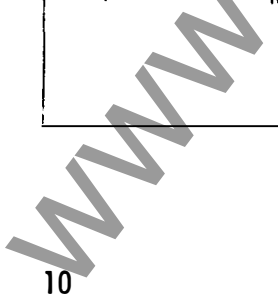
Operating Coil Burdens at rated Voltage

Frequency (Hertz)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	12	37	17.6	92
dc	7.8 cold--		7.8 cold--	
dc	6.5 hot--		6.5 hot--	

△ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (Hertz)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
dc	66 cold--		68 cold--	



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RELAY-INSTRUMENT DIVISION

CORAL SPRINGS, FL.

Printed in U.S.A.



INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION: Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the dc MG-6 relay — see "ADJUSTMENTS AND MAINTENANCE") it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.)

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on ac. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on dc, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a

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

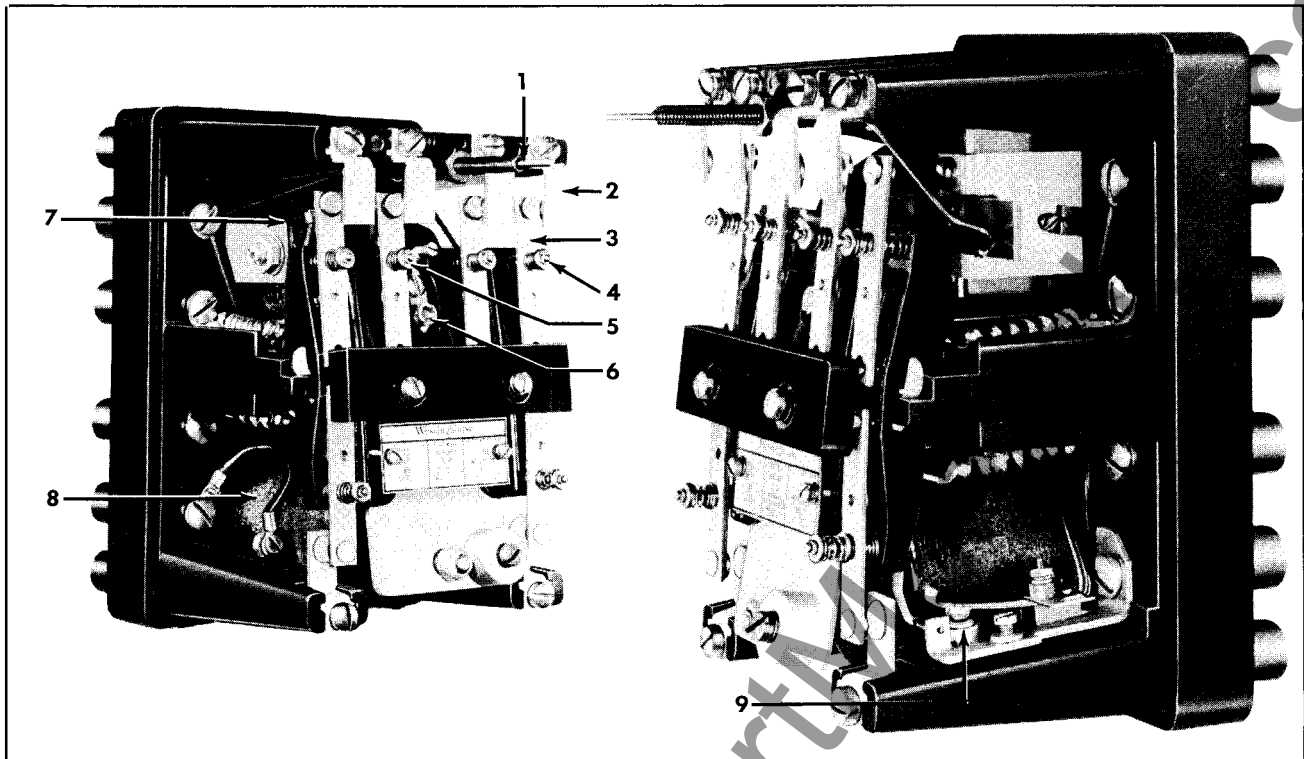


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric and Hand Reset Relay in Molded Case.
 1 – Reset Push Rod, 2 – Stationary Contact, 3 – Moving Contact, 4 – Moving Contact Spring Assembly,
 5 – Latch Adjustment Screw, 6 – Adjusting Screw for Armature Spring Tension, 7 – Reset Coil,
 8 – Operating Coil, 9 – Optional Operating Coil Cut-off Contact

third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consists of large silver buttons which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position.

The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch

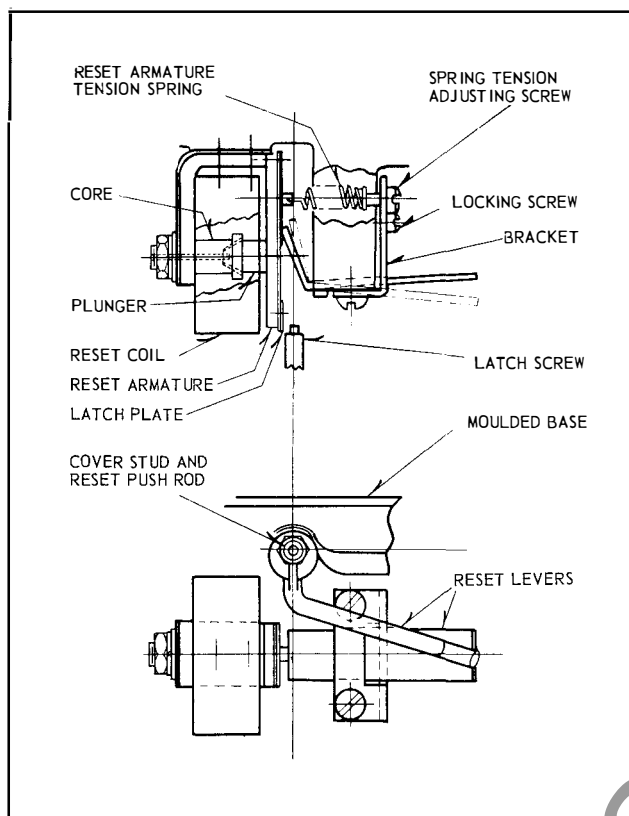


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay

plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring

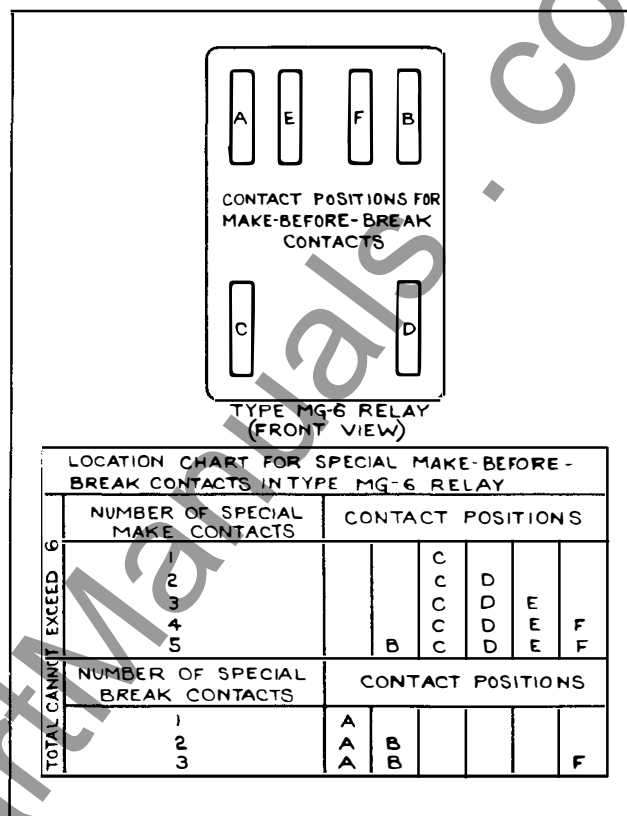


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts

on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break con-

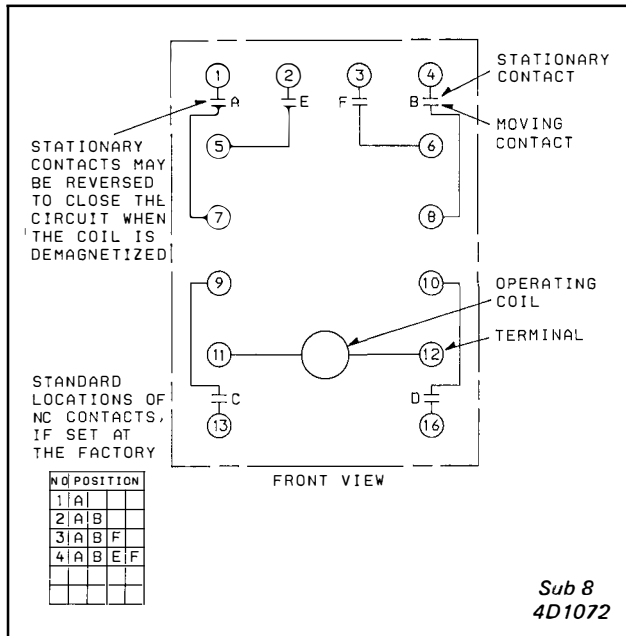


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case

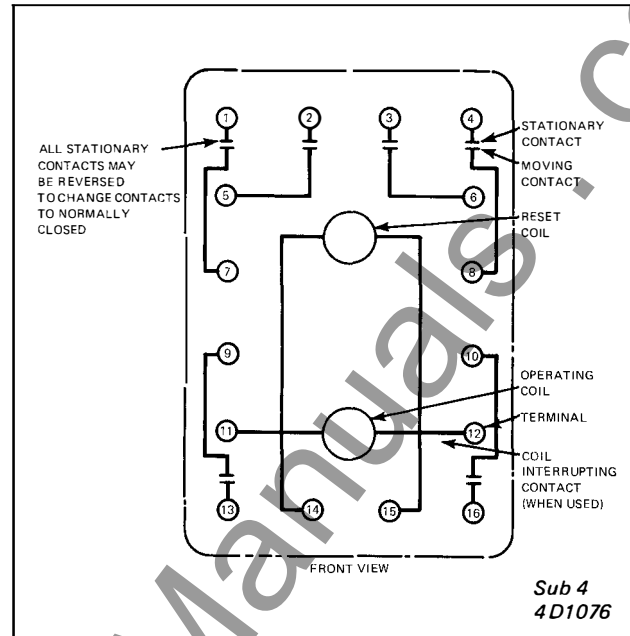


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case

tacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the internal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on ac and 5 cycles on dc (on a 60 hertz basis) when energized at the rated voltage.

50 Hz relay. The operate and reset coils for 50 Hz MG-6 relay are different than the 60 Hz coils.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on ac, and

the coil will stand this voltage safely for over two minutes if 60 hertz or 4 minutes if 25 hertz. (2) The time of the d-c relay can be reduced to slightly over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a dc relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated dc voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts ac
30	115
20	230
15	460
10	575

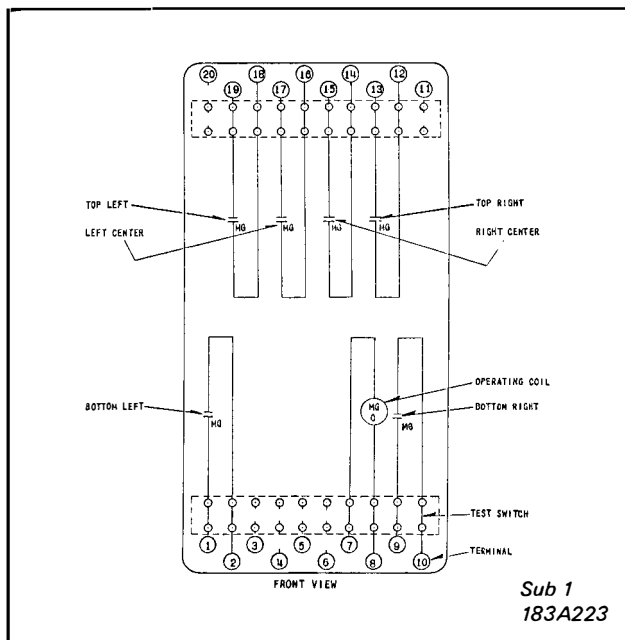


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case

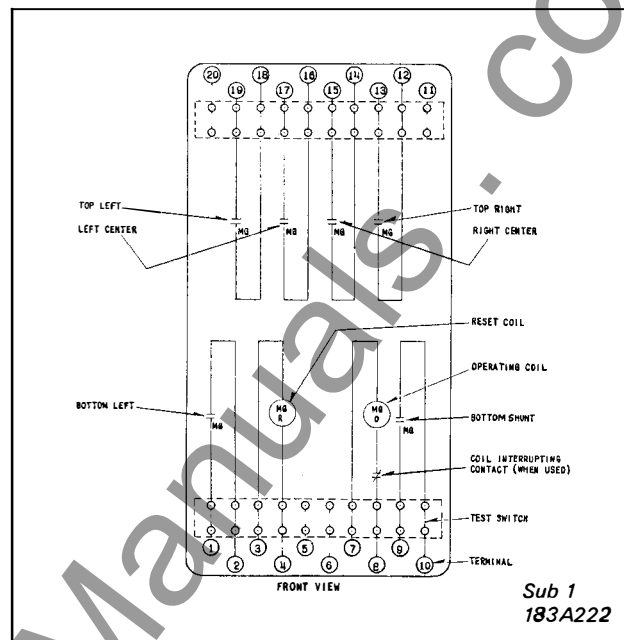


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case

Current	Volts dc
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for ac can be used with any combination of contacts, but the dc relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

Coil Resistance (at 25° C) (± 10%)

Rating	Operating Coil		Reset Coil
	dc Ohms	Closed Gap Impedance	dc Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 Hertz	19	354	91
208 volts, 60 Hertz	67	1160	322
230 volts, 60 Hertz	75	1410	364
460 volts, 60 Hertz	305	5680	1445
575 volts, 60 Hertz	495	8860	2208
115 volts, 50 Hertz	26	....	138
230 volts, 50 Hertz	105	....	550
460 volts, 50 Hertz	465	....	2200
575 volts, 50 Hertz	660	....	3550

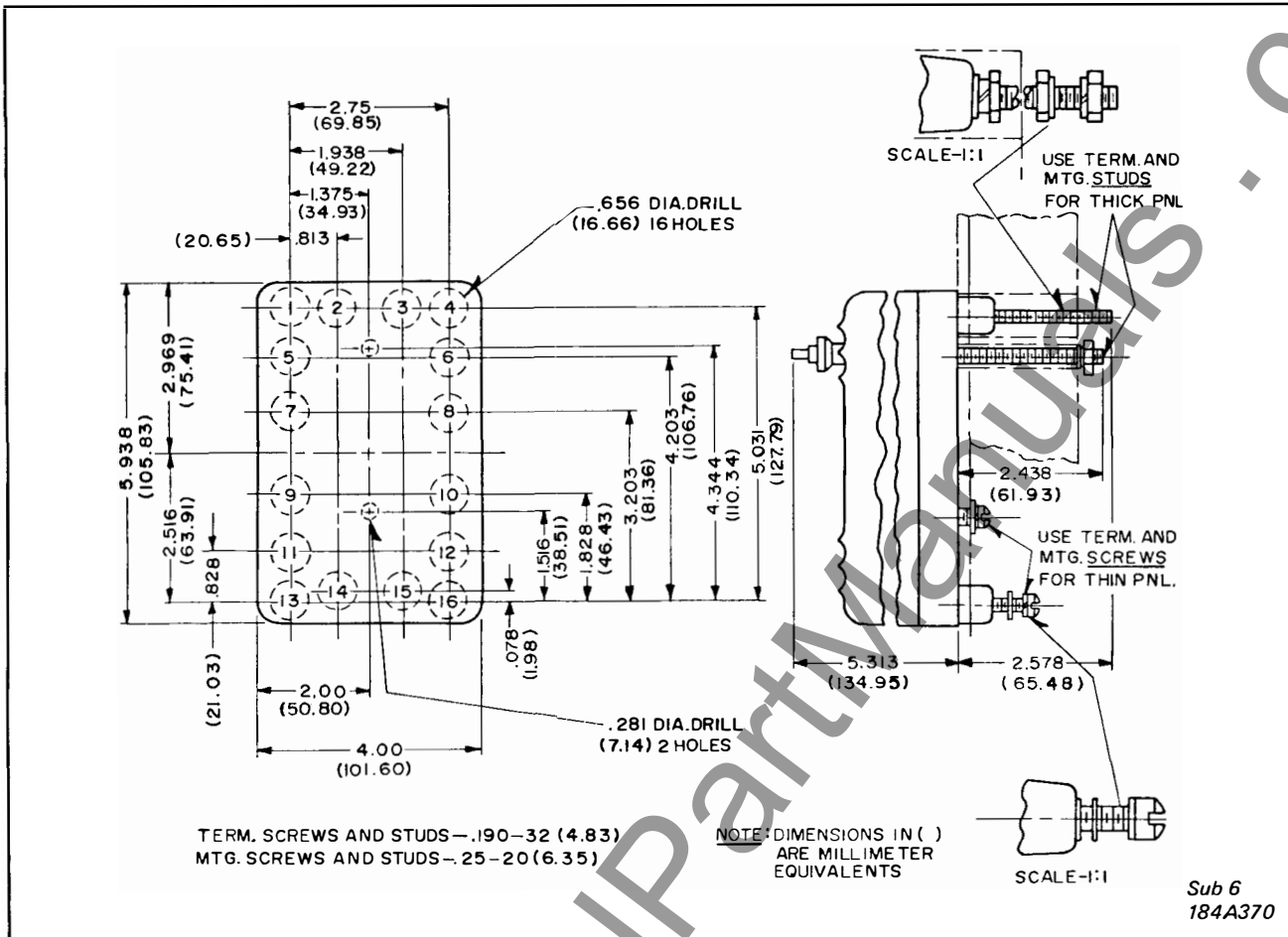


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow

and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follow approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

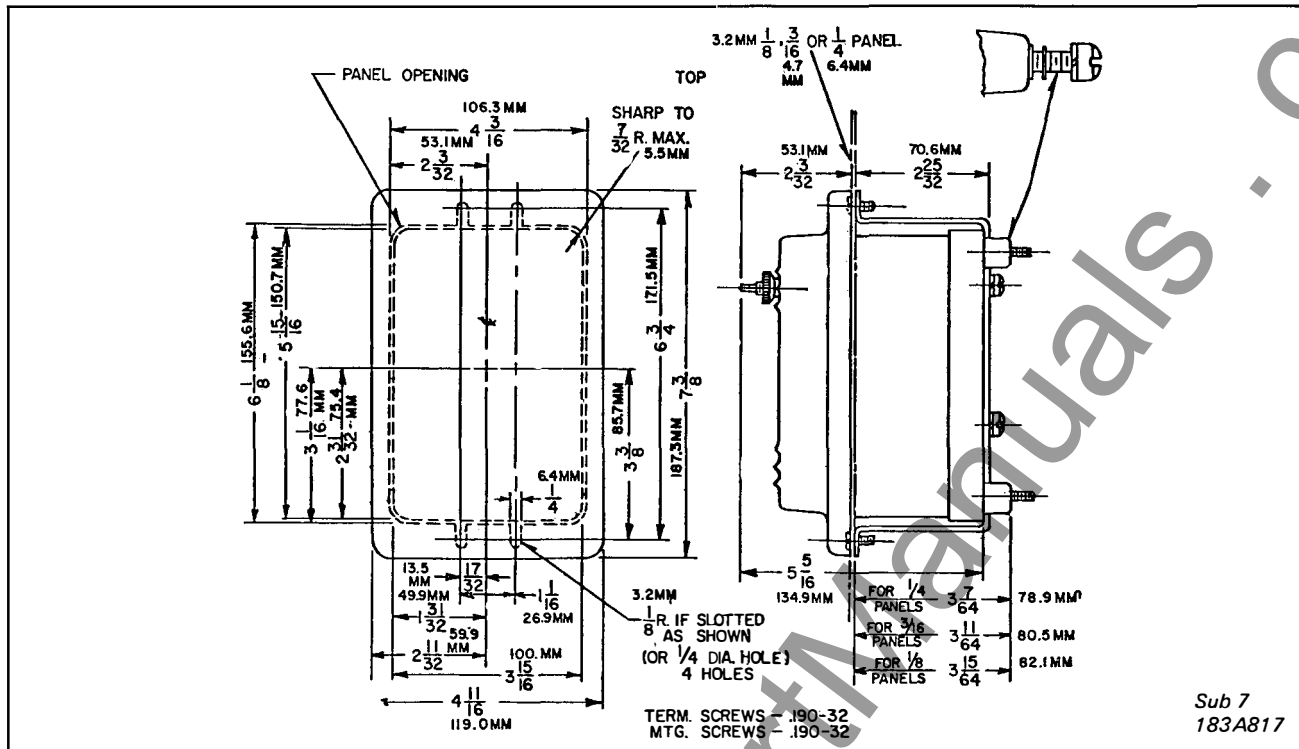


★ Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic For Terminals Supplied. For Reference Only.

The follow of the moving contact fingers should be $3/32"$ for the make contacts and $1/16"$ for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8"$ for the make contacts and $3/32"$ for the break contacts. In case moving contact fingers have been removed from

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately 1/16" follow before parting from its stationary contact.

-



• Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

less than line voltage, as in the case of d-c applications. For the contact and spring adjustments specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A small amount of silicone oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be re-applied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (Hertz)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	12	37	17.6	92
dc	7.8 cold--		7.8 cold--	
dc	6.5 hot--		6.5 hot--	

Δ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (Hertz)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
dc	66 cold--		68 cold--	

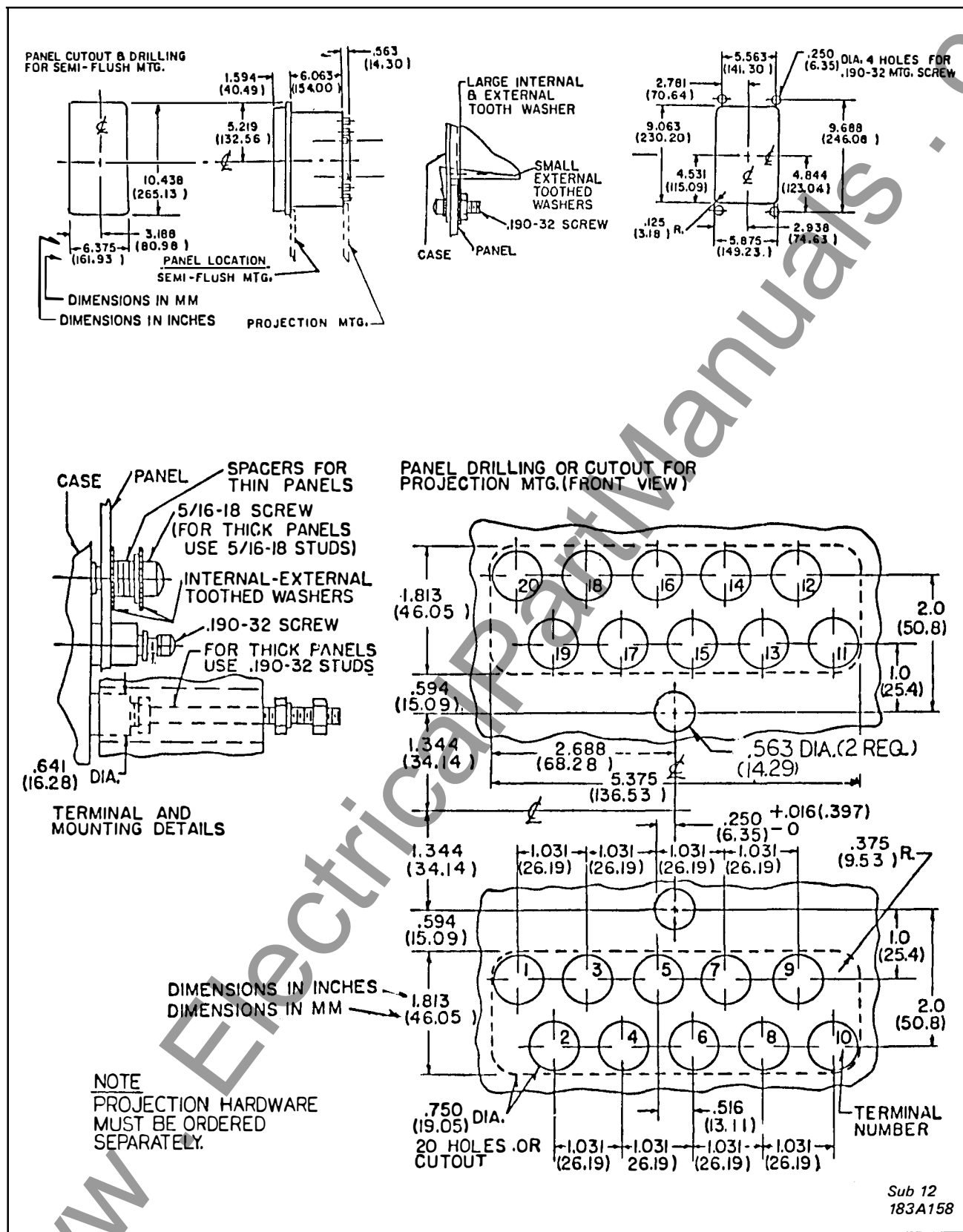


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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RELAY AND TELECOMMUNICATIONS DIVISION

CORAL SPRINGS, FL 33065

Printed in U.S.A.



INSTALLATION • OPERATION • MAINTENANCE INSTRUCTIONS

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although readjustment may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of

the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature by two screws. Silver contact buttons are welded on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is

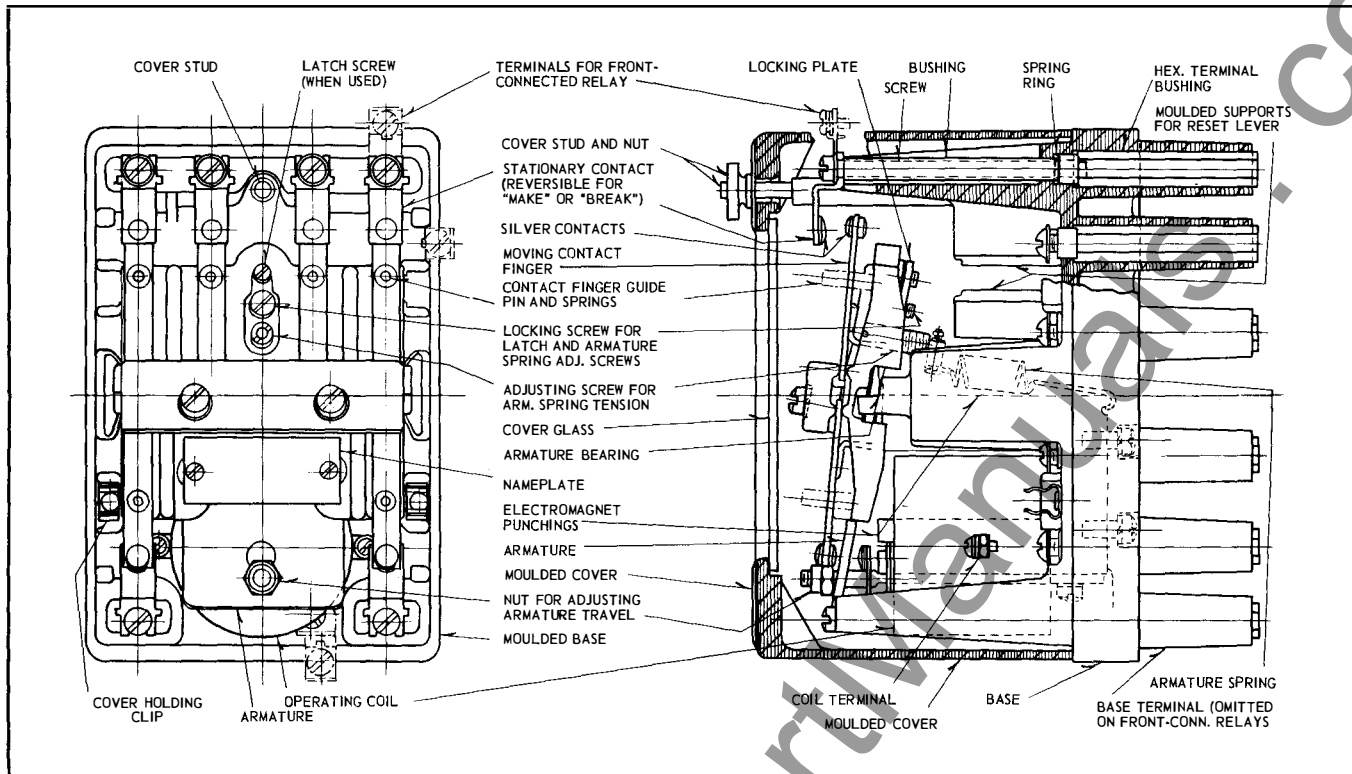


Fig. 1. Front View (Cover Omitted) and Side View of the Type MG-6 Self Reset Relay in Molded Case.

less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the

hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the stationary contact stud of the auxiliary contact, and the end of the moving contact spring is in contact with

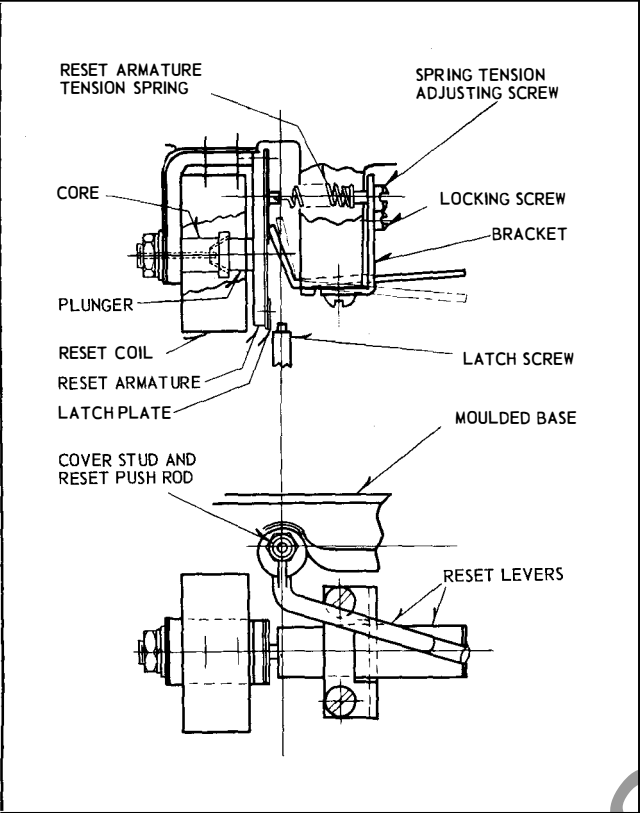


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the moulded insulation block strikes the end of the auxiliary contact spring and causes the contacts to part with a gap which is appreciably greater than the travel of the armature block at the point where it strikes the spring. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current at any rated coil voltage, but it is not intended for use in applications where several times rated voltage is applied to the operating coil in order to reduce the operating time.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection

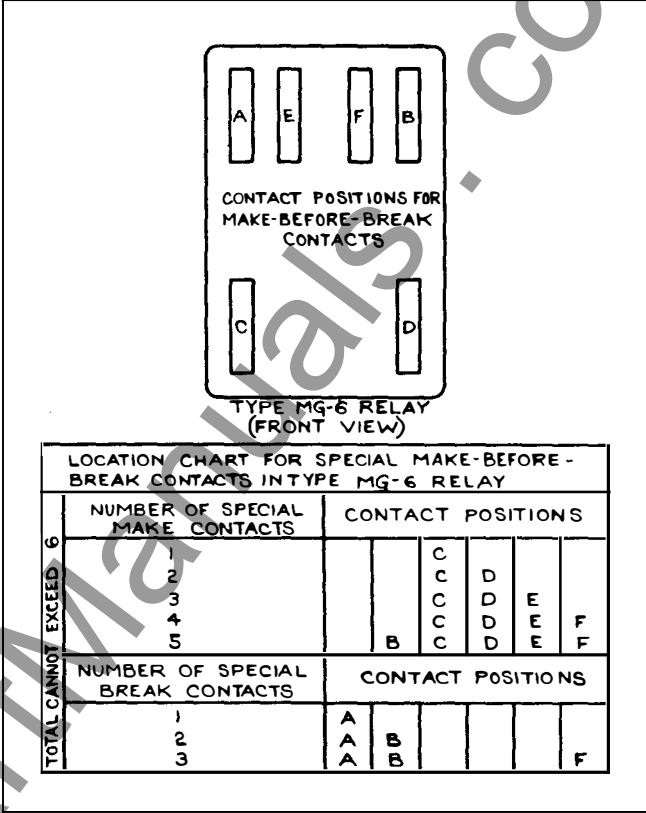


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the internal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

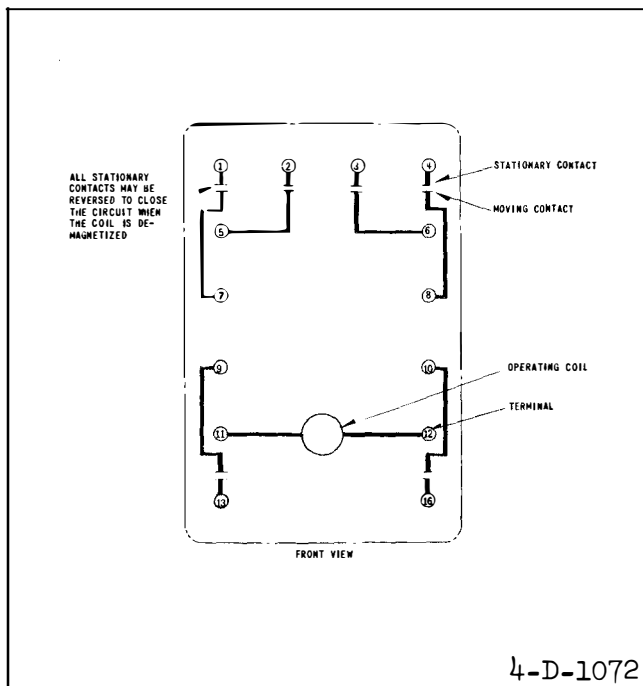


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

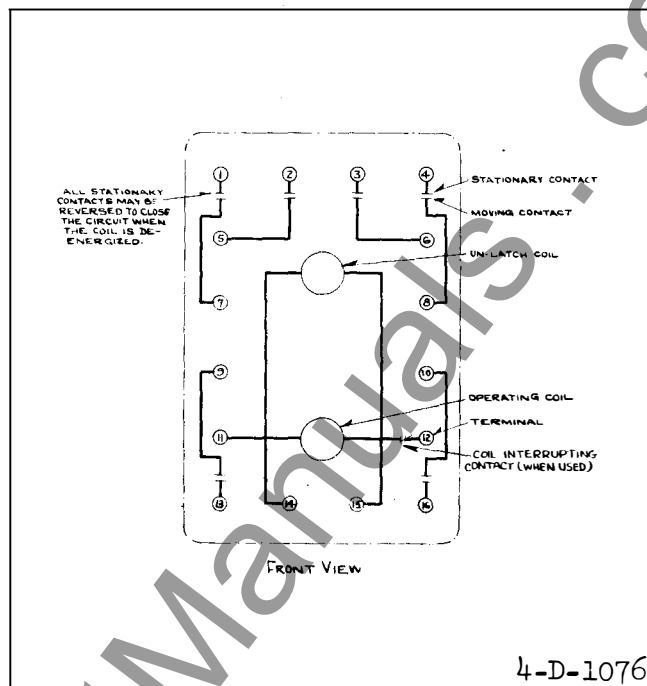


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage. If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. The time of the d-c relay can be reduced to slightly over 1 cycle if the coil is energized at five times rated voltage and there is not more than one back contact. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles.

Reset coils are for intermittent duty only and should not be energized longer than one minute.

The relay contacts will close circuits carrying 30

amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay cannot have more than four circuit-opening contacts if the normal contact pressures and armature travel are maintained.

INSTALLATION

The relays should be mounted on switchboard

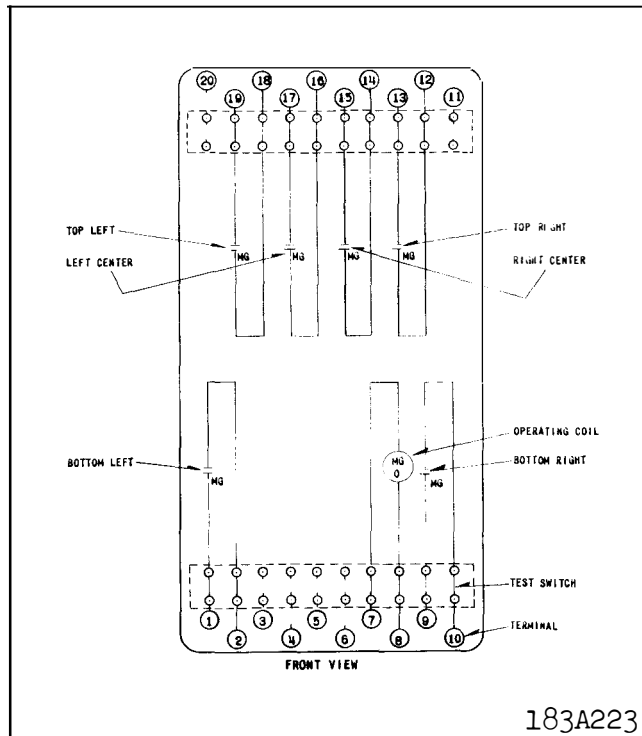


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

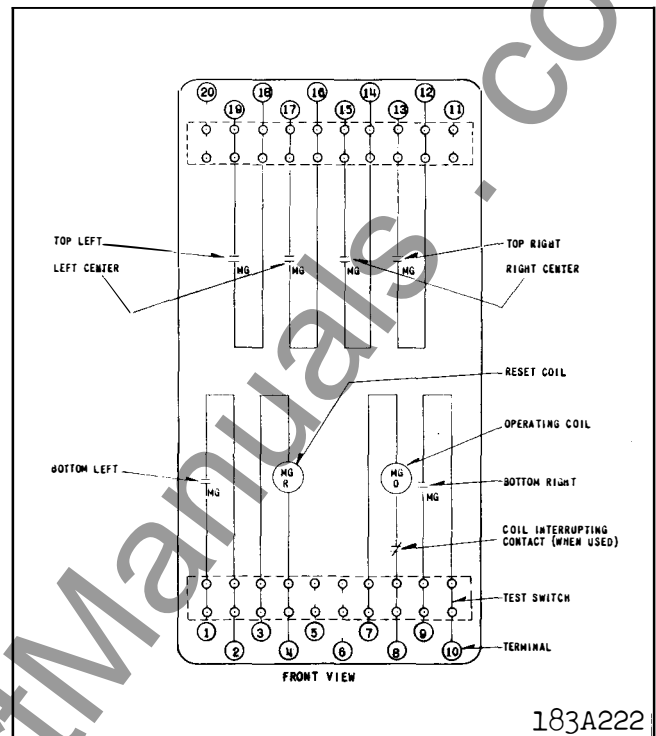


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

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.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of

thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

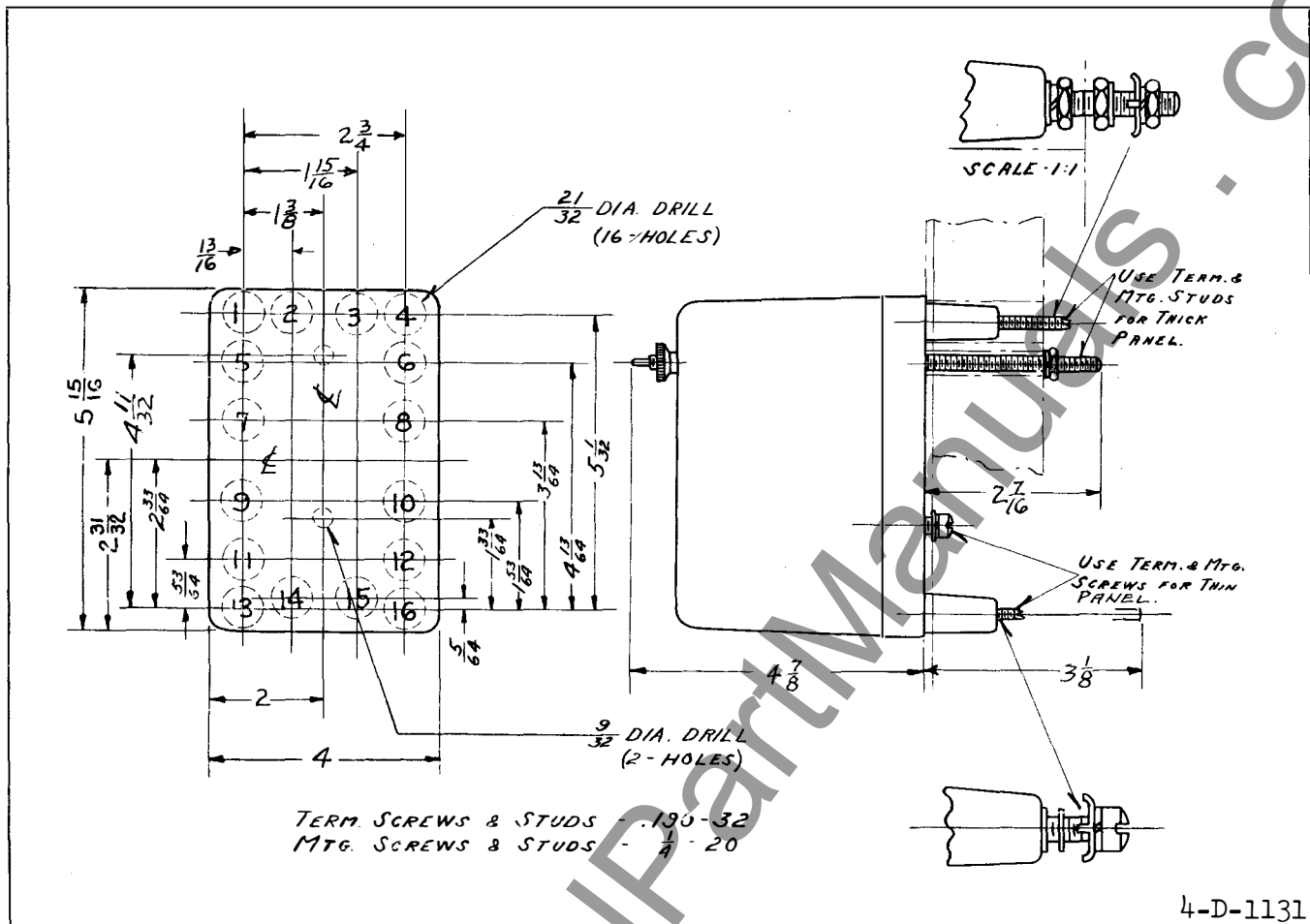


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

maintained.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the

adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, (except 4 turns for d-c relays with coil-interrupting contacts) and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

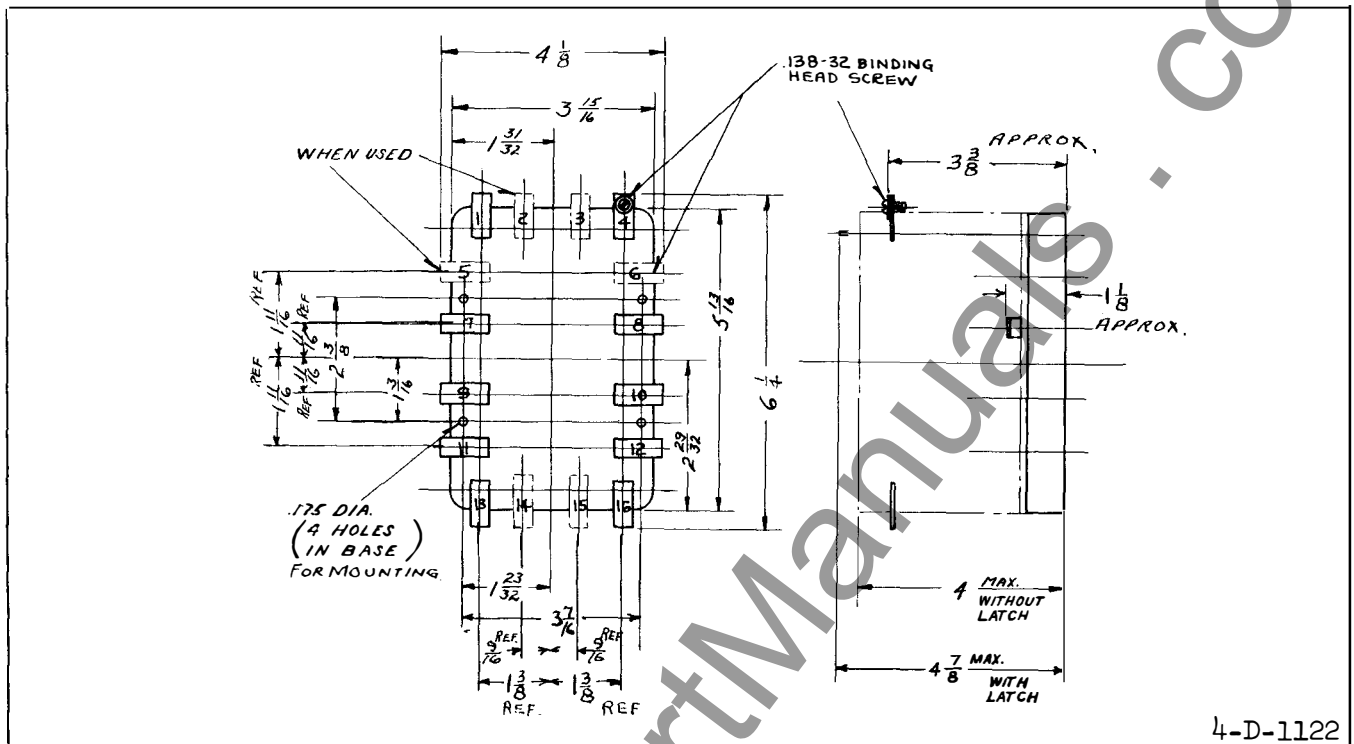


Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about $1\frac{1}{2}$ turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the

impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the arma-



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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although readjustment may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of

the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature by two screws. Silver contact buttons are welded on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is

SUPERSEDES I.L. 41-753.1

*Denotes change from superseded issue.

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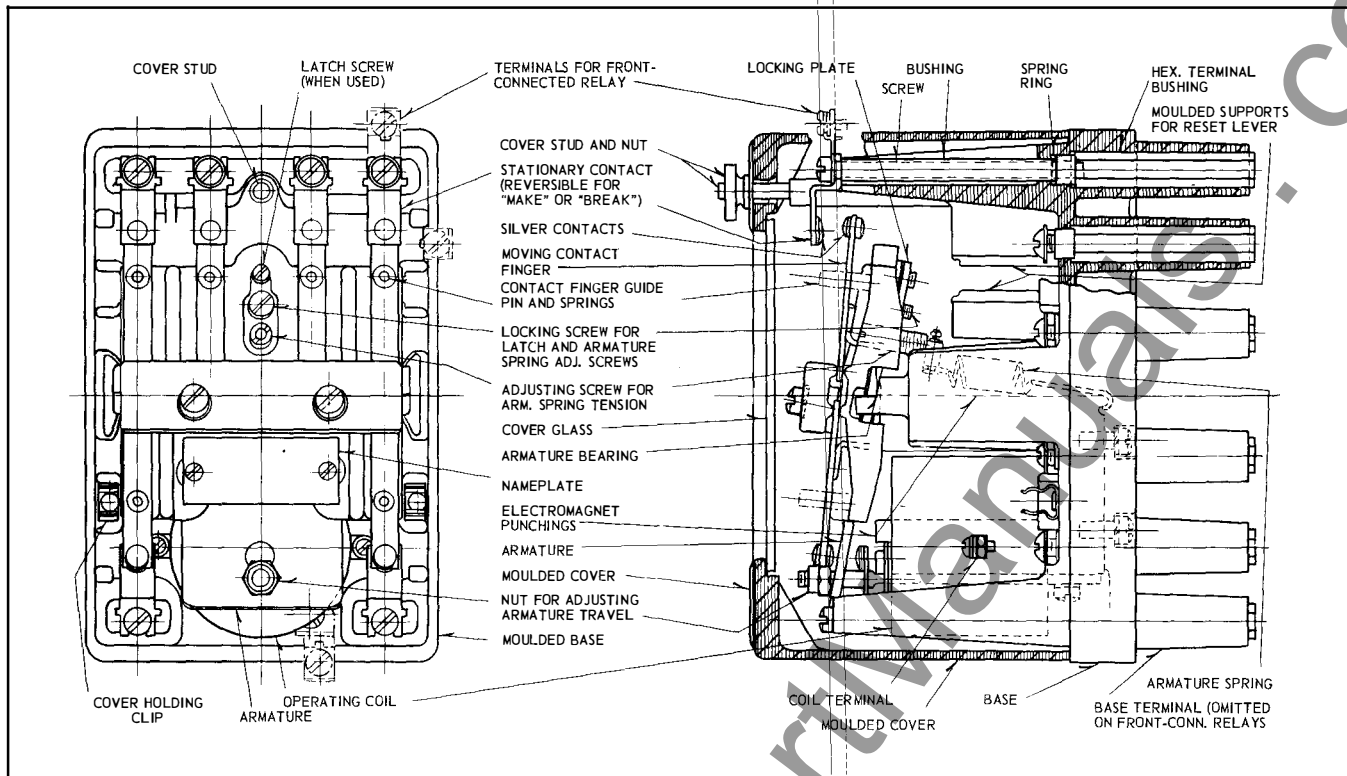


Fig. 1. Front View (Cover Omitted) and Side View of the Type MG-6 Self Reset Relay in Molded Case.

less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the

hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the stationary contact stud of the auxiliary contact, and the end of the moving contact spring is in contact with

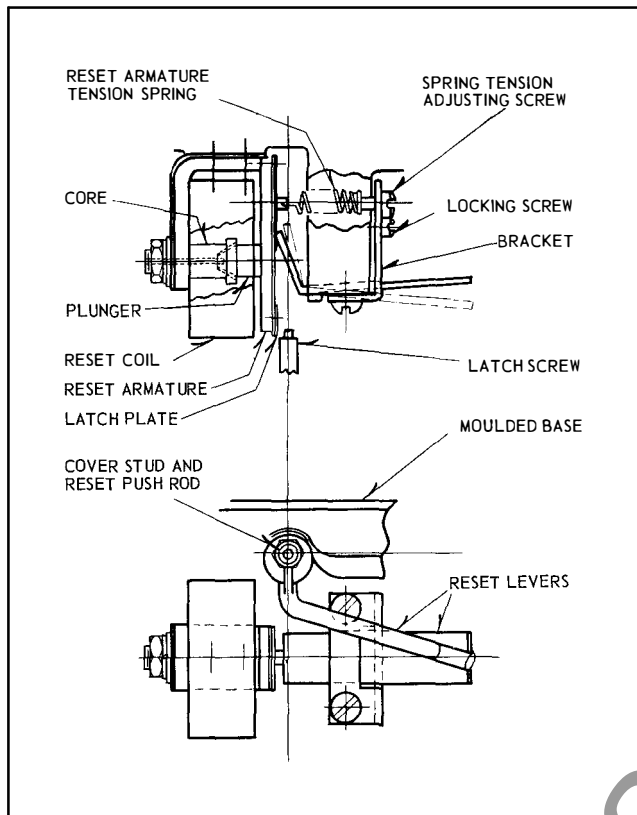


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the moulded insulation block strikes the end of the auxiliary contact spring and causes the contacts to part with a gap which is appreciably greater than the travel of the armature block at the point where it strikes the spring. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current at any rated coil voltage, but it is not intended for use in applications where several times rated voltage is applied to the operating coil in order to reduce the operating time.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection

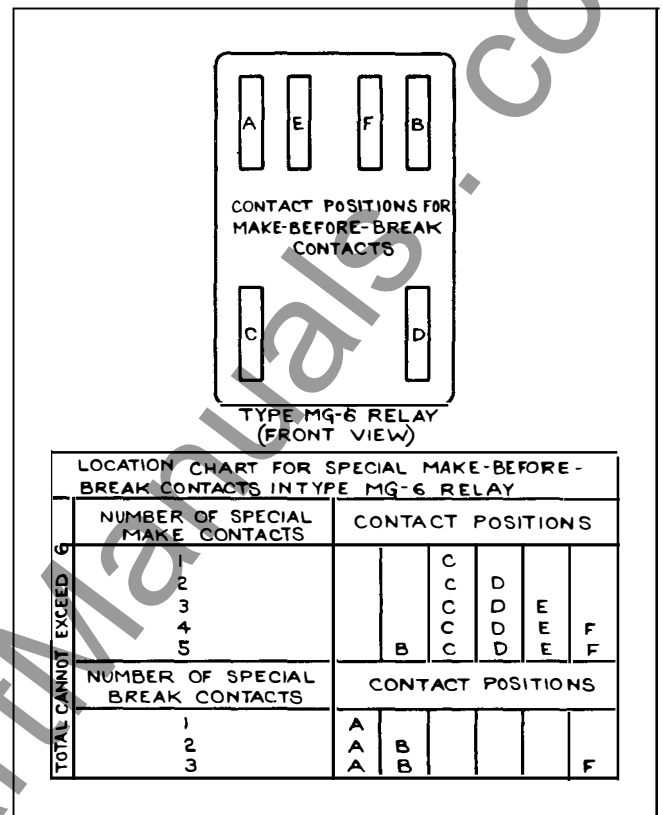


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the internal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

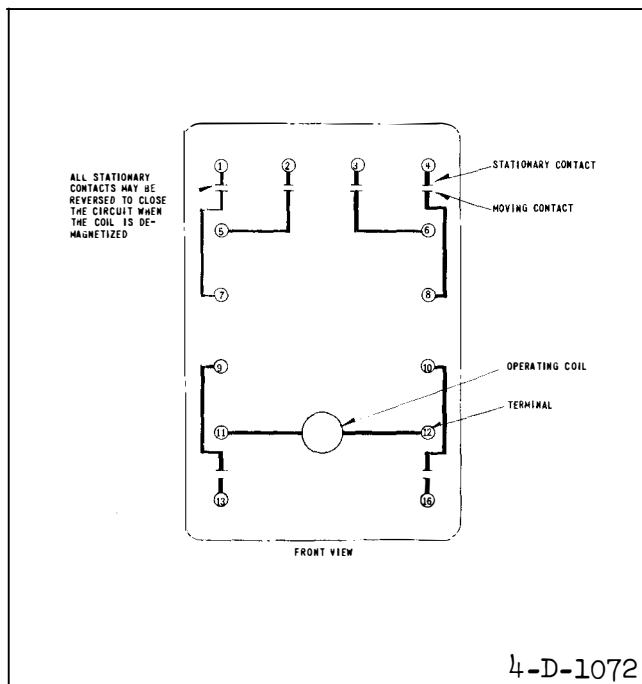


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

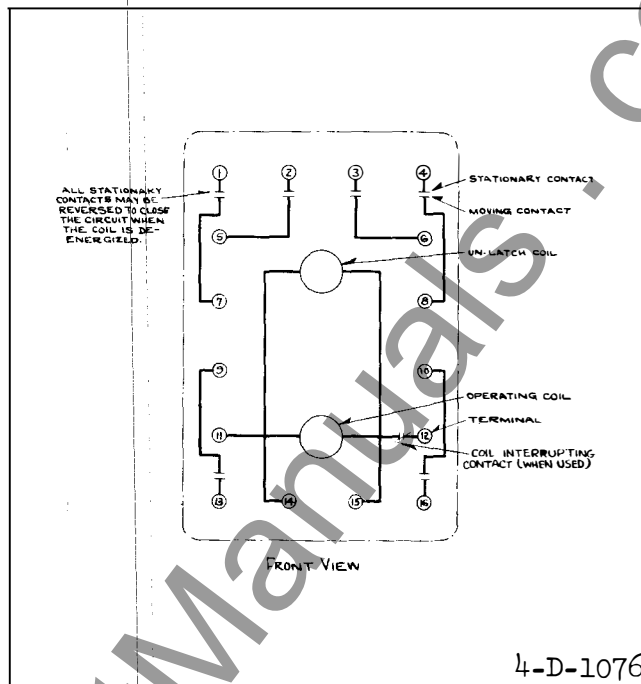


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage. If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. The time of the d-c relay can be reduced to slightly over 1 cycle if the coil is energized at five times rated voltage and there is not more than one back contact. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles.

* Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30

amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay cannot have more than four circuit-opening contacts if the normal contact pressures and armature travel are maintained.

INSTALLATION

The relays should be mounted on switchboard

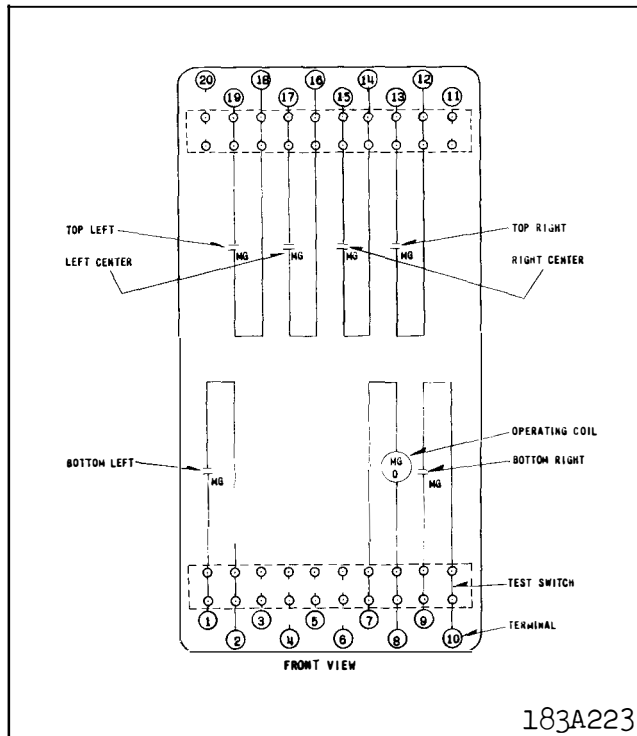


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

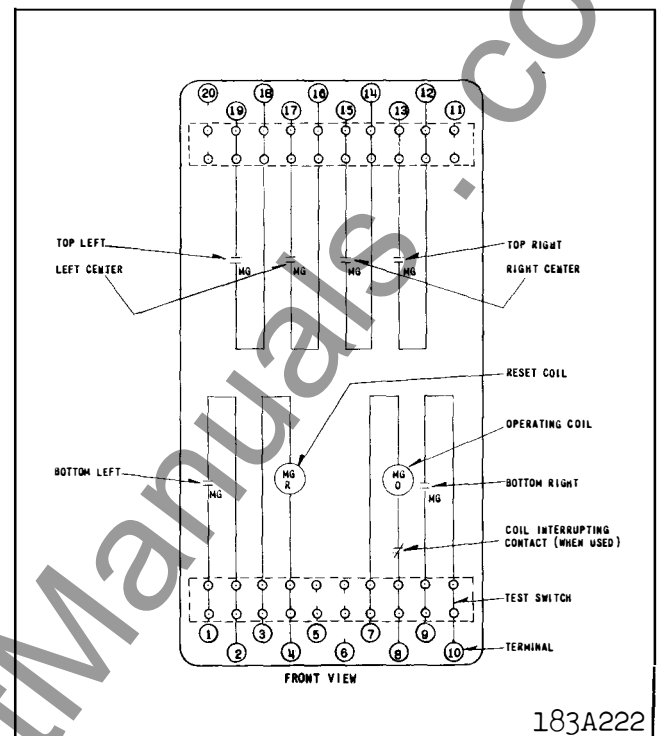


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

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.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of

thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

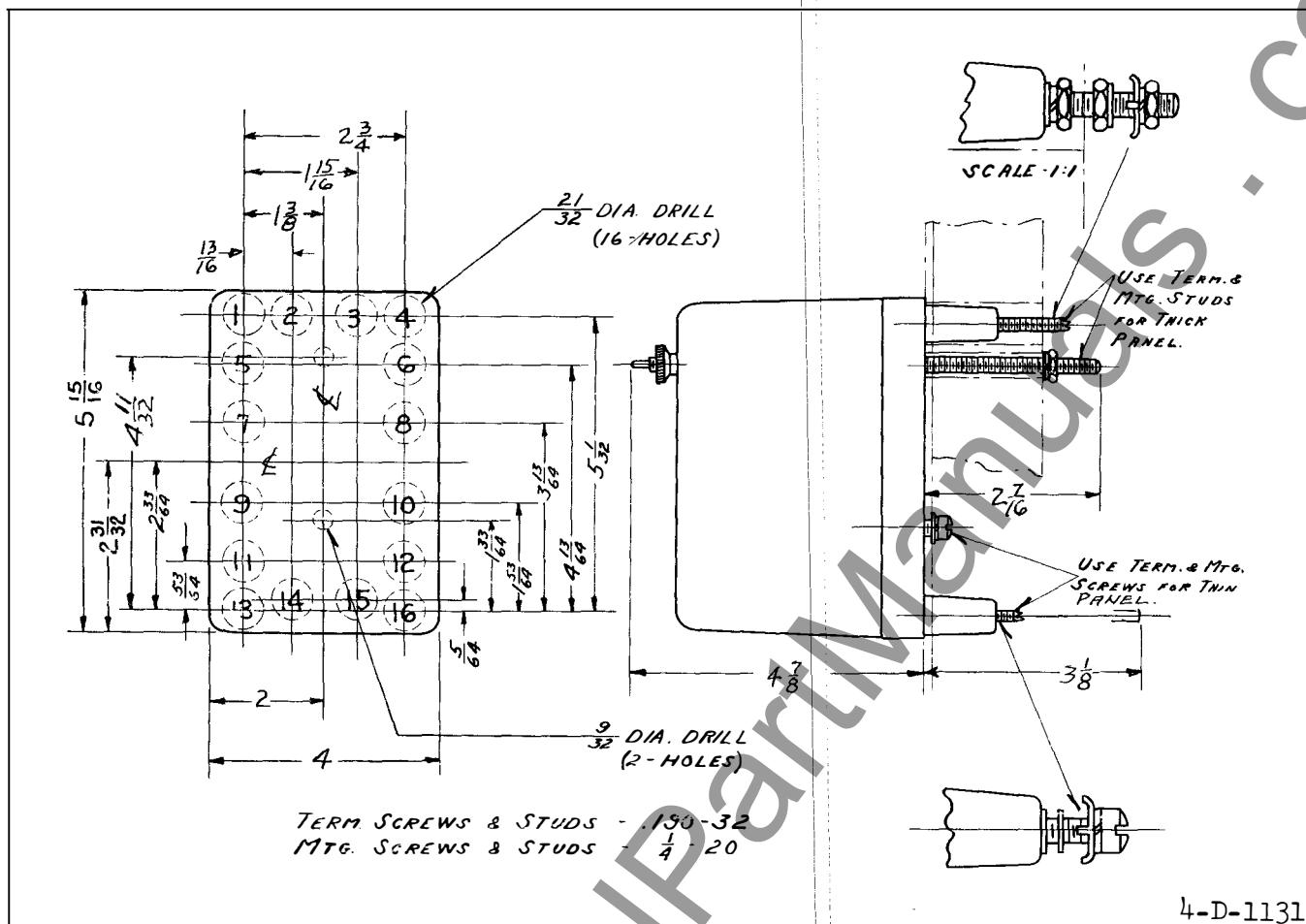


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

maintained.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the

adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, (except 4 turns for d-c relays with coil-interrupting contacts) and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

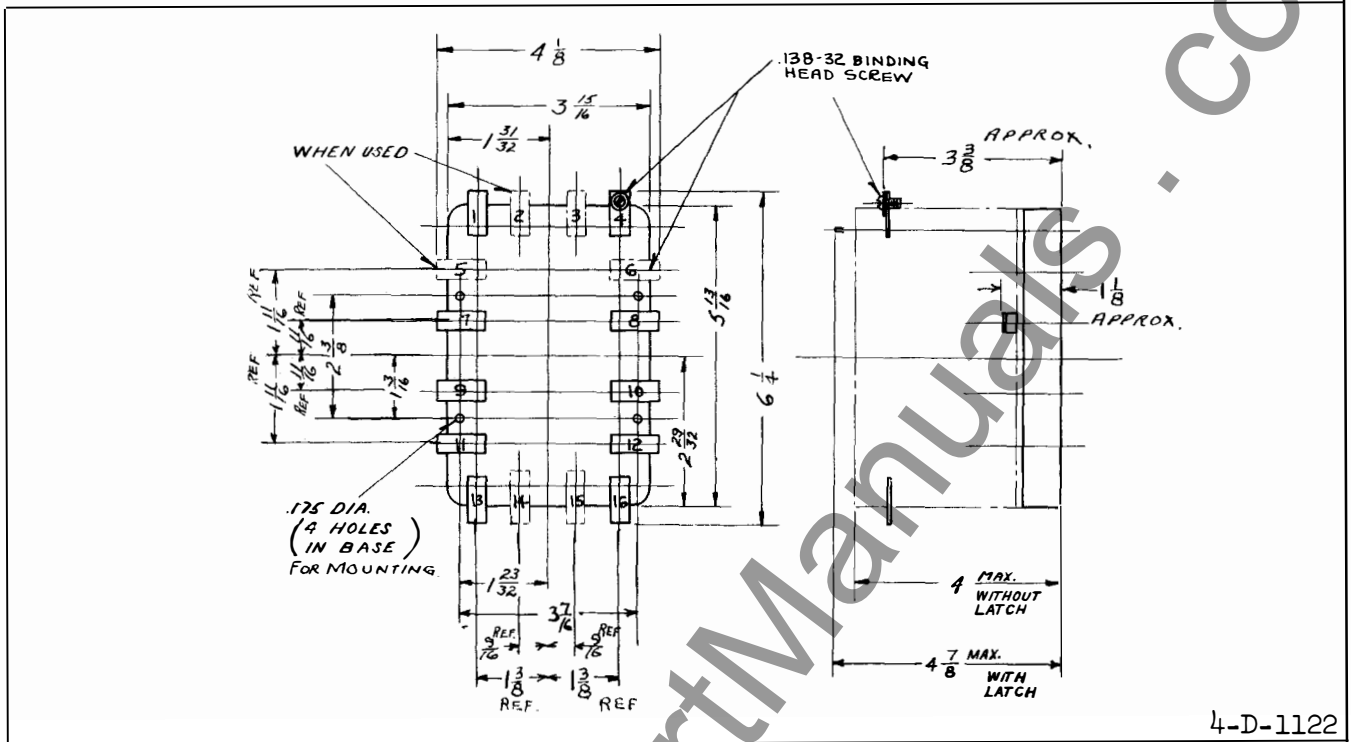


Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about $1\frac{1}{2}$ turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the

impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the arma-



WESTINGHOUSE ELECTRIC CORPORATION

METER DIVISION

NEWARK, N.J.

Printed in U. S. A.



INSTALLATION • OPERATION • MAINTENANCE INSTRUCTIONS

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although readjustment may be required on the D-C MG-6 relay — see "ADJUSTMENTS AND MAINTENANCE") it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of

the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature by two screws. Silver contact buttons are welded on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is

SUPERSEDES I.L. 41-753.1A

*Denotes change from superseded issue.

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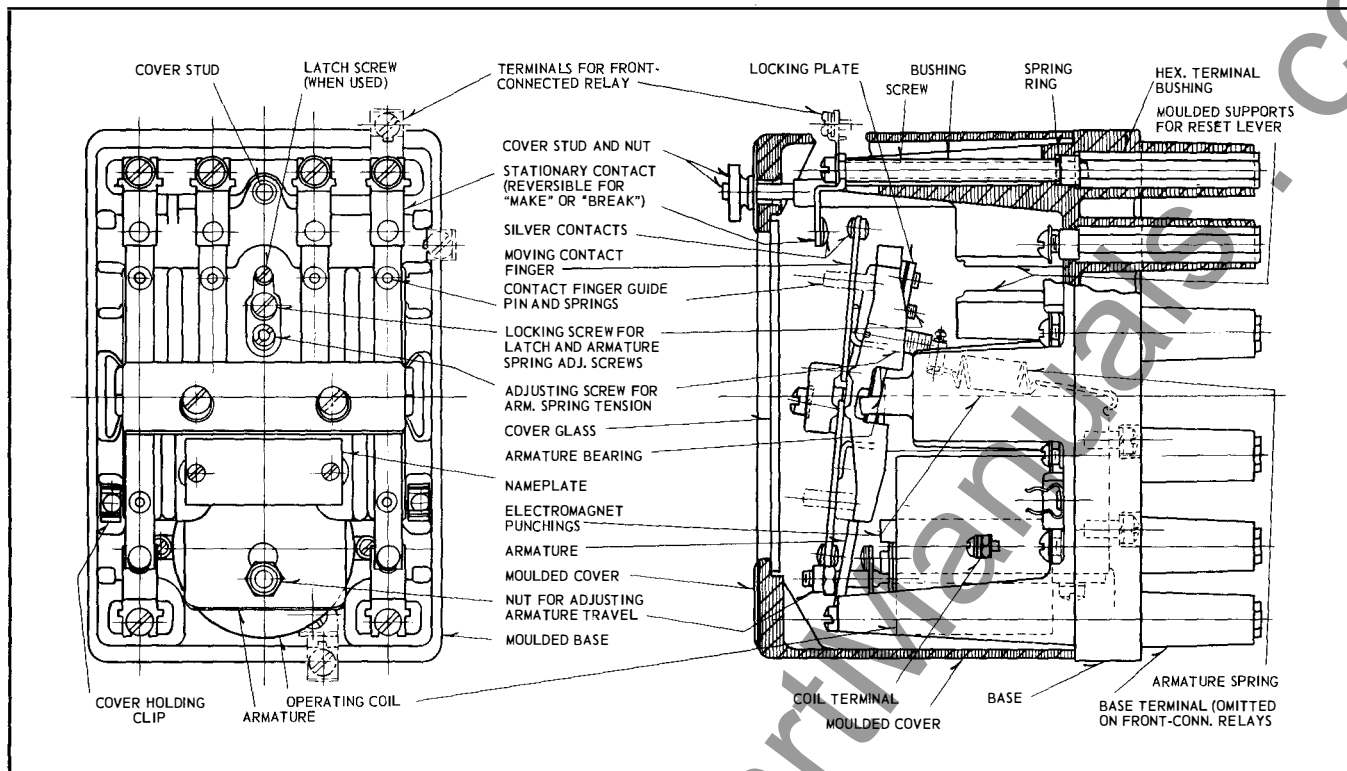


Fig. 1. Front View (Cover Omitted) and Side View of the Type MG-6 Self Reset Relay in Molded Case.

less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the

hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the stationary contact stud of the auxiliary contact, and the end of the moving contact spring is in contact with

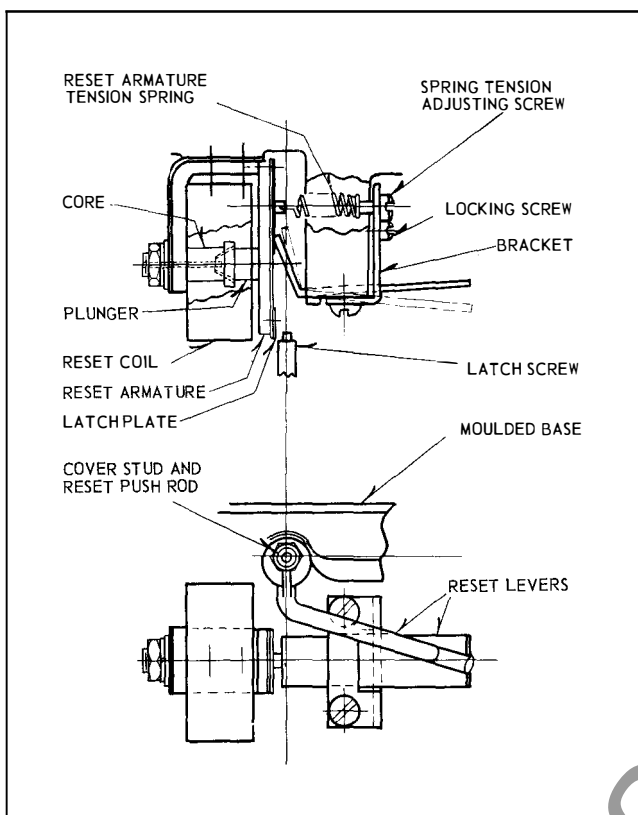


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the moulded insulation block strikes the end of the auxiliary contact spring and causes the contacts to part with a gap which is appreciably greater than the travel of the armature block at the point where it strikes the spring. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current at any rated coil voltage, but it is not intended for use in applications where several times rated voltage is applied to the operating coil in order to reduce the operating time.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection

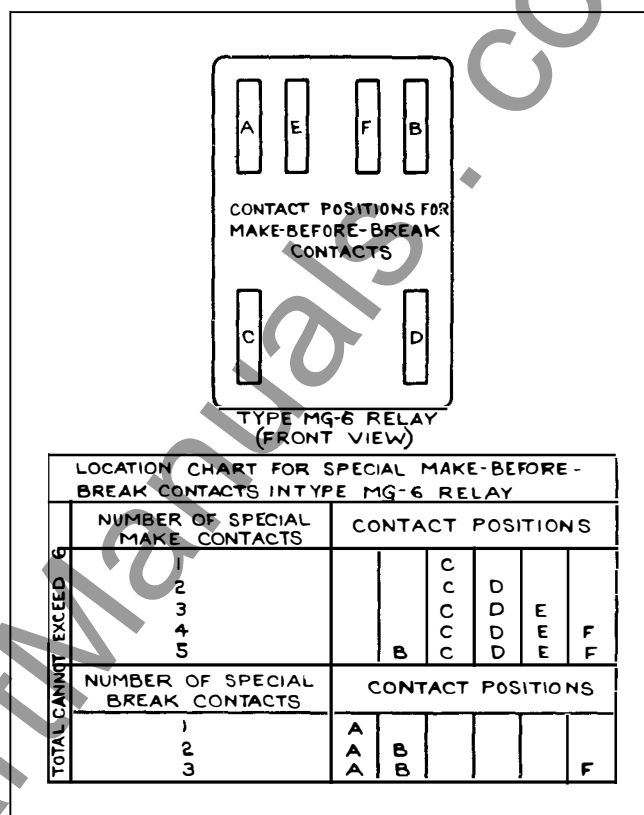


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the internal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

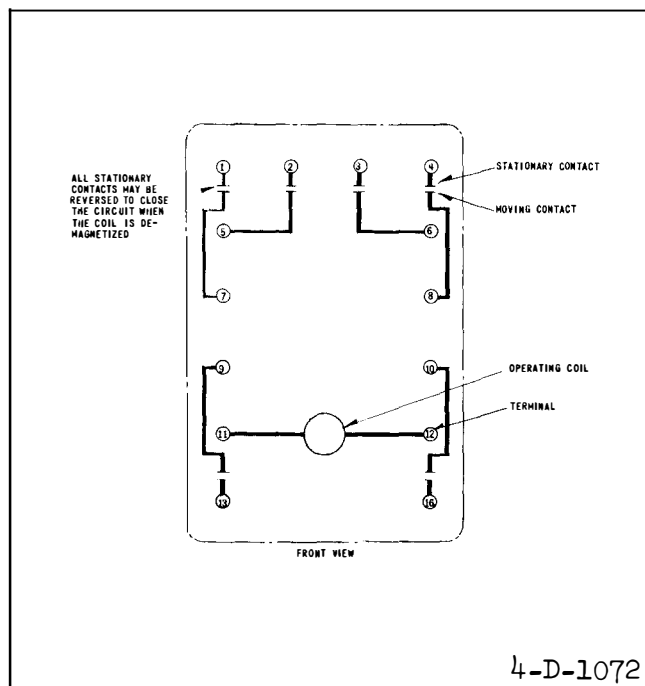


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

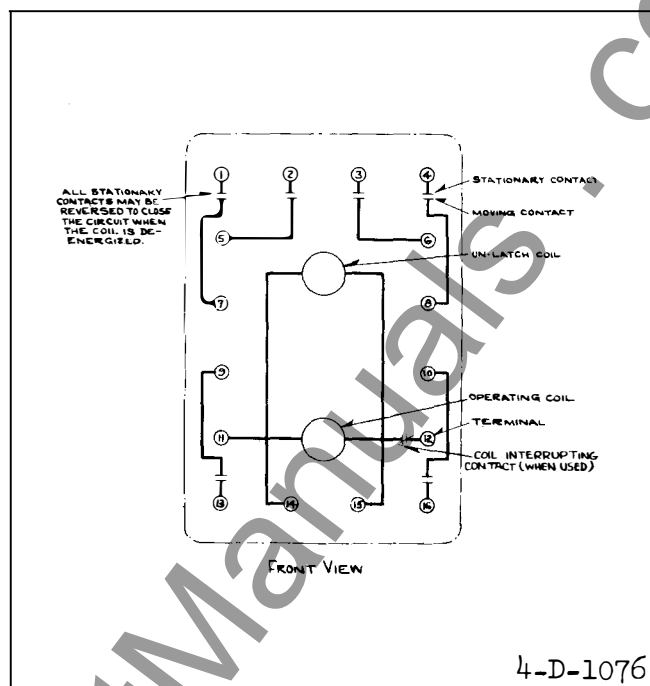


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage. If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. The time of the d-c relay can be reduced to slightly over 1 cycle if the coil is energized at five times rated voltage and there is not more than one back contact. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30

amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay cannot have more than four circuit-opening contacts if the normal contact pressures and armature travel are maintained.

INSTALLATION

The relays should be mounted on switchboard

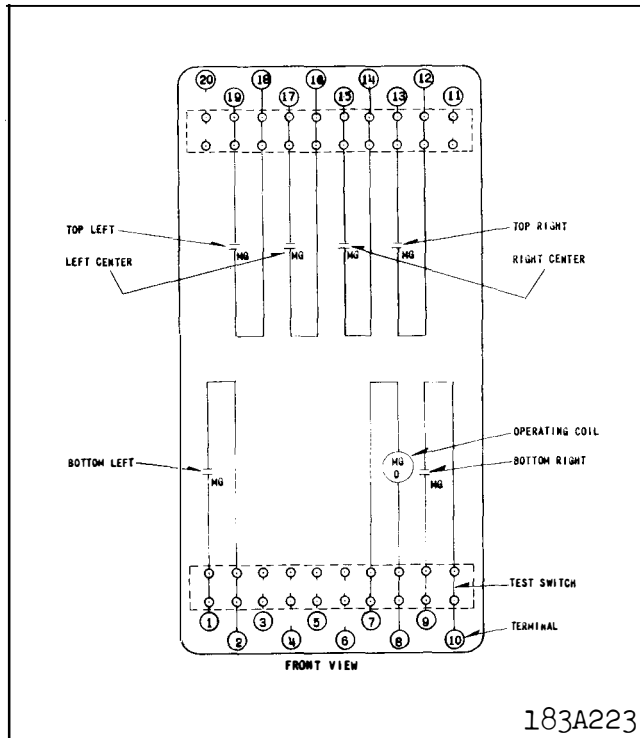


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

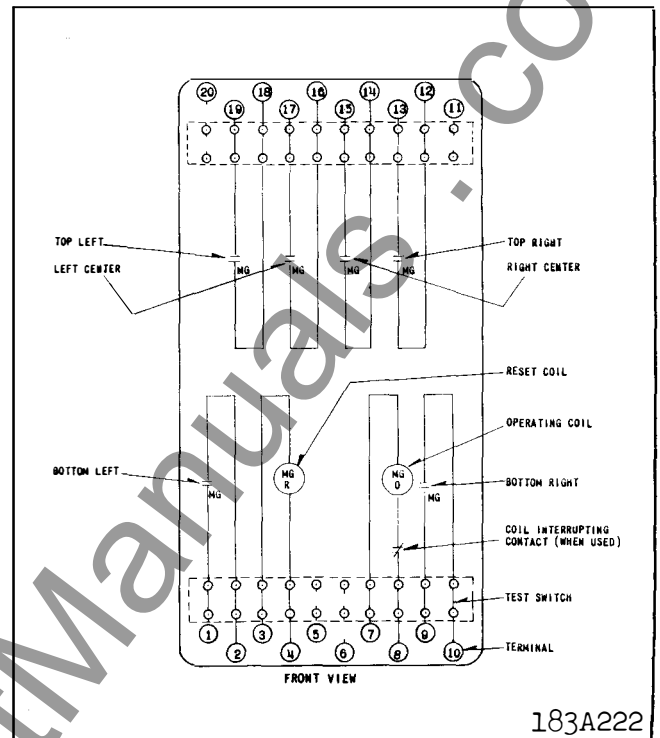


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

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.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of

thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

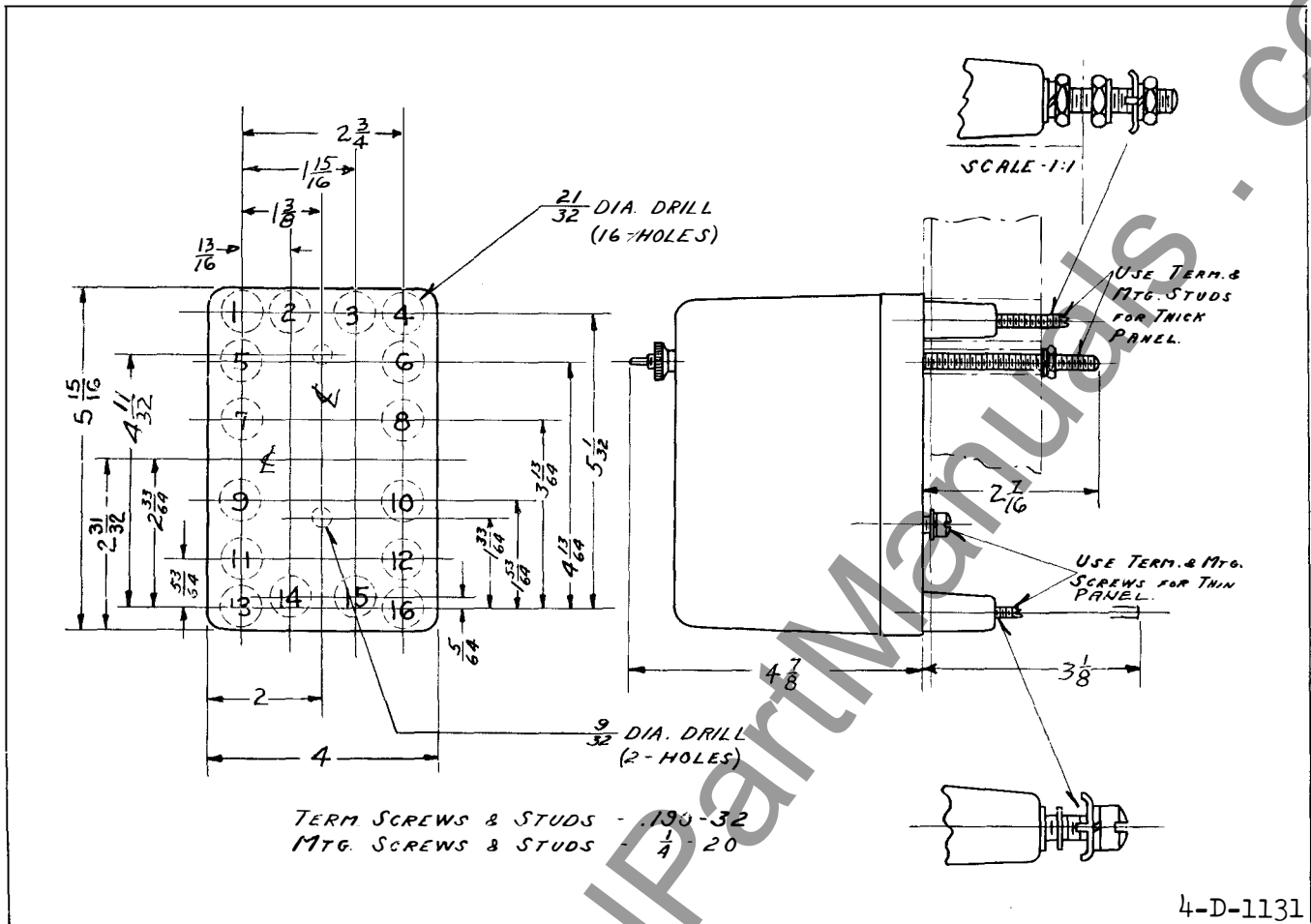


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

maintained.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the

adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, (except 4 turns for d-c relays with coil-interrupting contacts) and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

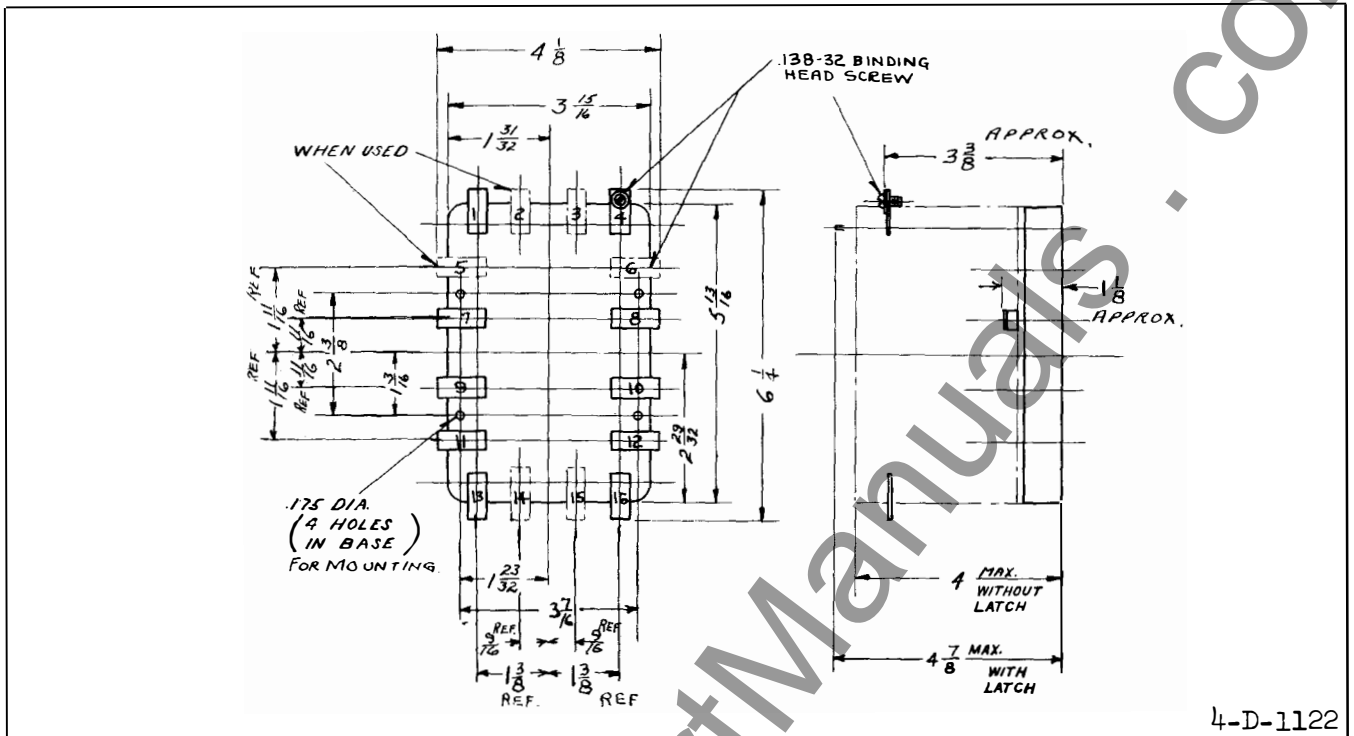


Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

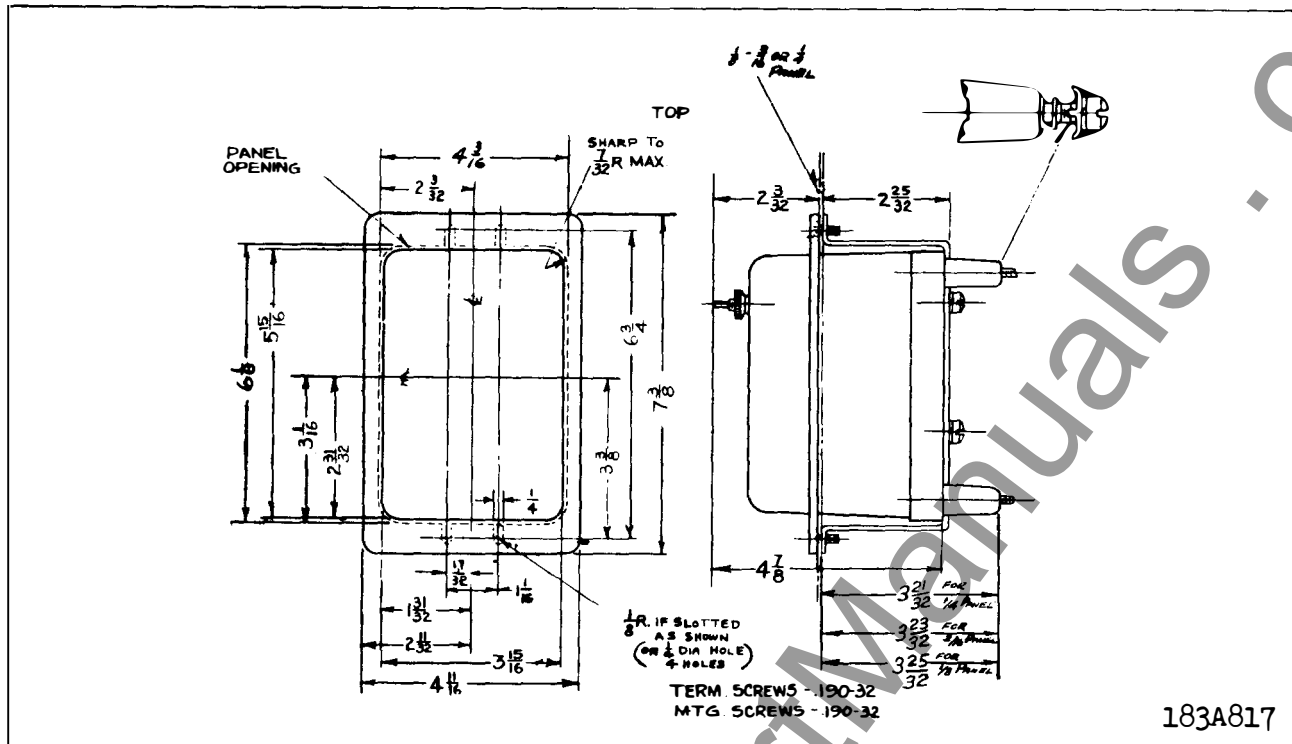
on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about $1\frac{1}{2}$ turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the

impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the arma-



* Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

ture is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about $1/8$ " of that position. A pair of tweezers on which the ends are bent at a right angle to the body, or a similar tool, is useful in replacing the upper end of the spring in the groove of the adjusting member. Such a tool is particularly helpful on relays which have an electrical reset assembly.

On latch-type relays the latch screw is adjusted so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .010 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .005 inch, and should not be more

than about $1/64$ ". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 5 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to

strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil-interrupting contact, the following points must be observed to assure satisfactory operation. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is only .005 inch. With the armature in this position the coil interrupting contact should be open by about 1/16 inch. This gap is adjusted at the factory by varying the number of slotted shims used between the relay base and the contact supporting bracket. The two main contacts at the lower end of the base should be assembled as circuit-opening contacts, and the main armature restraining spring should have 4 turns tension (see 3rd paragraph of this section) for DC as well as for AC relays. It is necessary also that the L-shaped spring which carries the moving member of the coil-interrupting contact have its sides approximately straight before assembly with

the supporting bracket, and that the angle between the sides be approximately 80°.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	15	35.5	19	96.5
D-C	7.8	cold--	7.8	cold--
D-C	6.5	hot --	6.5	hot --

Δ Rated voltage is 120 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66	cold--	68	cold--

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RELAY DEPARTMENT

NEWARK, N. J.

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INSTALLATION • OPERATION • MAINTENANCE INSTRUCTIONS

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see "ADJUSTMENTS AND MAINTENANCE") it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

- * An operating coil cutoff contact can be supplied with the electronic-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit)

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

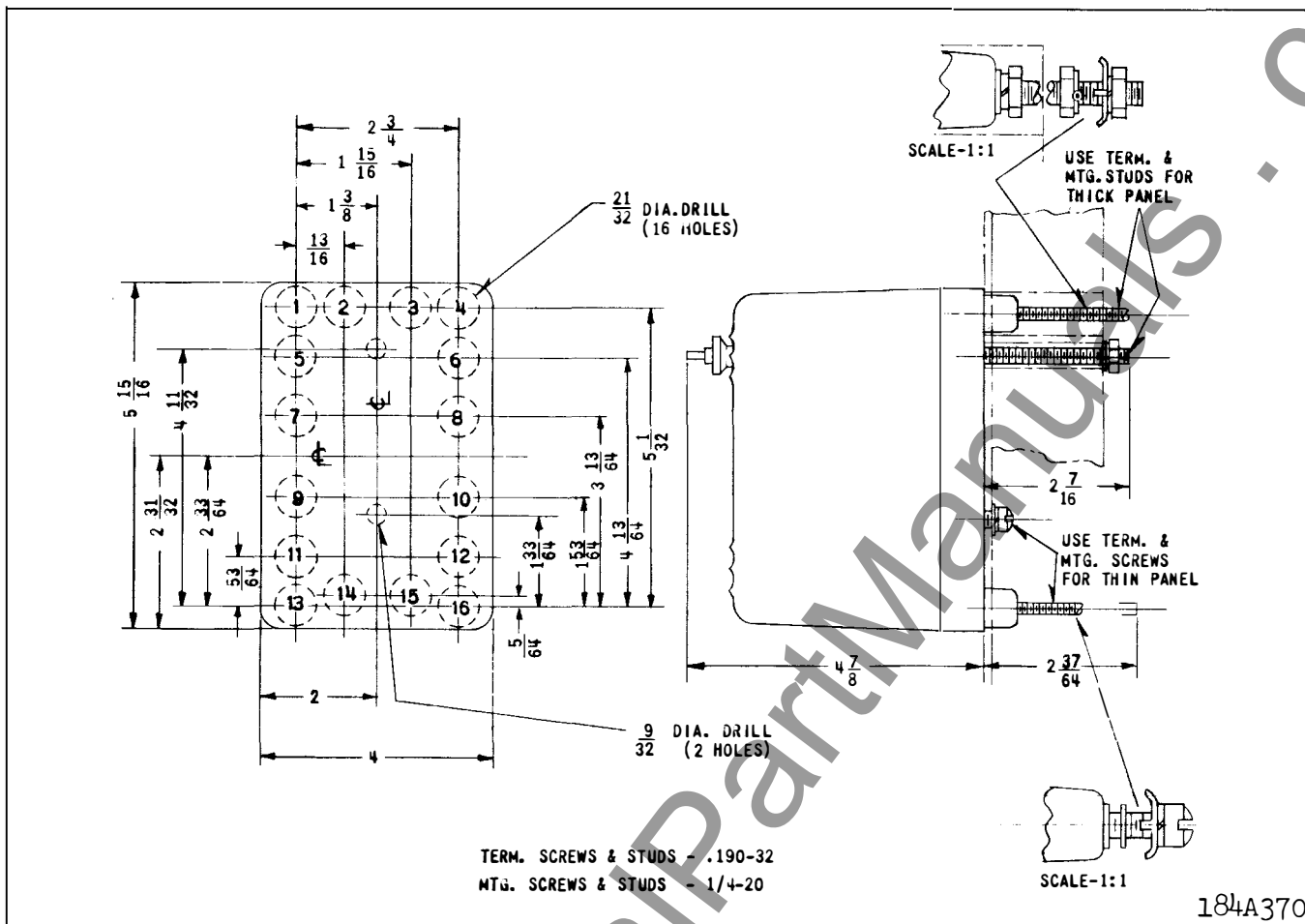
The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

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*Denotes change from superseded issue.

EFFECTIVE OCTOBER 1959



* Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

mounted by four screws through the sides of the base as indicated in the drilling plan.

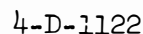
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

* maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with



all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately 1/16" follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about 1/16". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

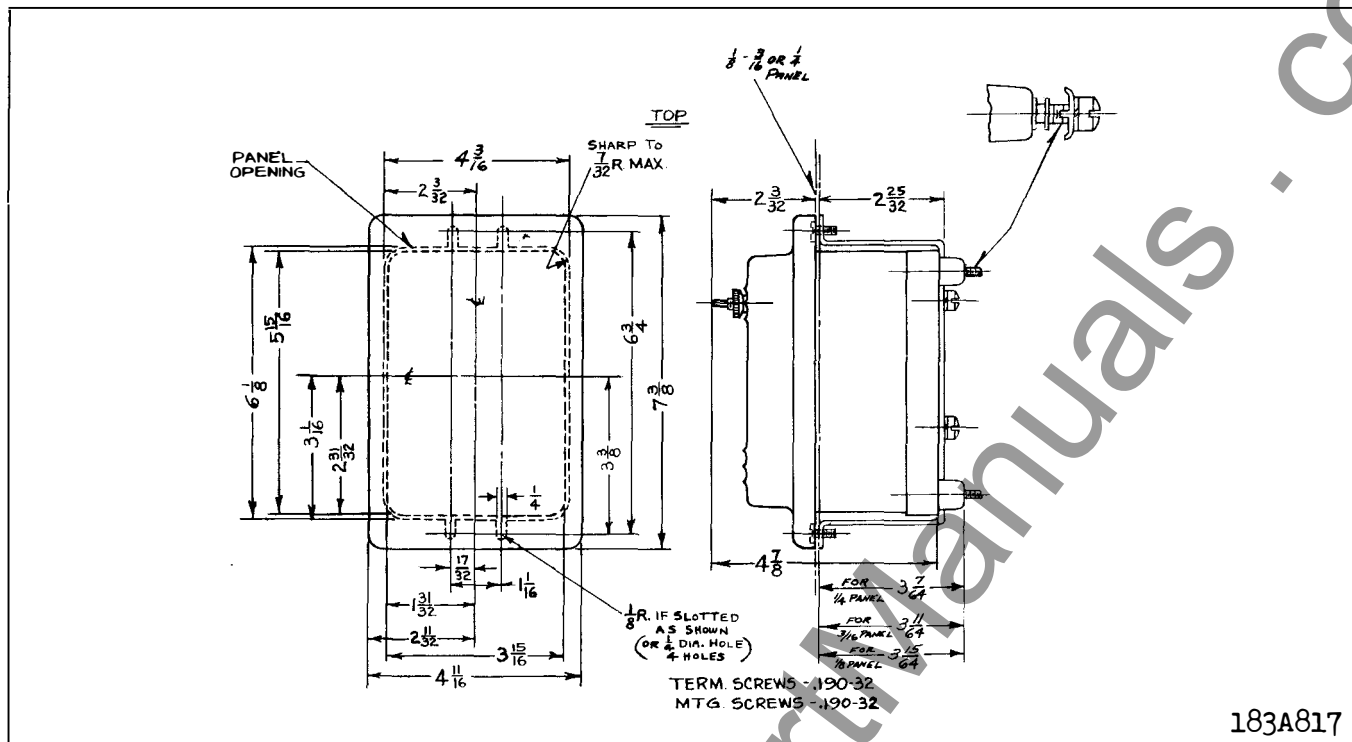


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .010 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .005 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 5 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

- * If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .020 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .005 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	15	35.5	19	96.5
D-C	7.8	cold--	7.8	cold--
D-C	6.5	hot --	6.5	hot --

Δ Rated voltage is 120 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66	cold--	68	cold--

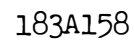


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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INSTALLATION • OPERATION • MAINTENANCE INSTRUCTIONS

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit)

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

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*Denotes change from superseded issue.

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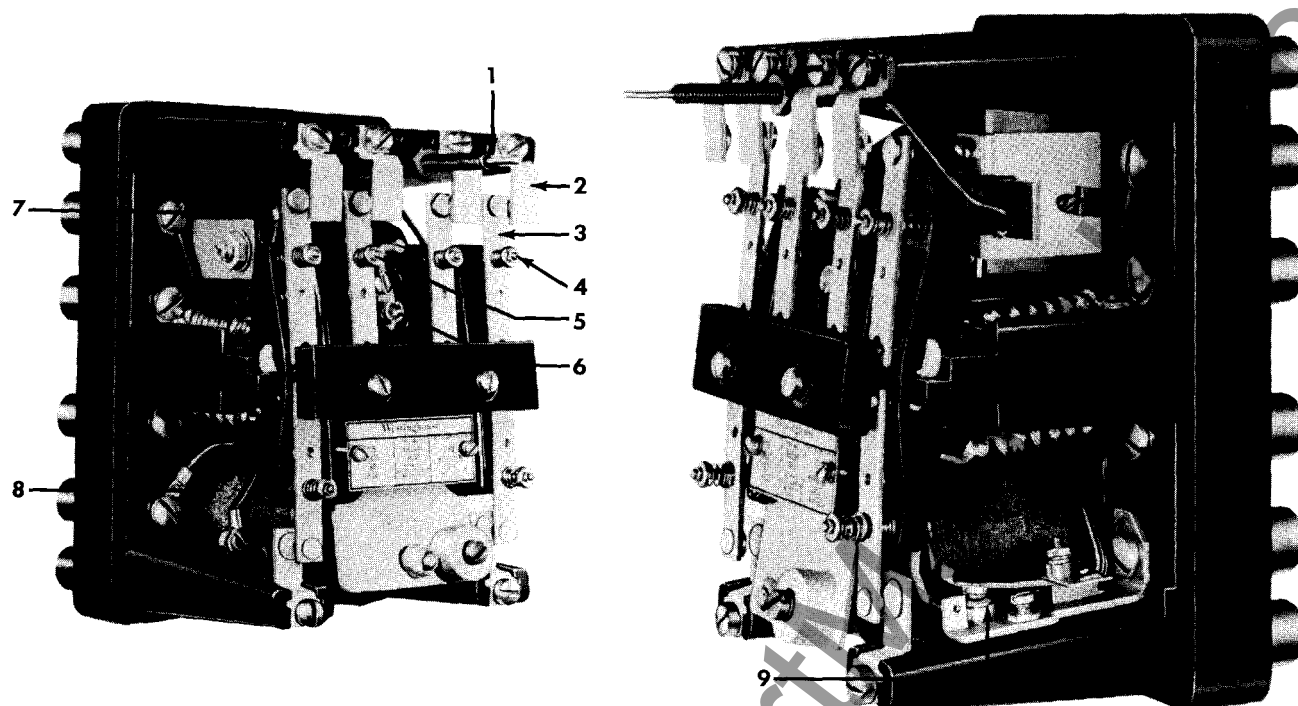


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

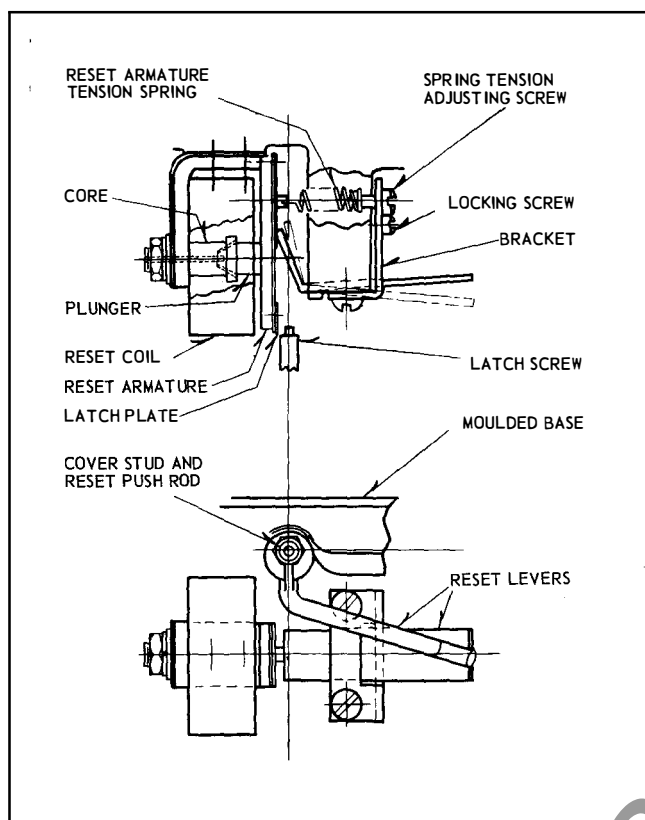


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

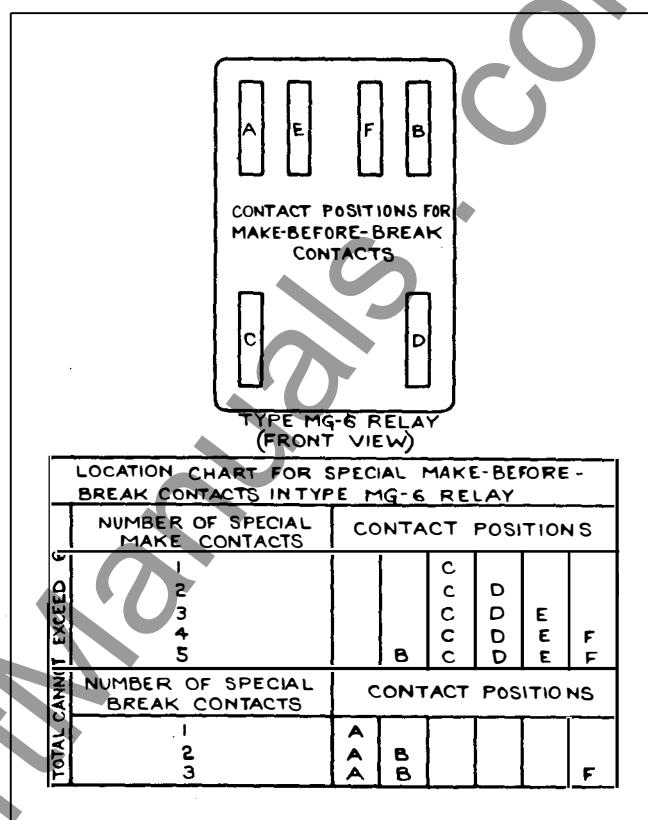


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

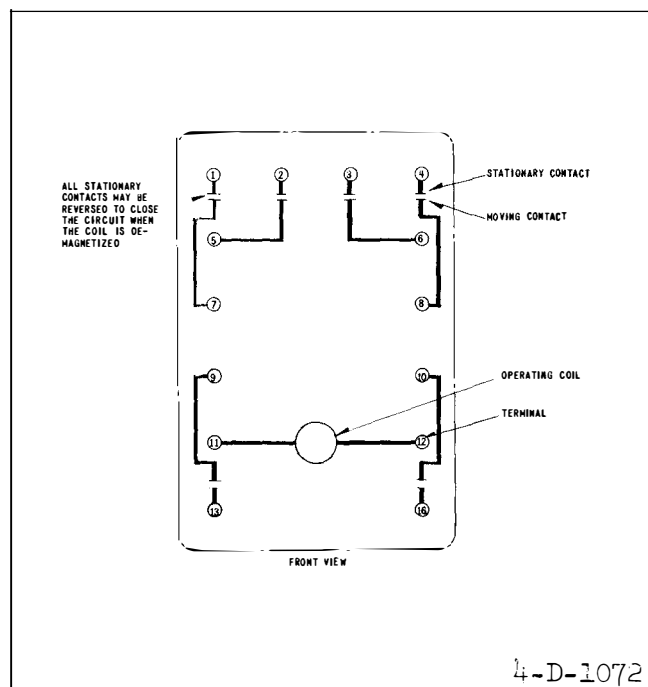


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

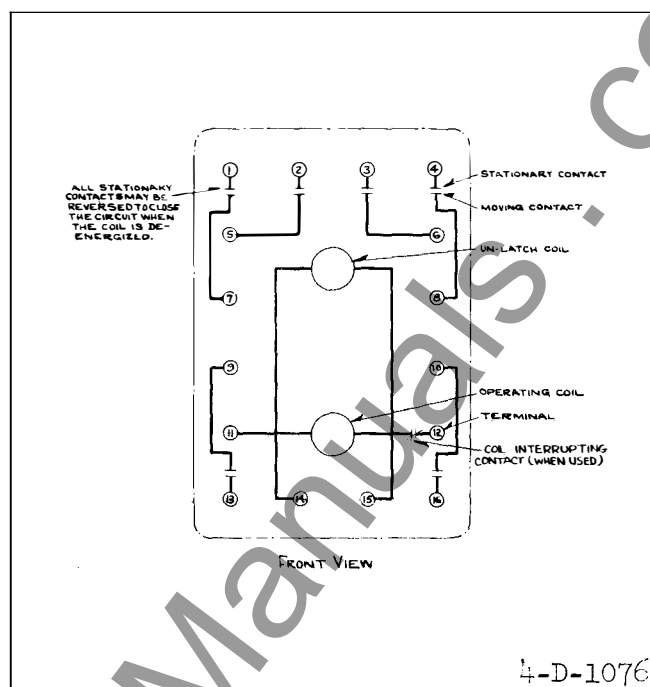


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles of 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

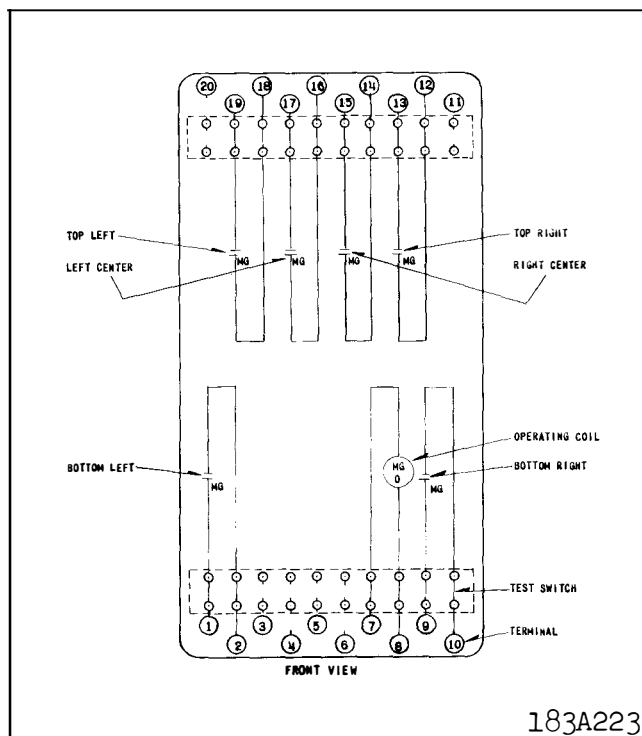


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

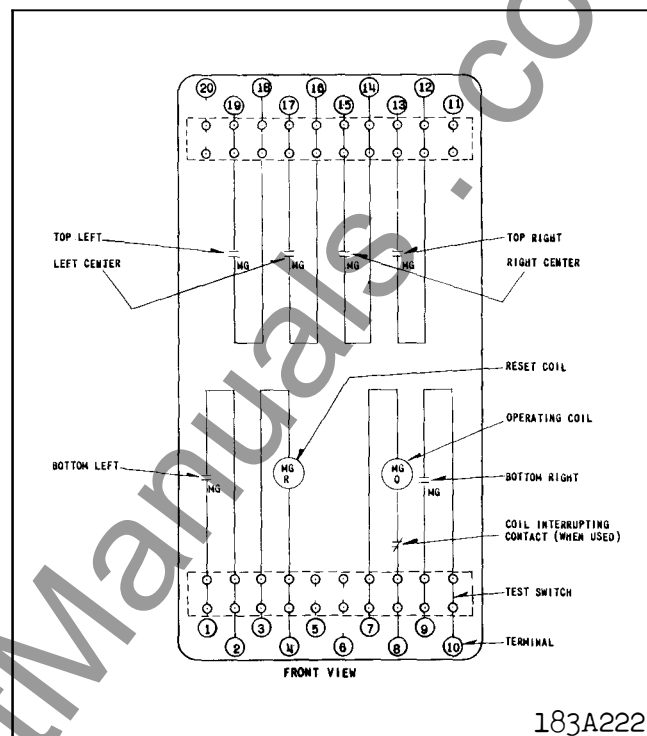


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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 elec-

trical 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.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be

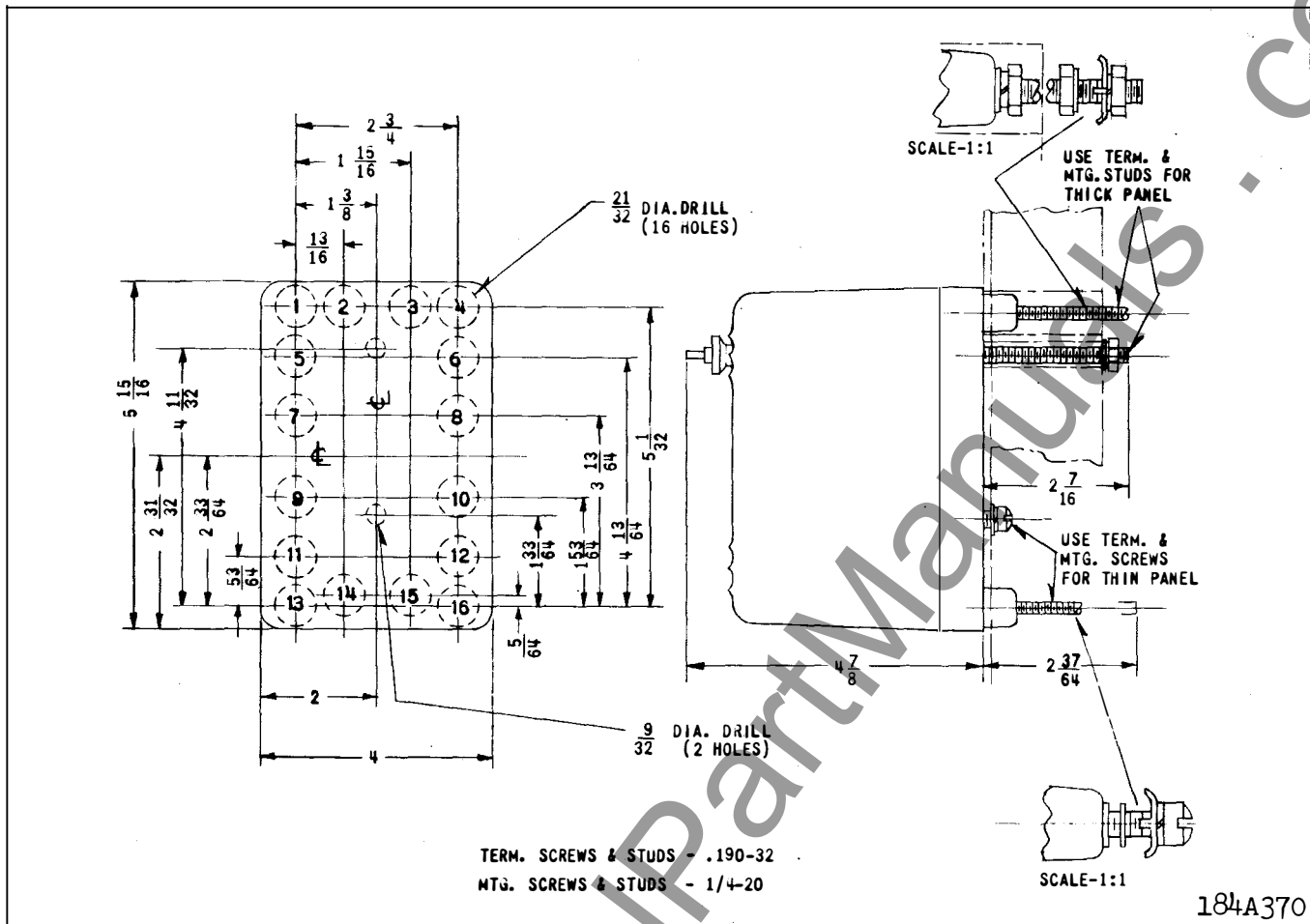


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

* maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is $\frac{7}{16}$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with

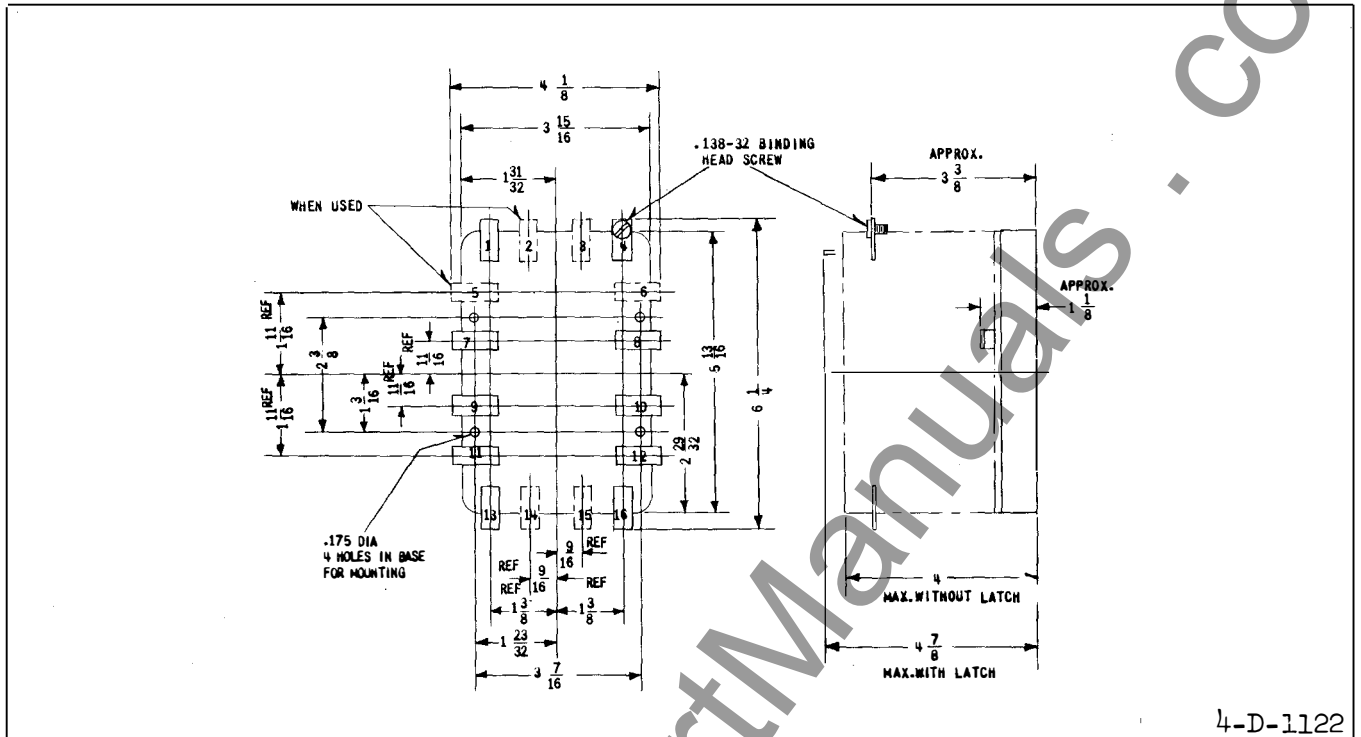


Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

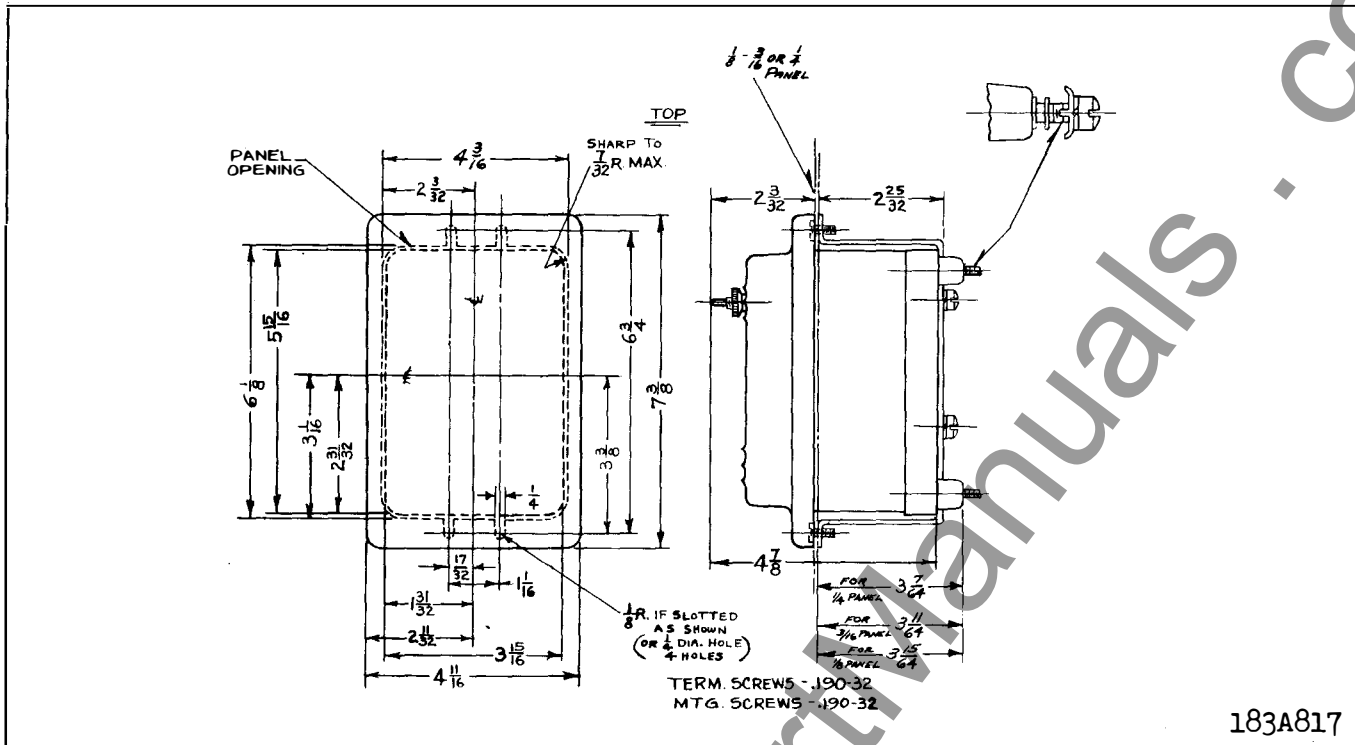
all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The

positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments



specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .010 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .005 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 5 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .020 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

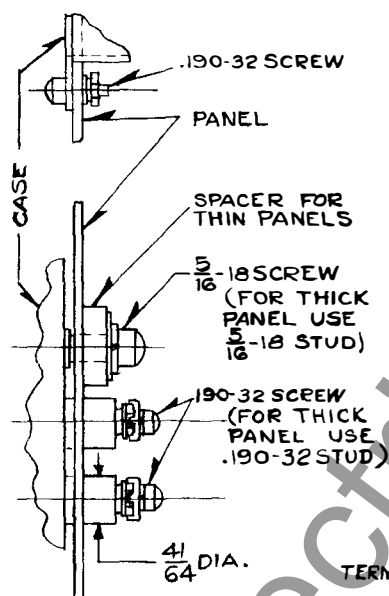
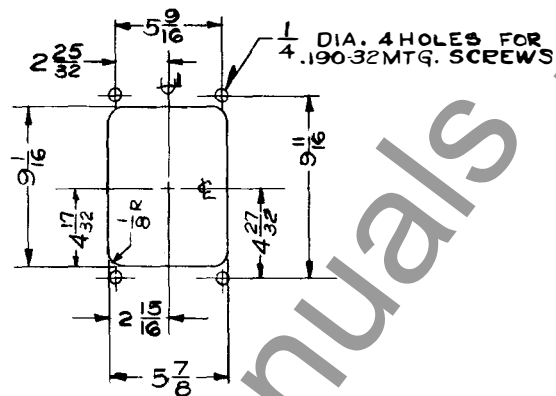
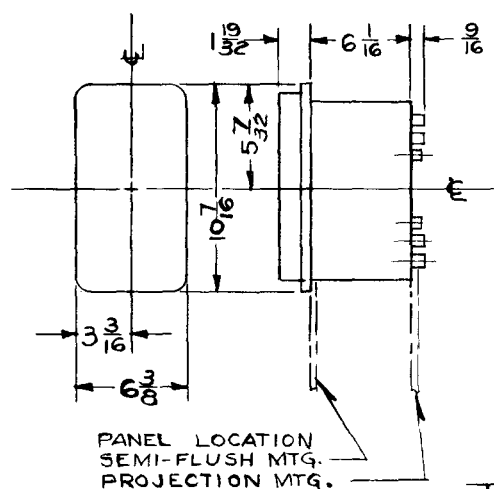
* Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

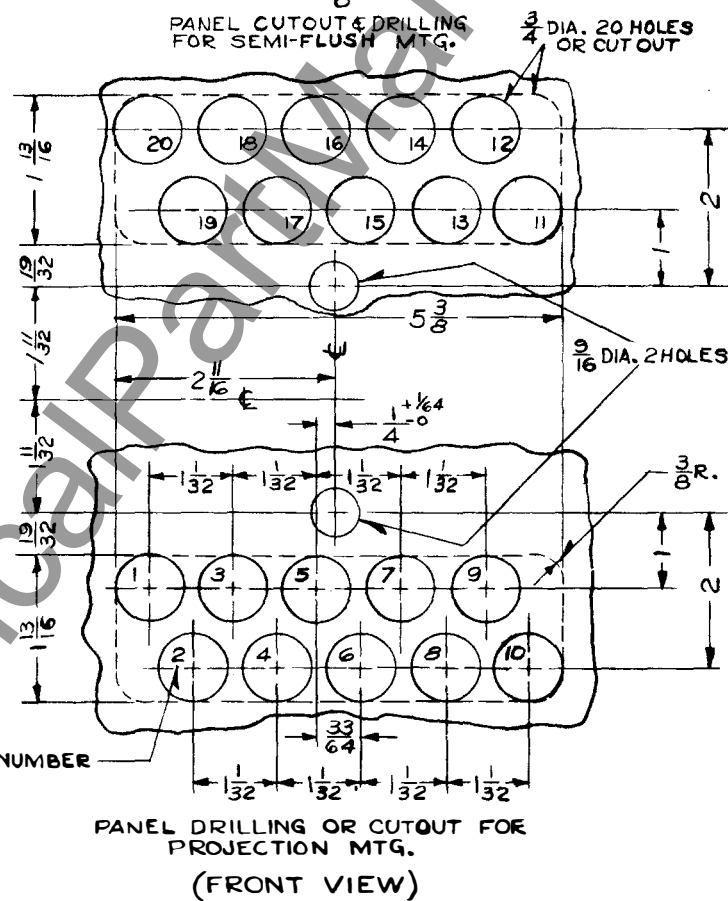
△ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	



NOTE: ALL DIMENSIONS
IN INCHES



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Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay In Type FT22 Case.

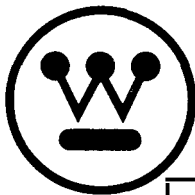
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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit)

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1C

*Denotes change from superseded issue.

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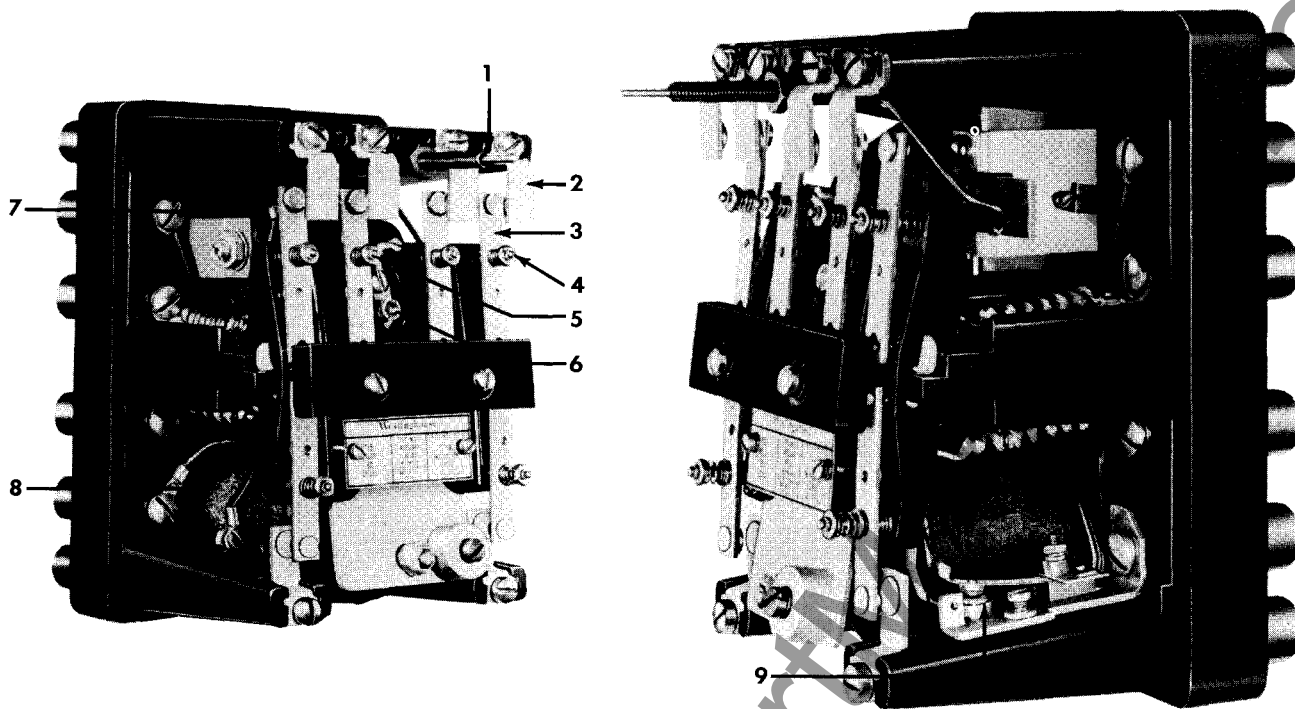


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

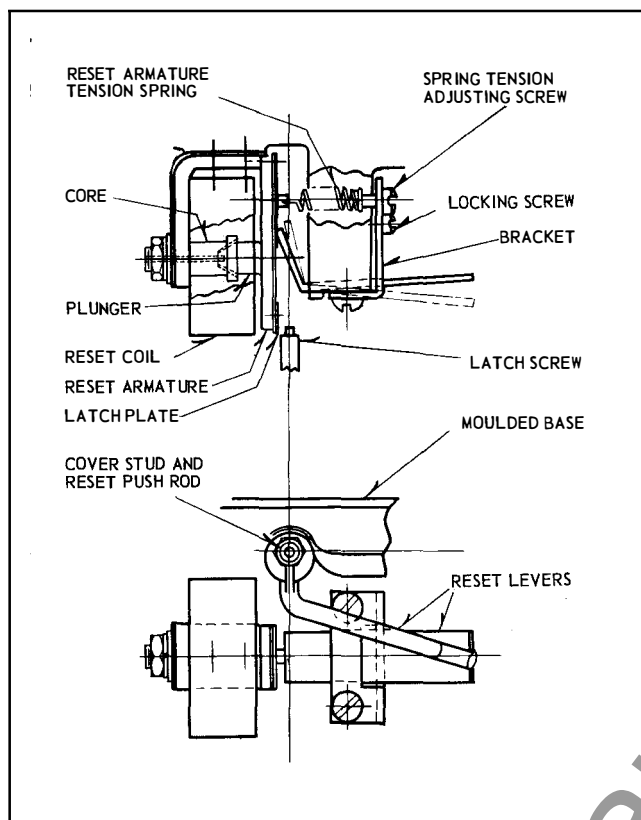


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

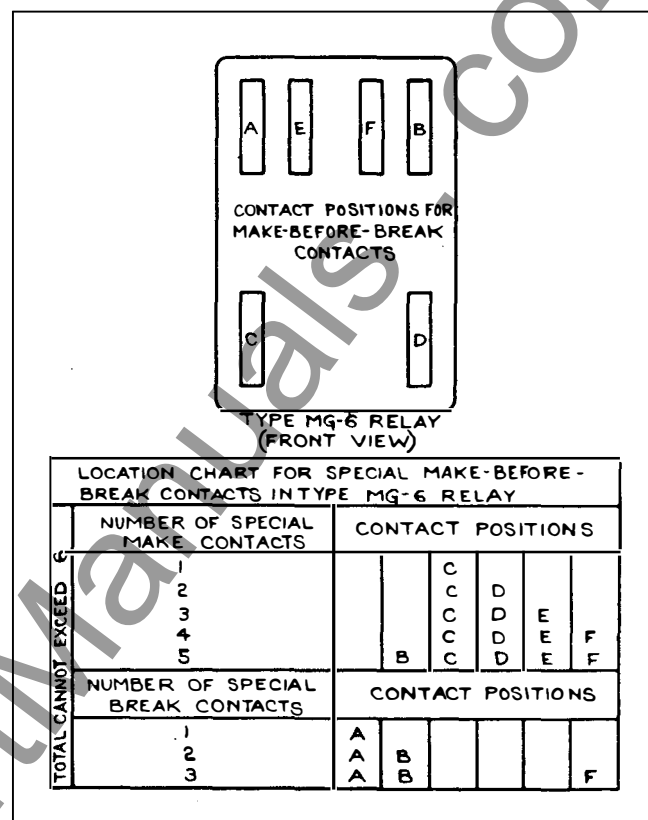


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

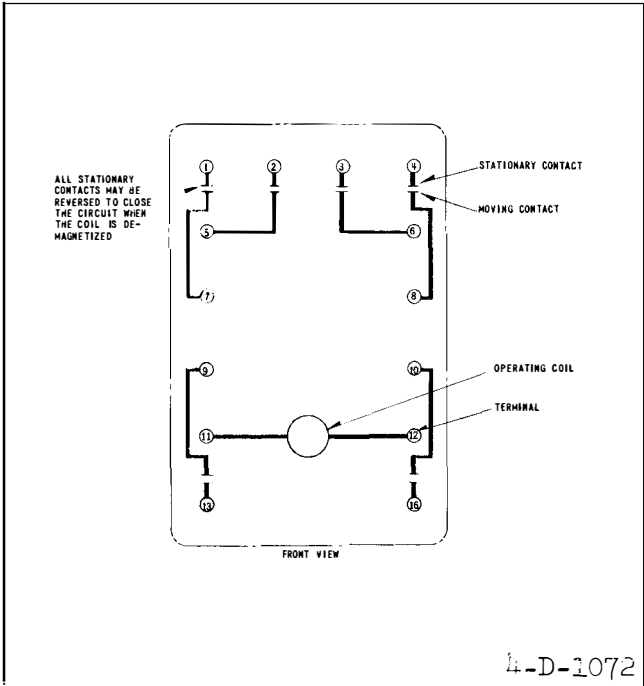


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

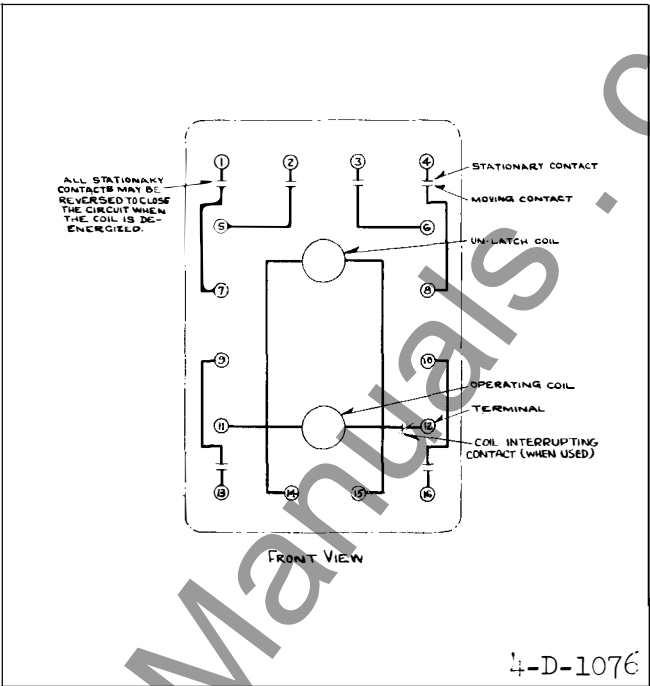


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles of 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

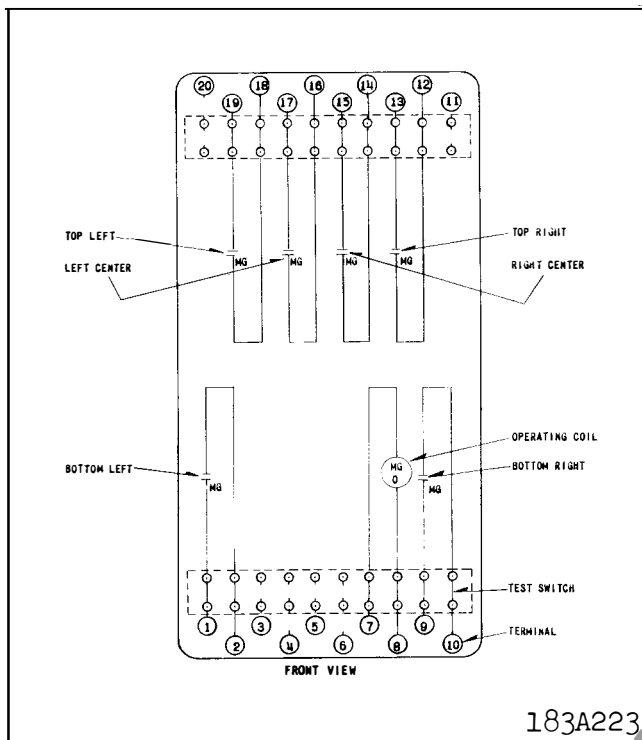


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

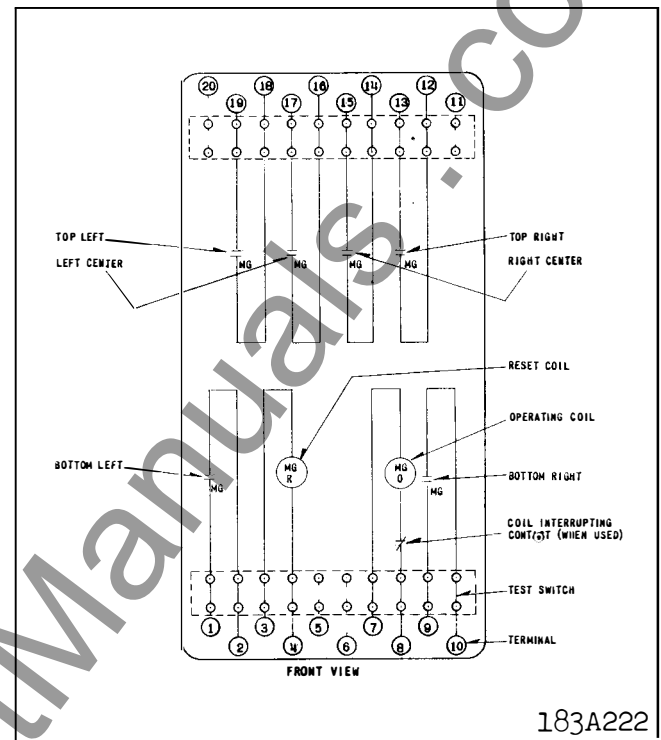


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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 elec-

trical 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.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be

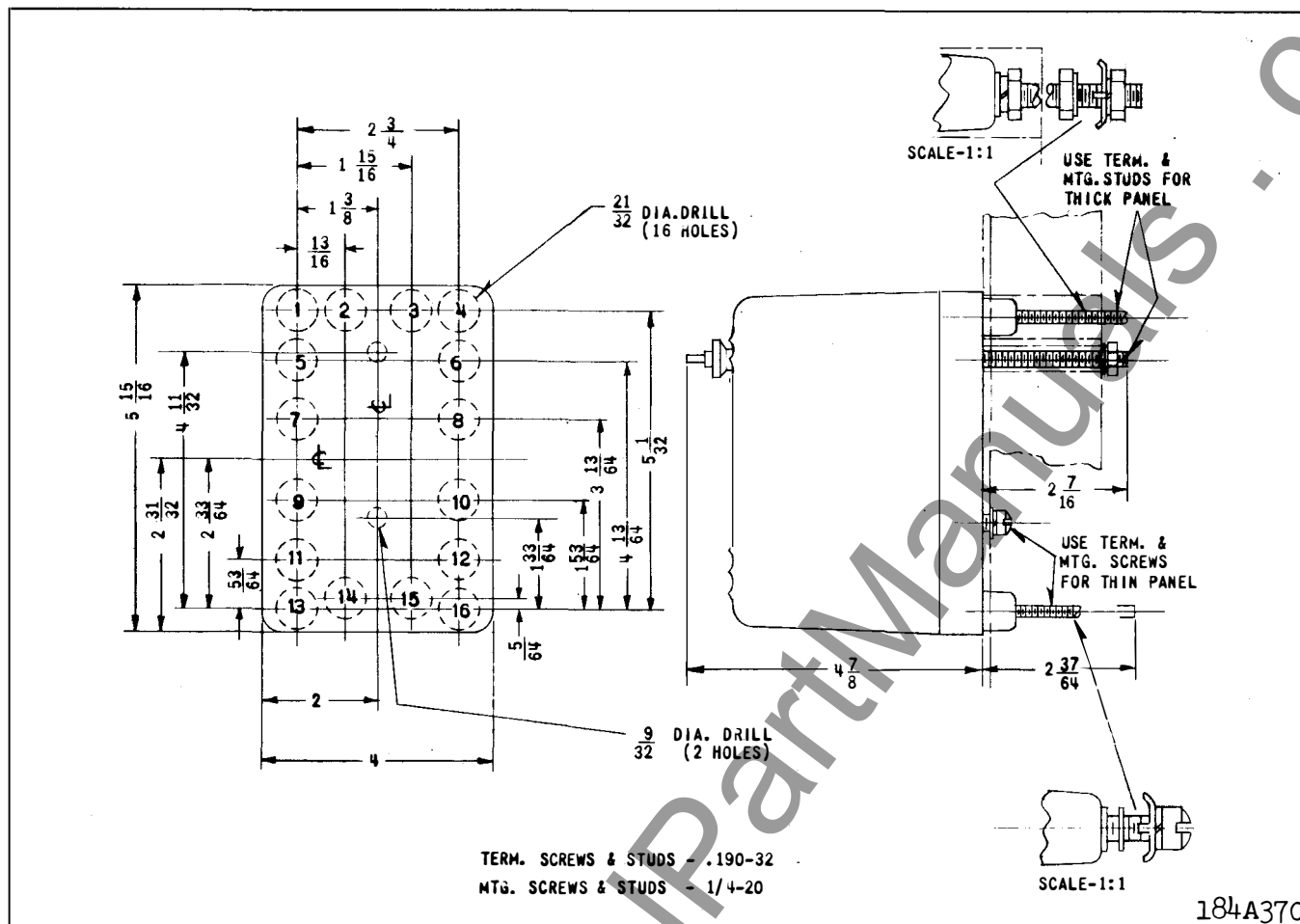


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to disturb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are

* maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that when the armature is in contact with it the lower edge of the armature is 7/16" above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with

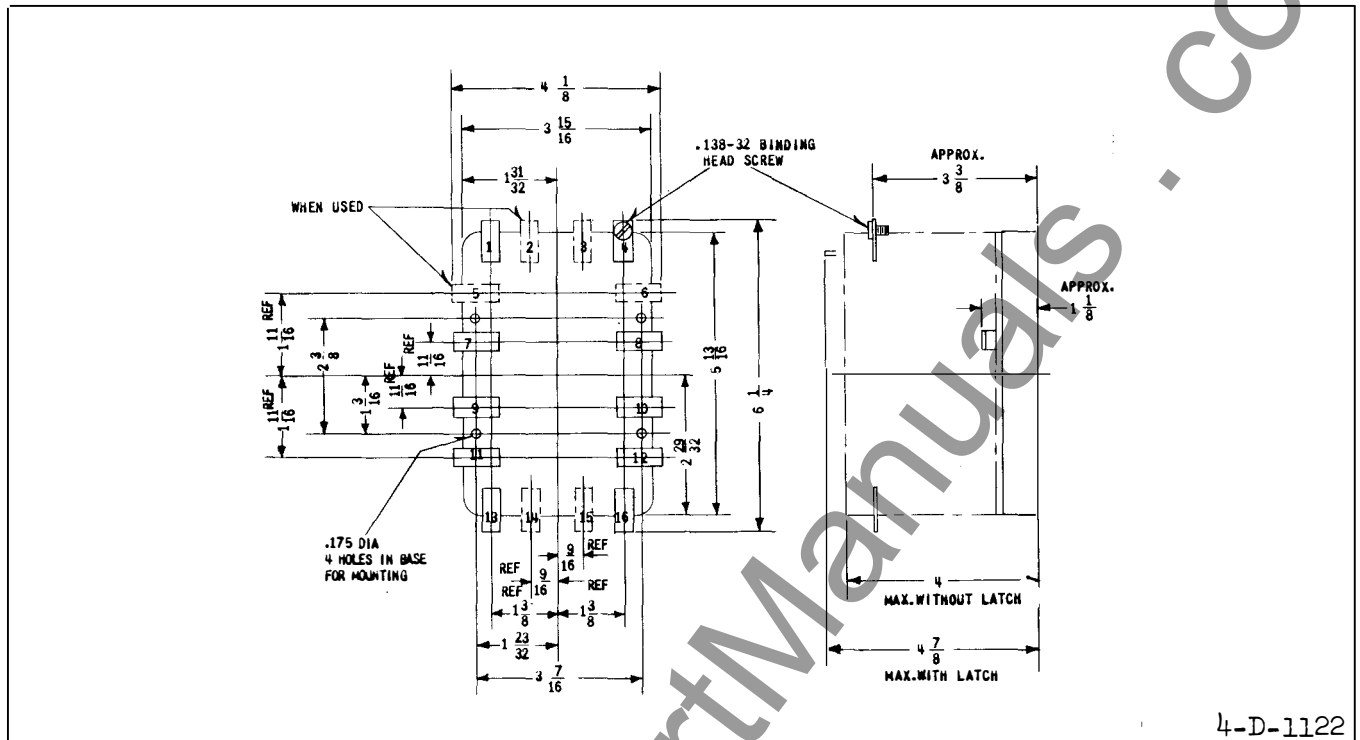


Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

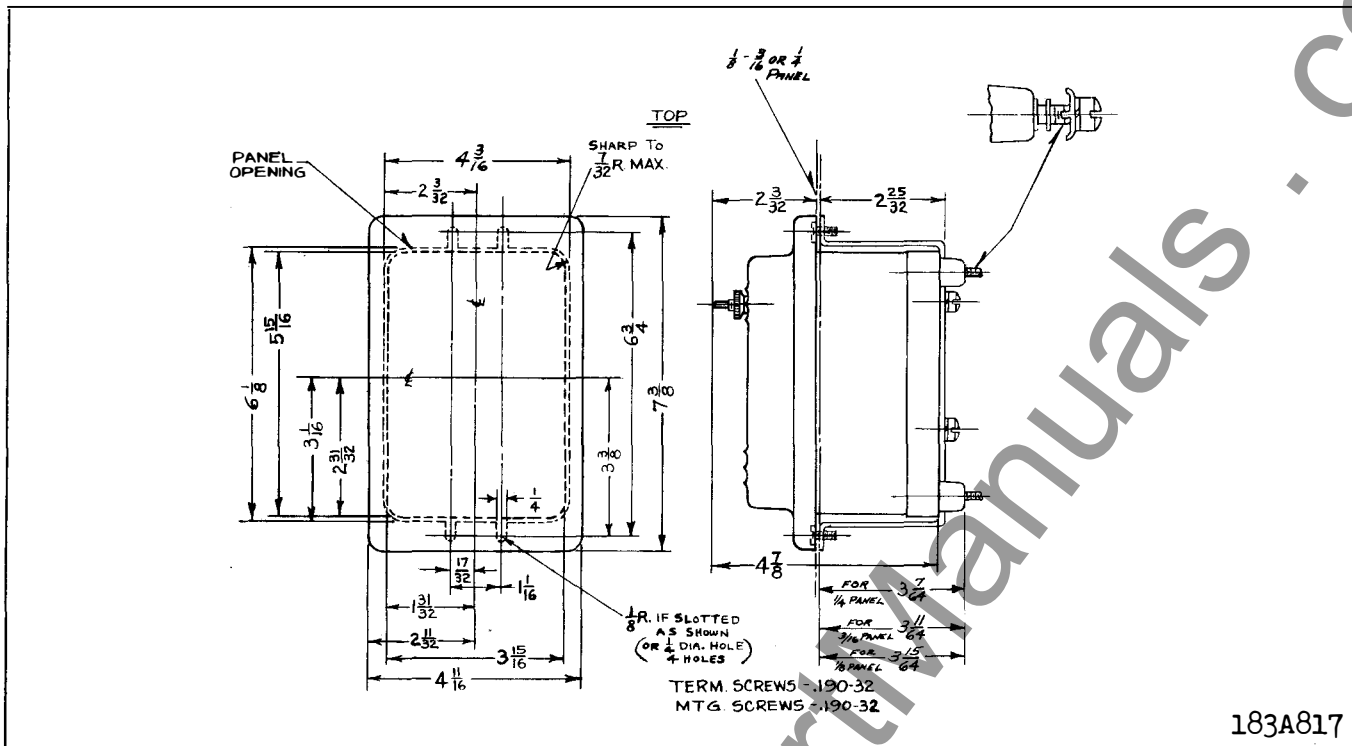
all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The

positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments



specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .010 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .005 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 5 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .020 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

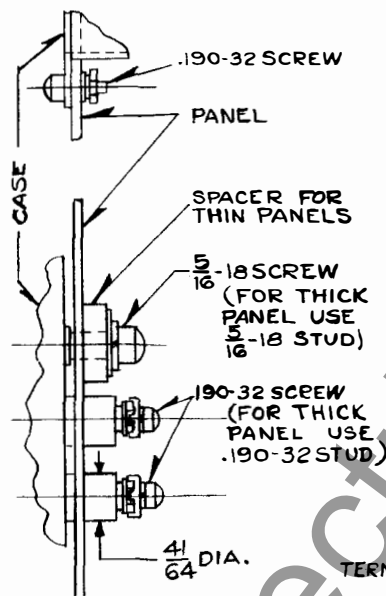
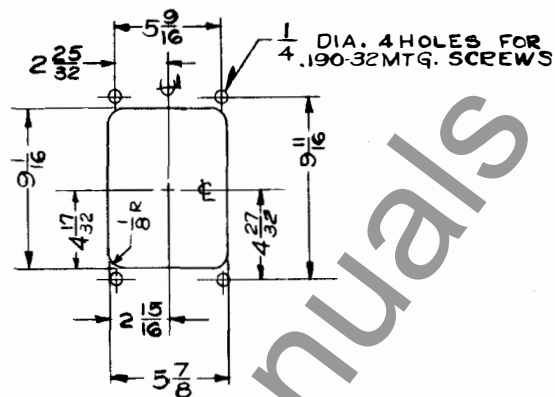
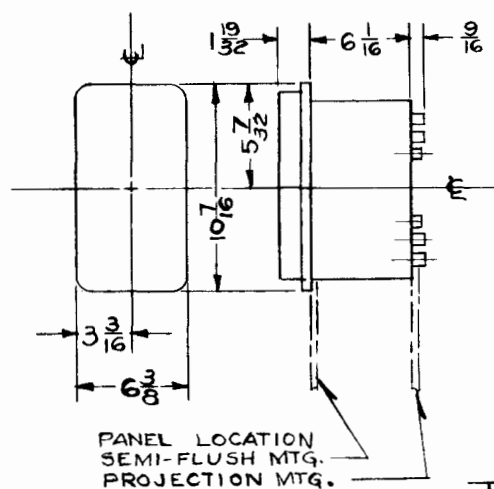
Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

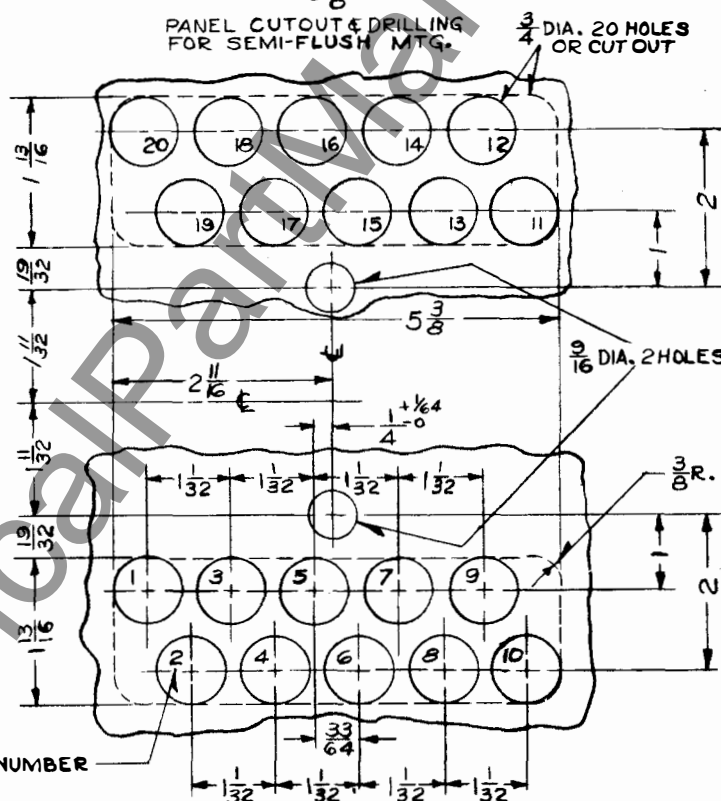
△ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	



NOTE: ALL DIMENSIONS
IN INCHES



183A158

Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay In Type FT22 Case.

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RELAY DEPARTMENT

NEWARK, N. J.

Printed in U. S. A.



INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1E

*Denotes change from superseded issue.

EFFECTIVE JANUARY 1968

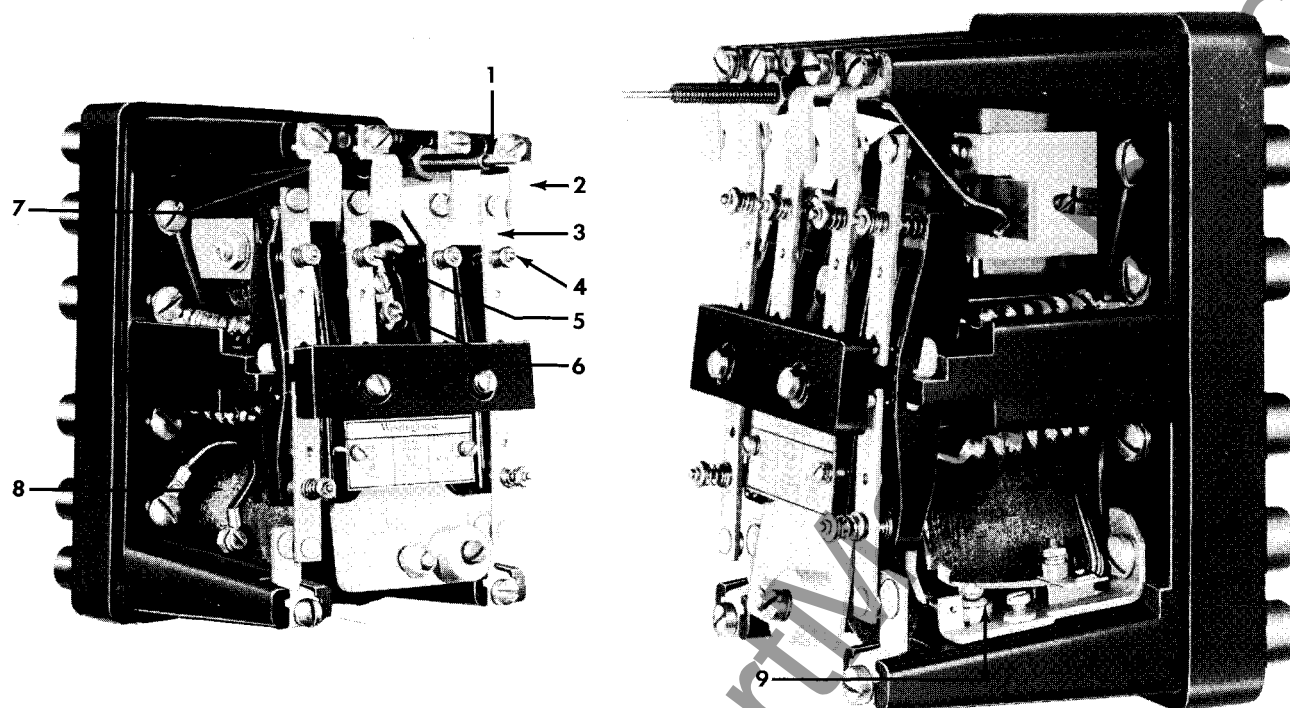


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

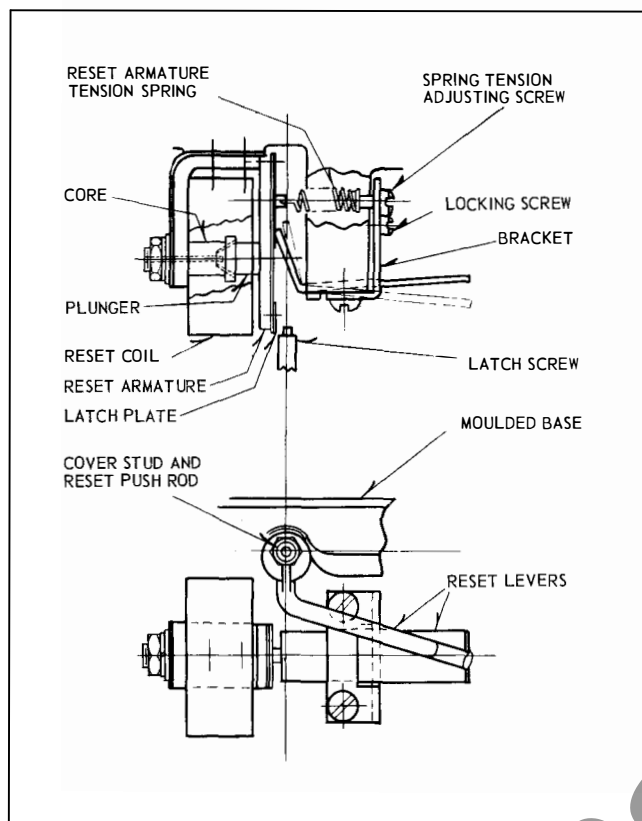


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

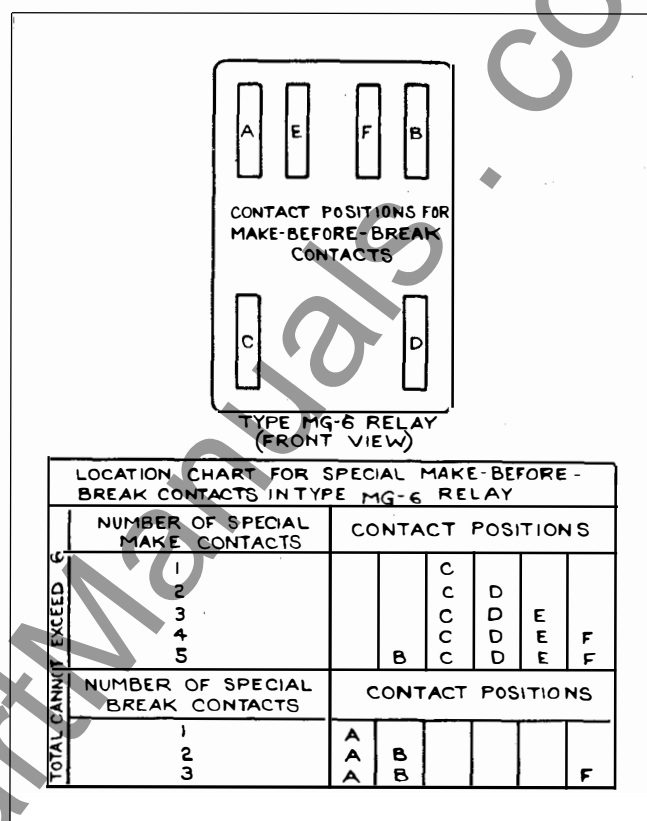


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

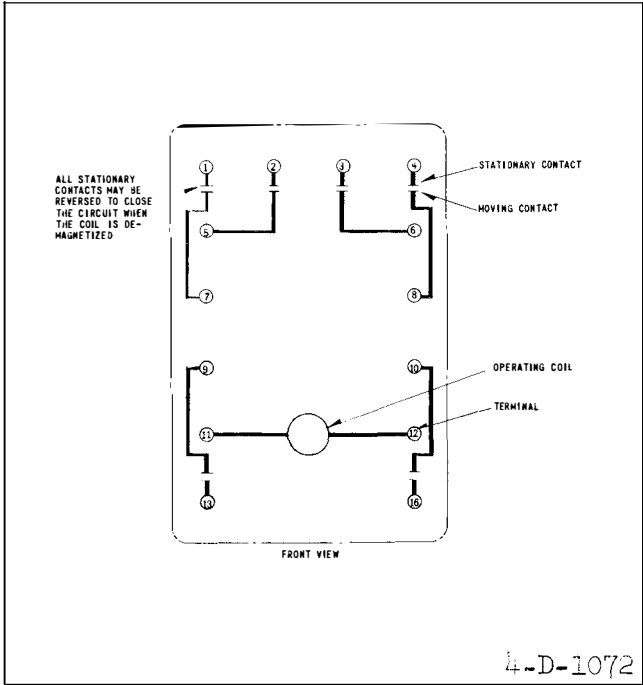


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the F'T22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

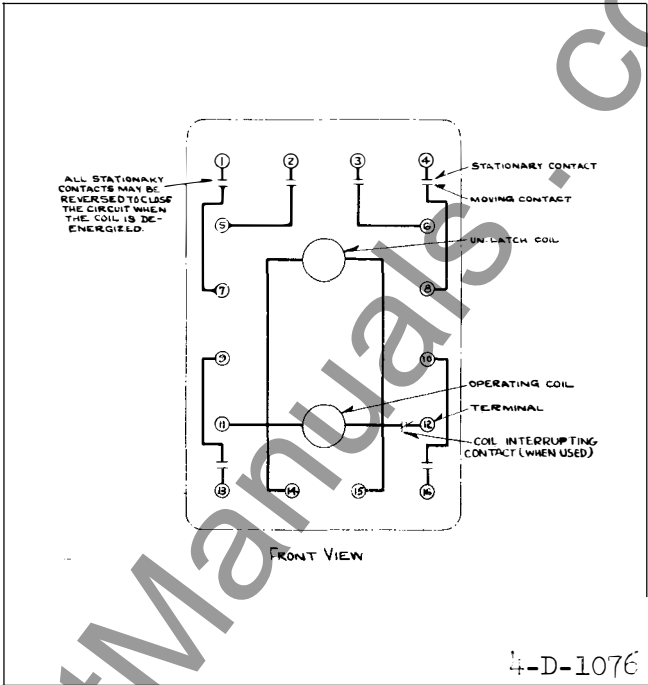


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed;

Current	Volts A-C
30	115
20	230
15	460
10	575

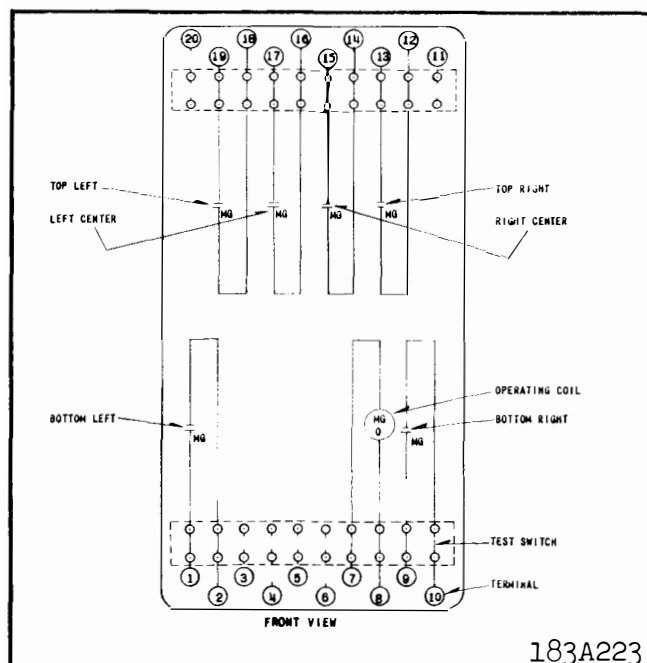


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

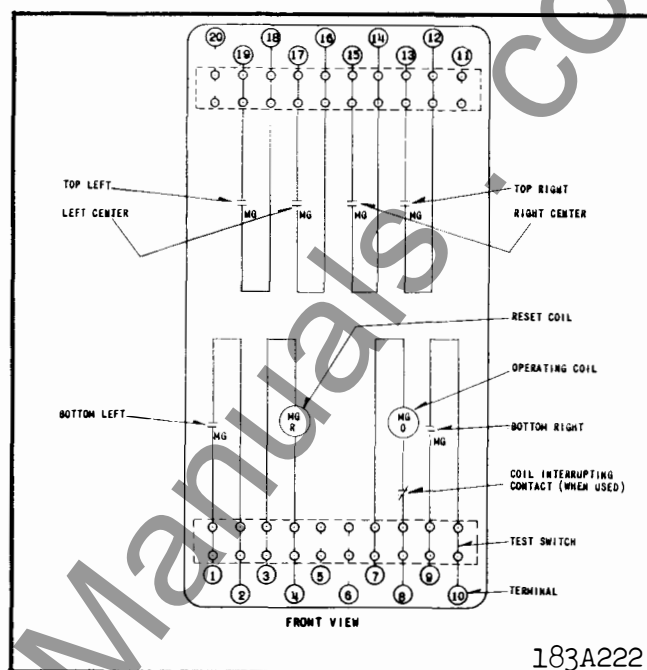


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

For detailed F'T case information refer to I.L. 41-076.

*

Coil Resistance (at 25° C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208

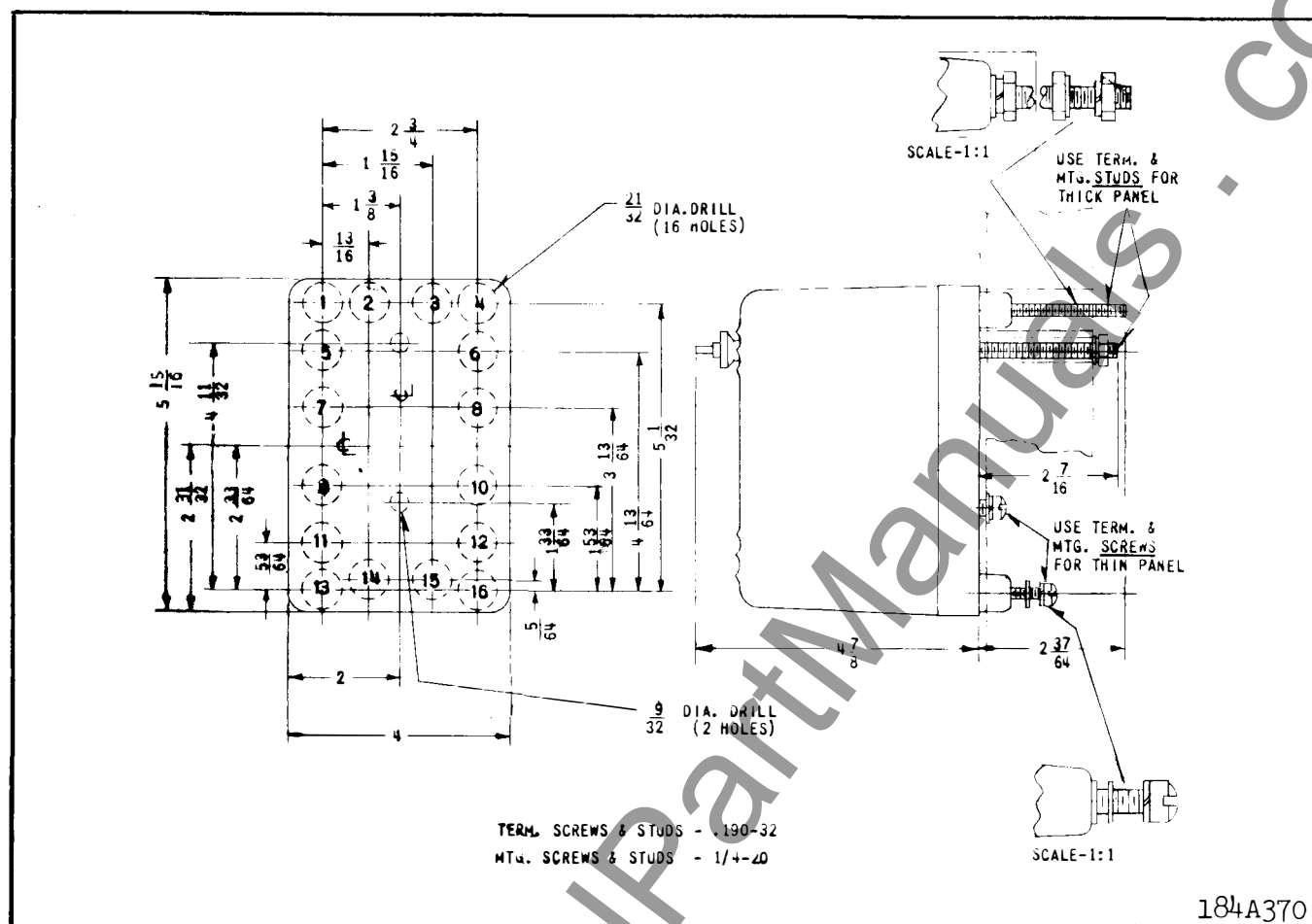


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

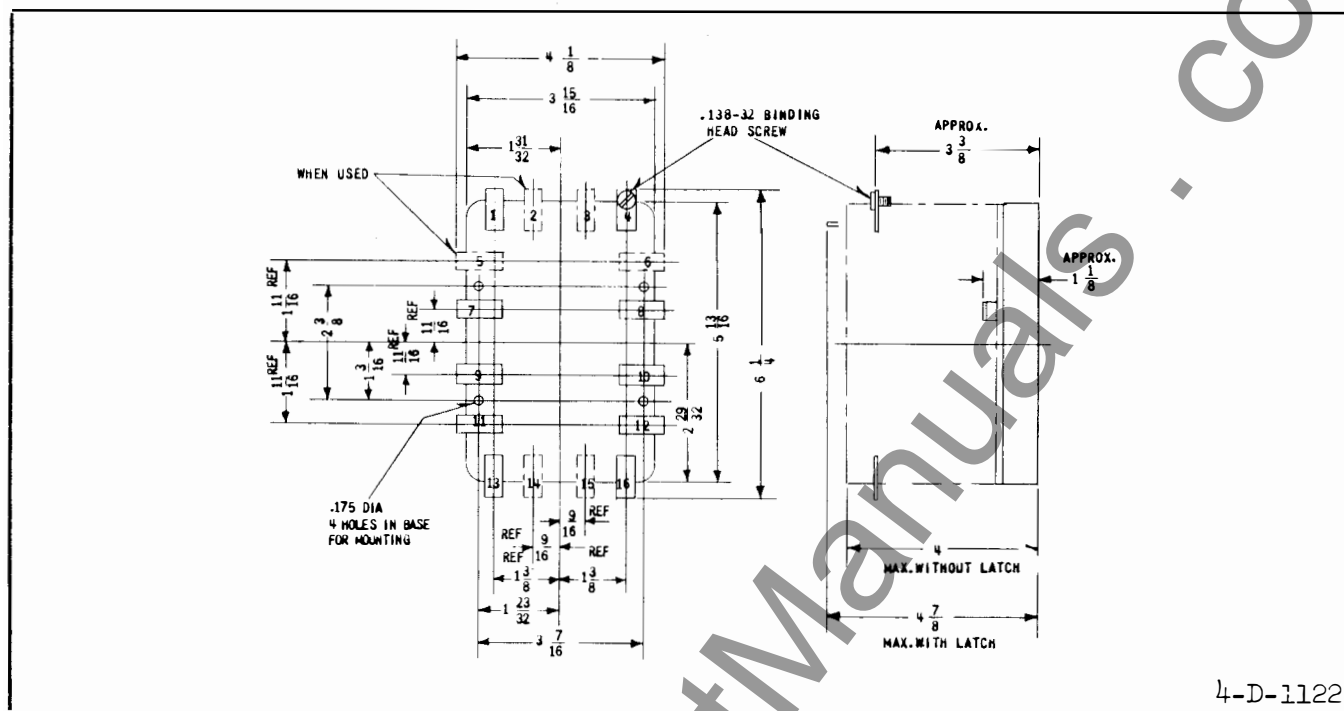
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



4-D-1122

Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

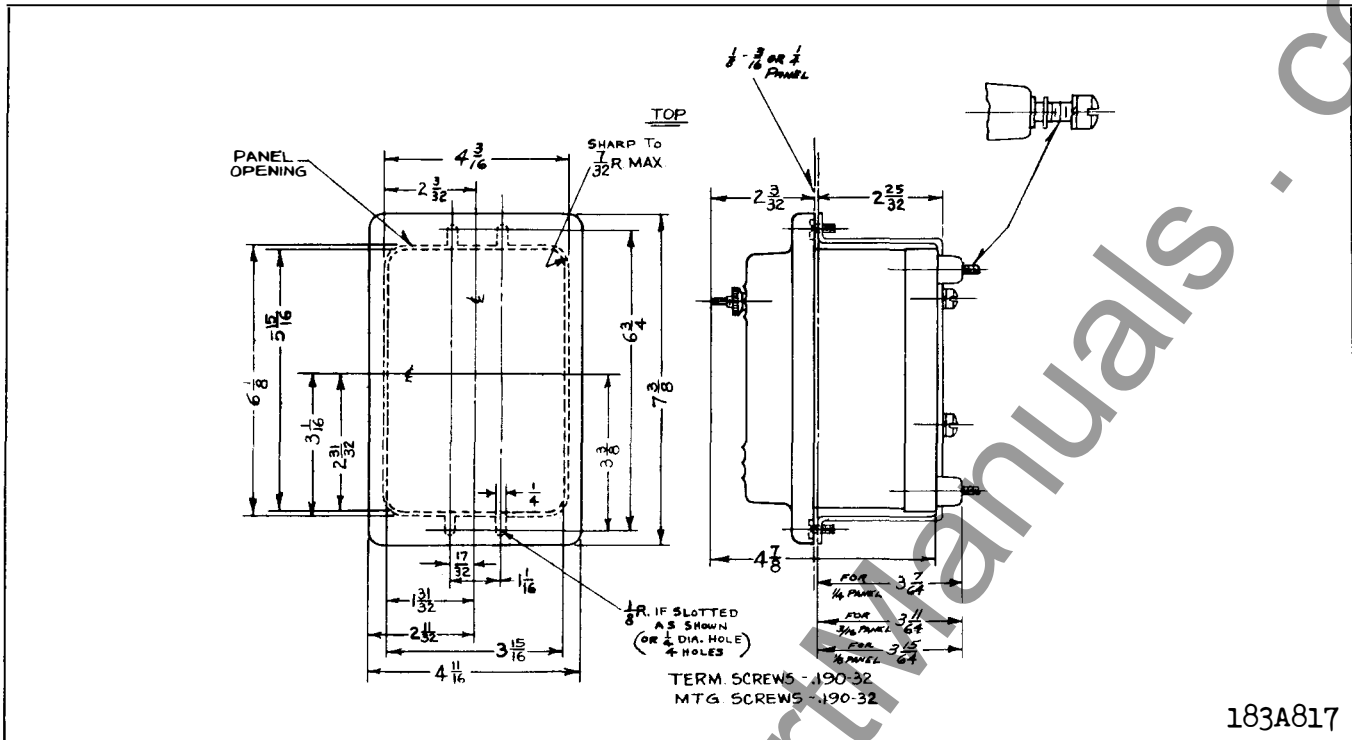


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearings carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand

* edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the * electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

△ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	

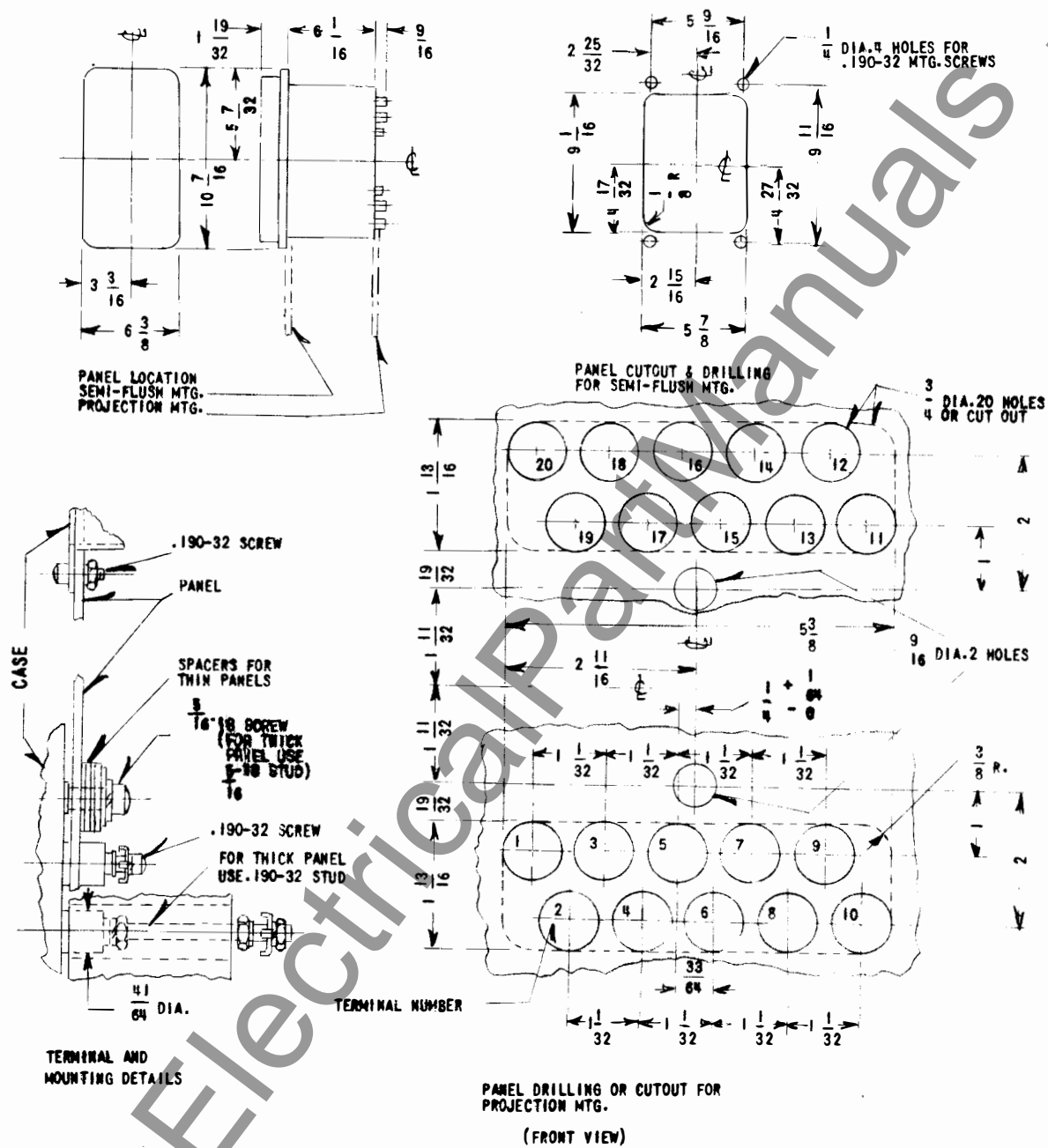


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION

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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see "ADJUSTMENTS AND MAINTENANCE") it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

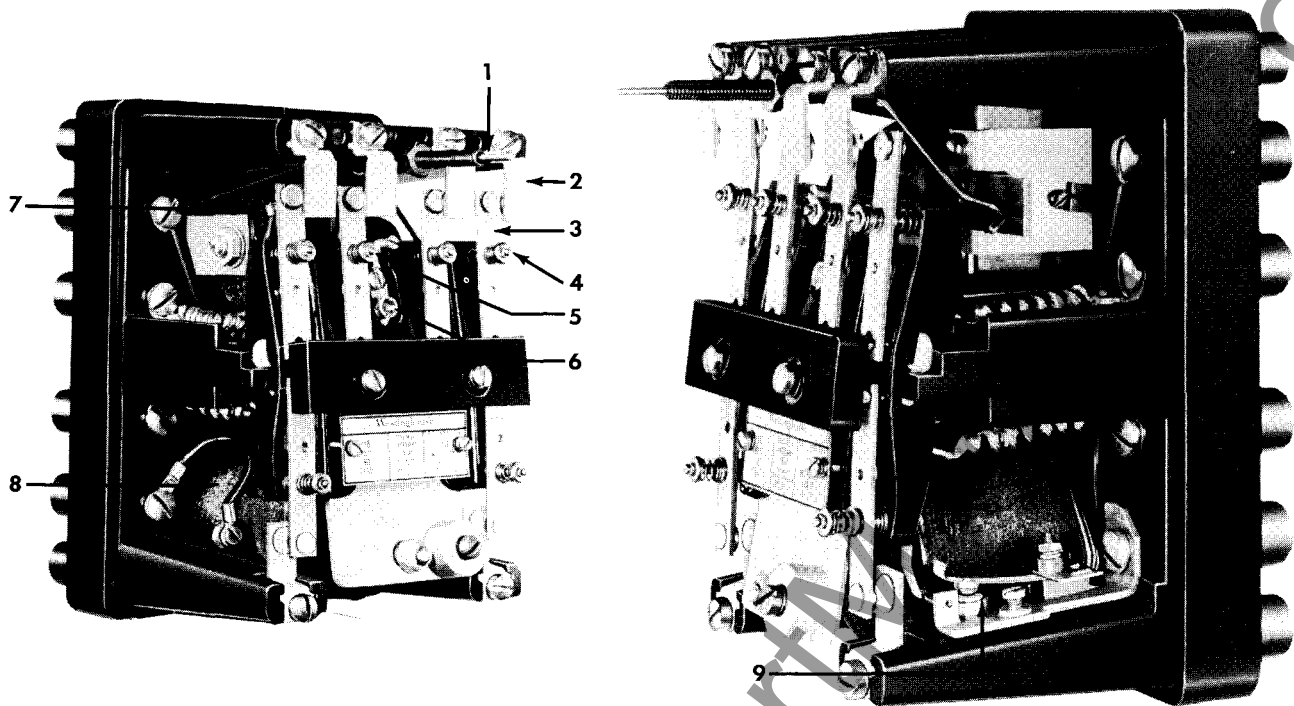


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 — Reset push rod, 2 — stationary contact, 3 — moving contact, 4 — moving contact spring assembly, 5 — latch adjustment screw, 6 — adjusting screw for armature spring tension, 7 — reset coil, 8 — operating coil, 9 — optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

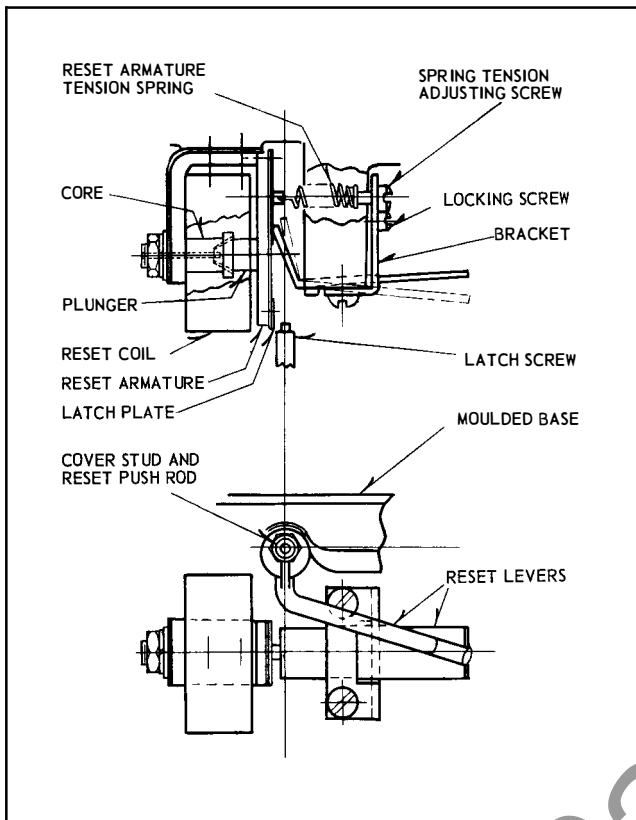


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

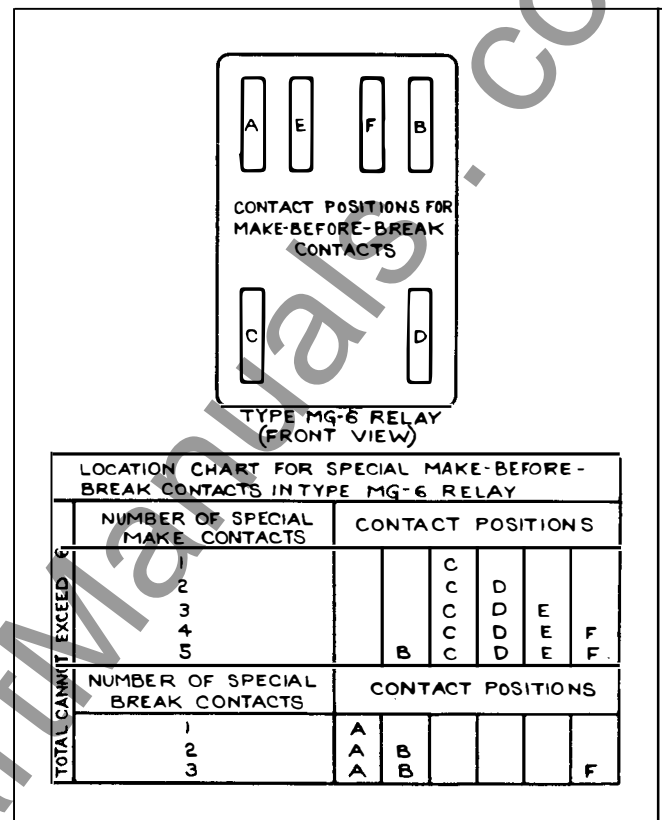


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

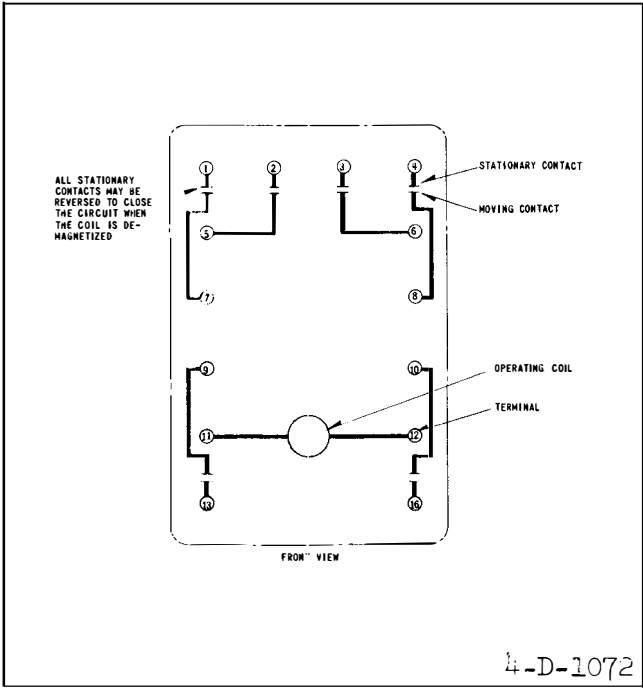


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

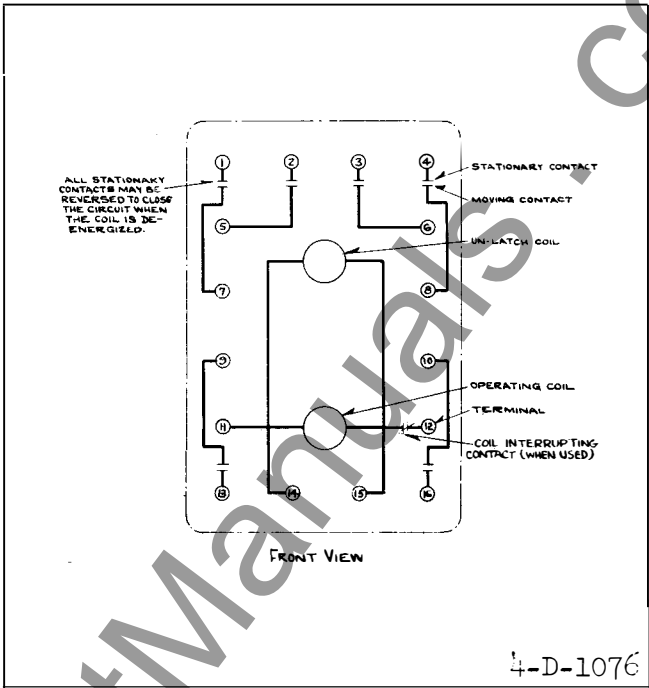


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

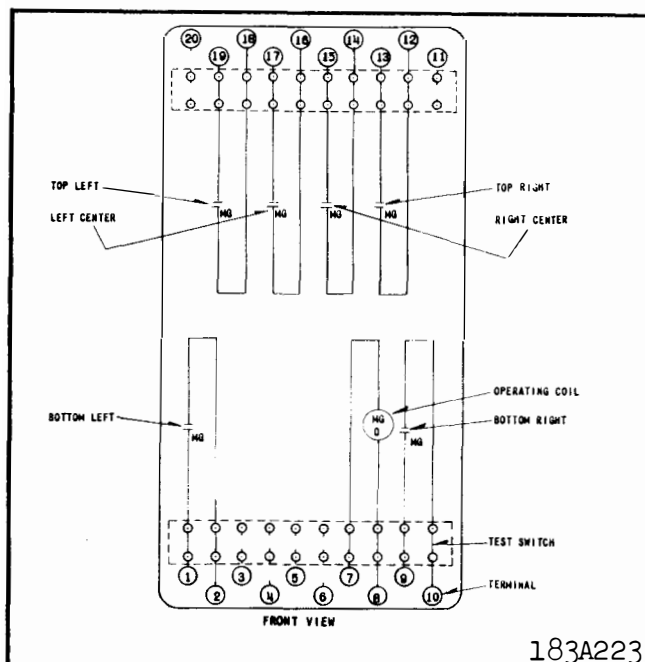


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

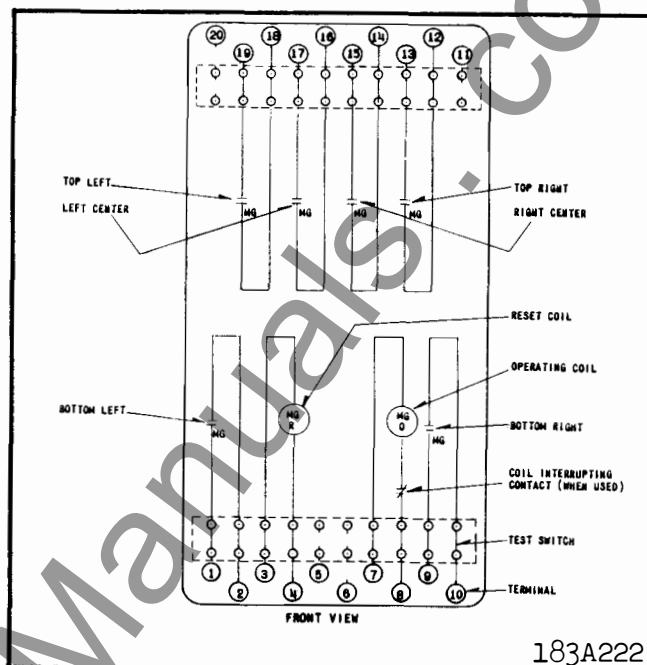


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

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

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

*

Coil Resistance (at 25°C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208

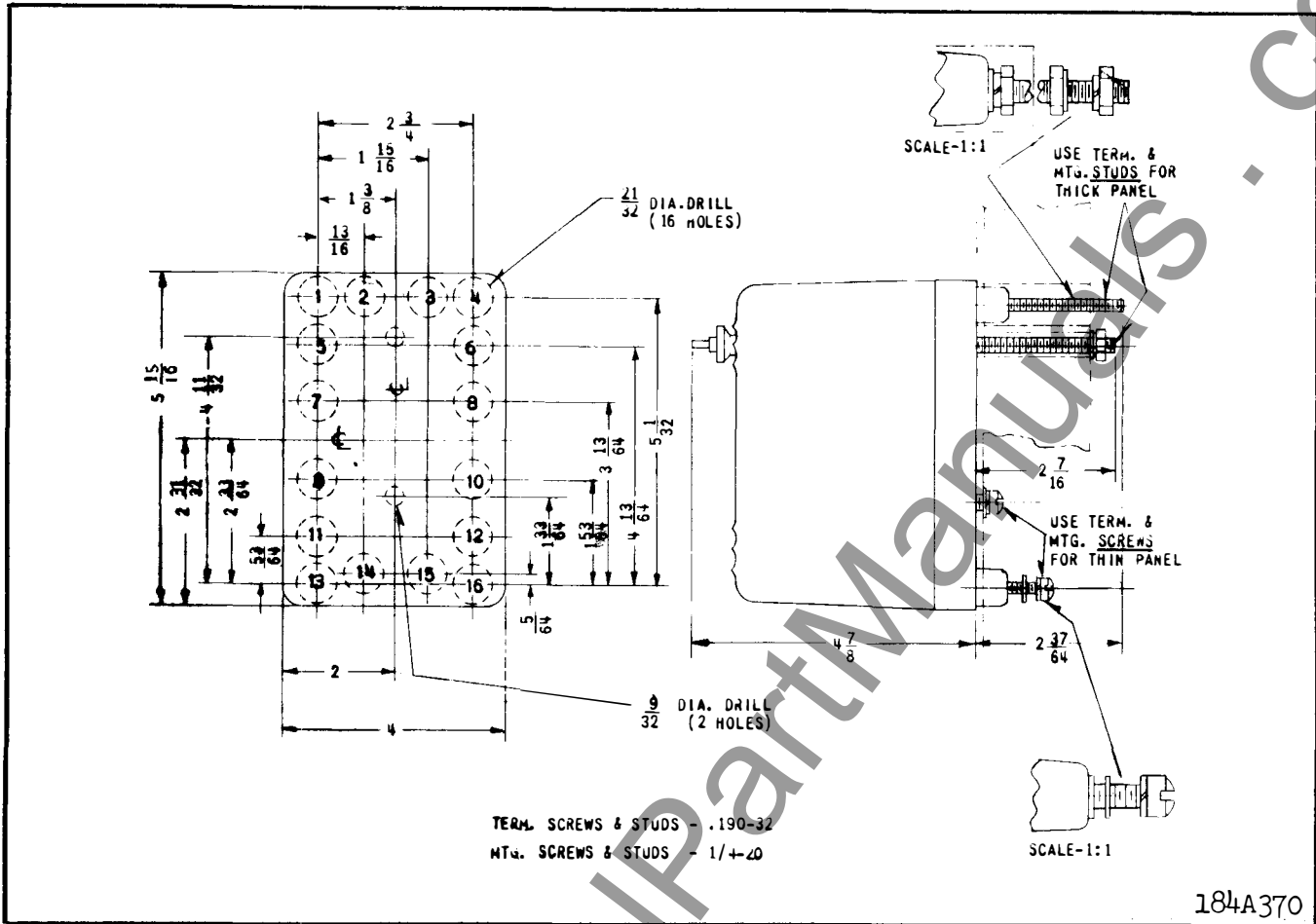


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

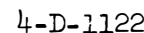
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately 1/16" follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about 1/16". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

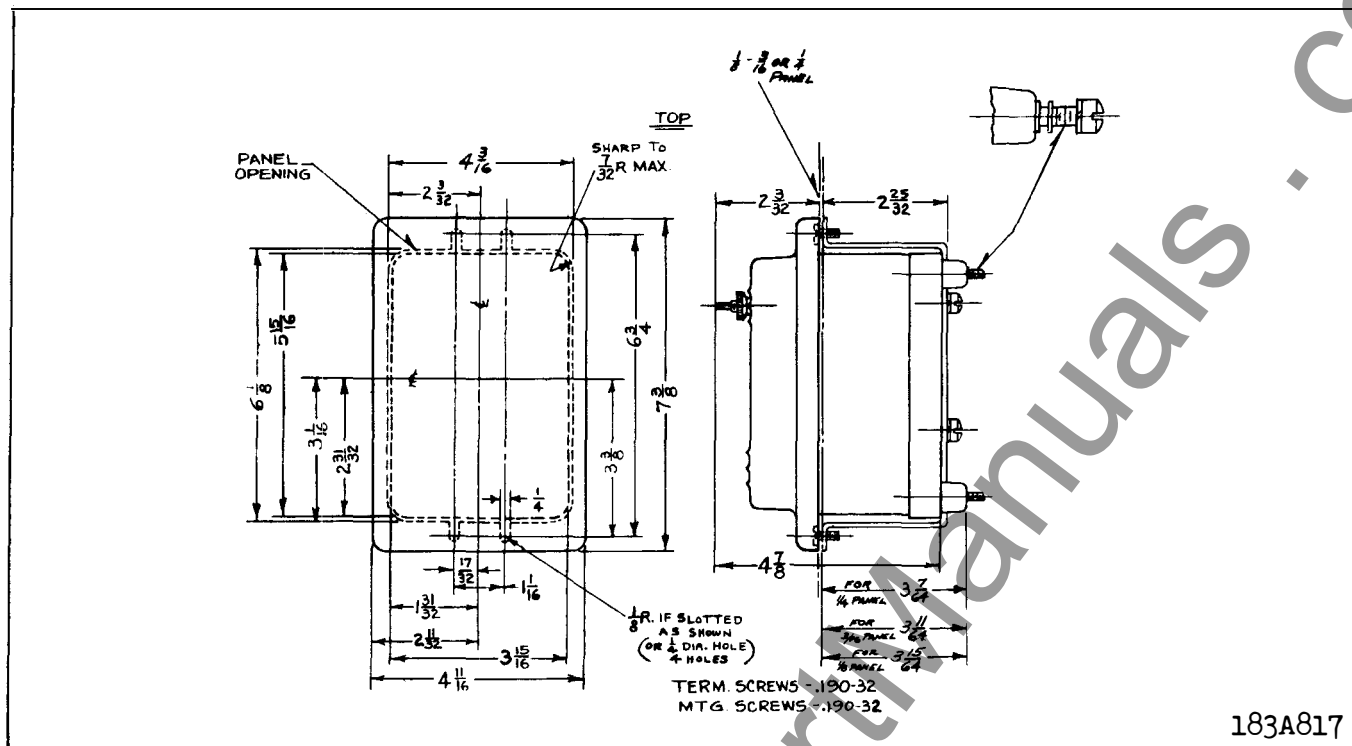


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specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 * and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw * should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand

* edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the * electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND RENEWAL PARTS

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ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

Δ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	

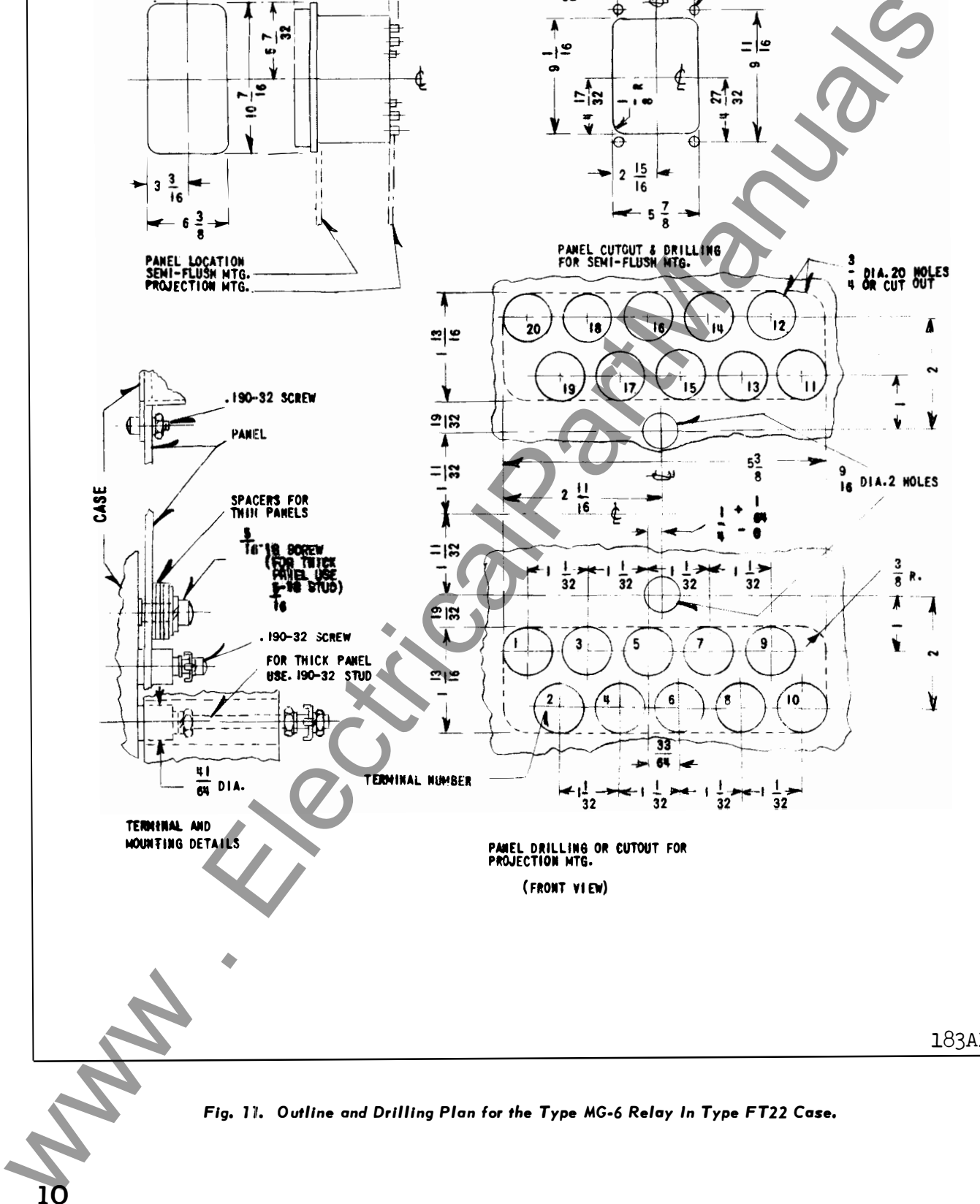


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay In Type FT22 Case.

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RELAY-INSTRUMENT DIVISION

NEWARK, N. J.

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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1E

*Denotes change from superseded issue.

EFFECTIVE JANUARY 1968

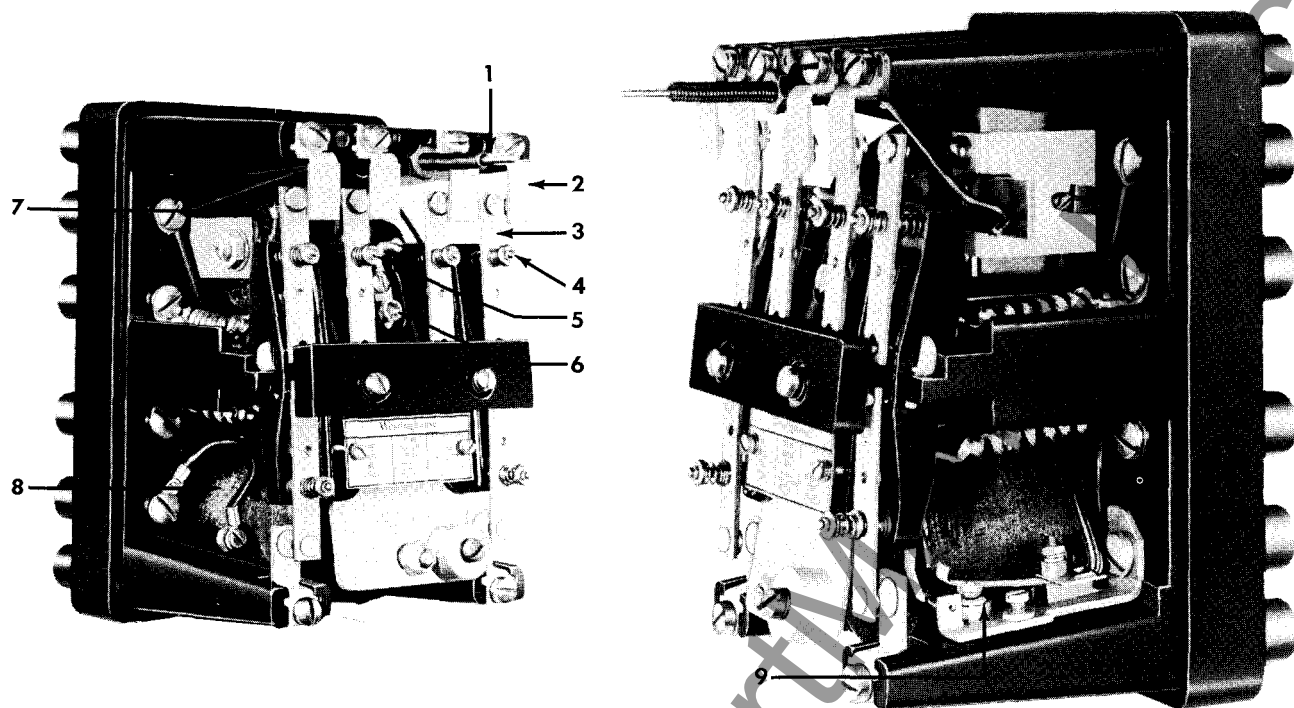


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch from the medium of the reset lever shown in the figure.

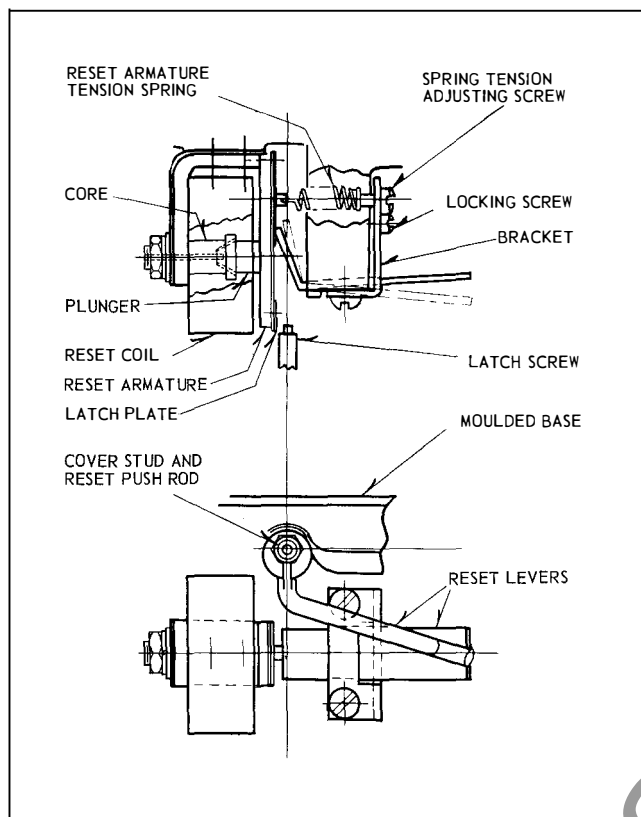


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

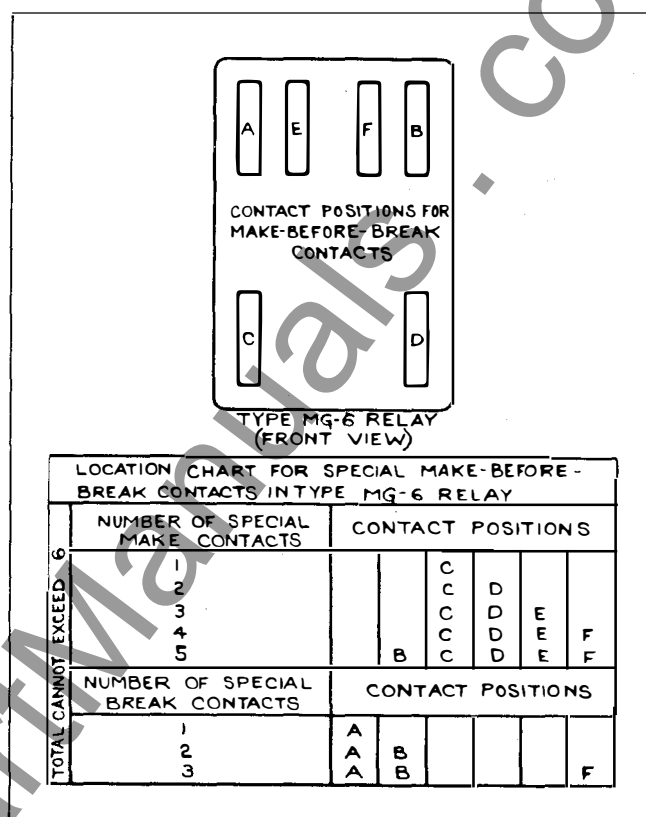


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

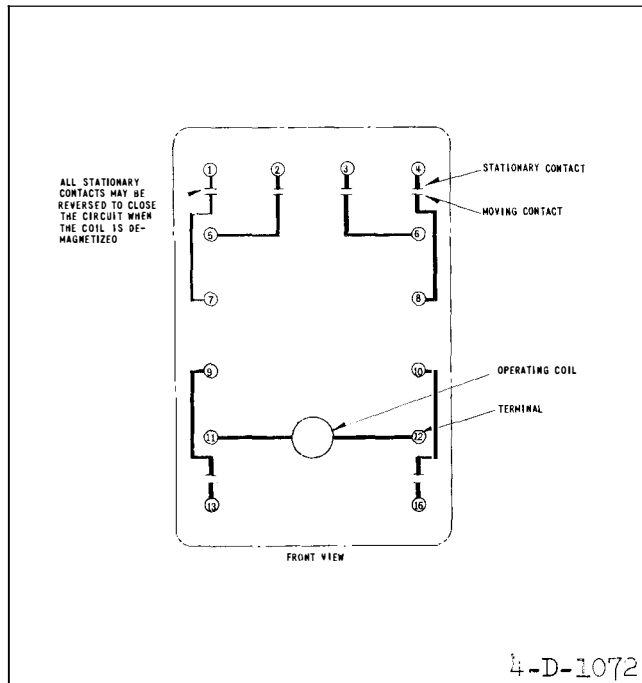


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

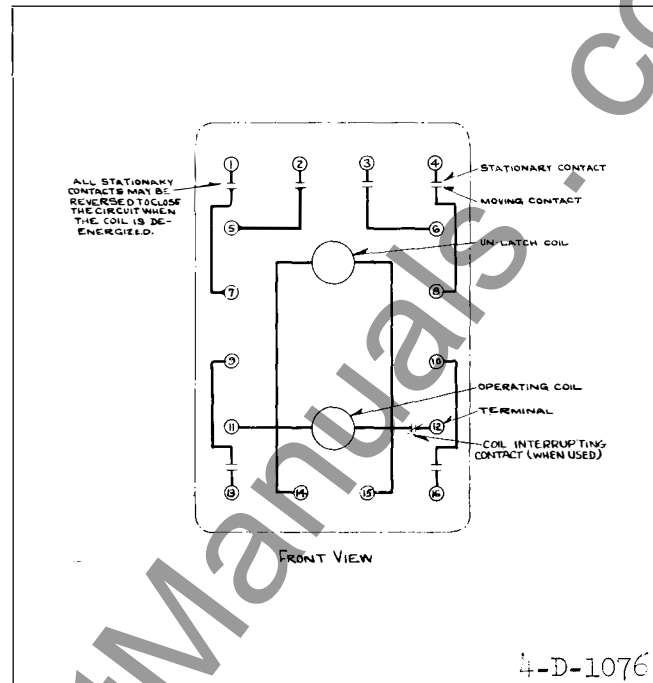


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

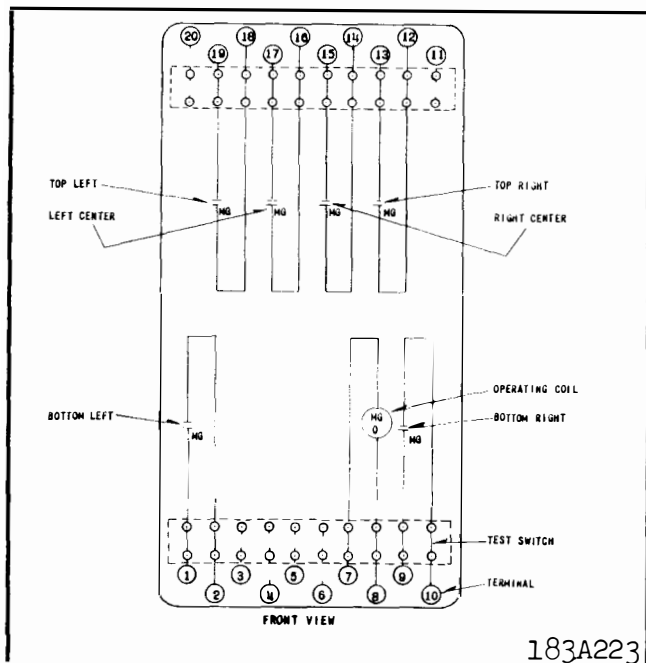


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

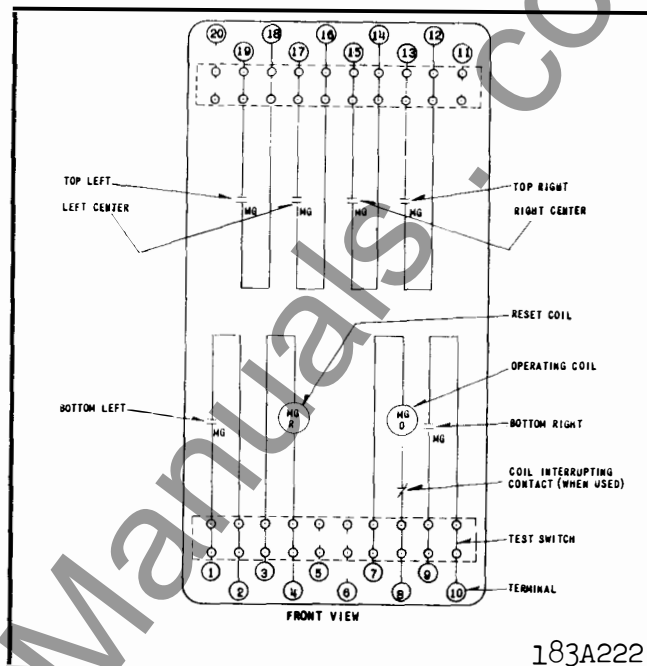


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

For detailed F'T case information refer to I.L. 41-076.

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

*

Coil Resistance (at 25°C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208

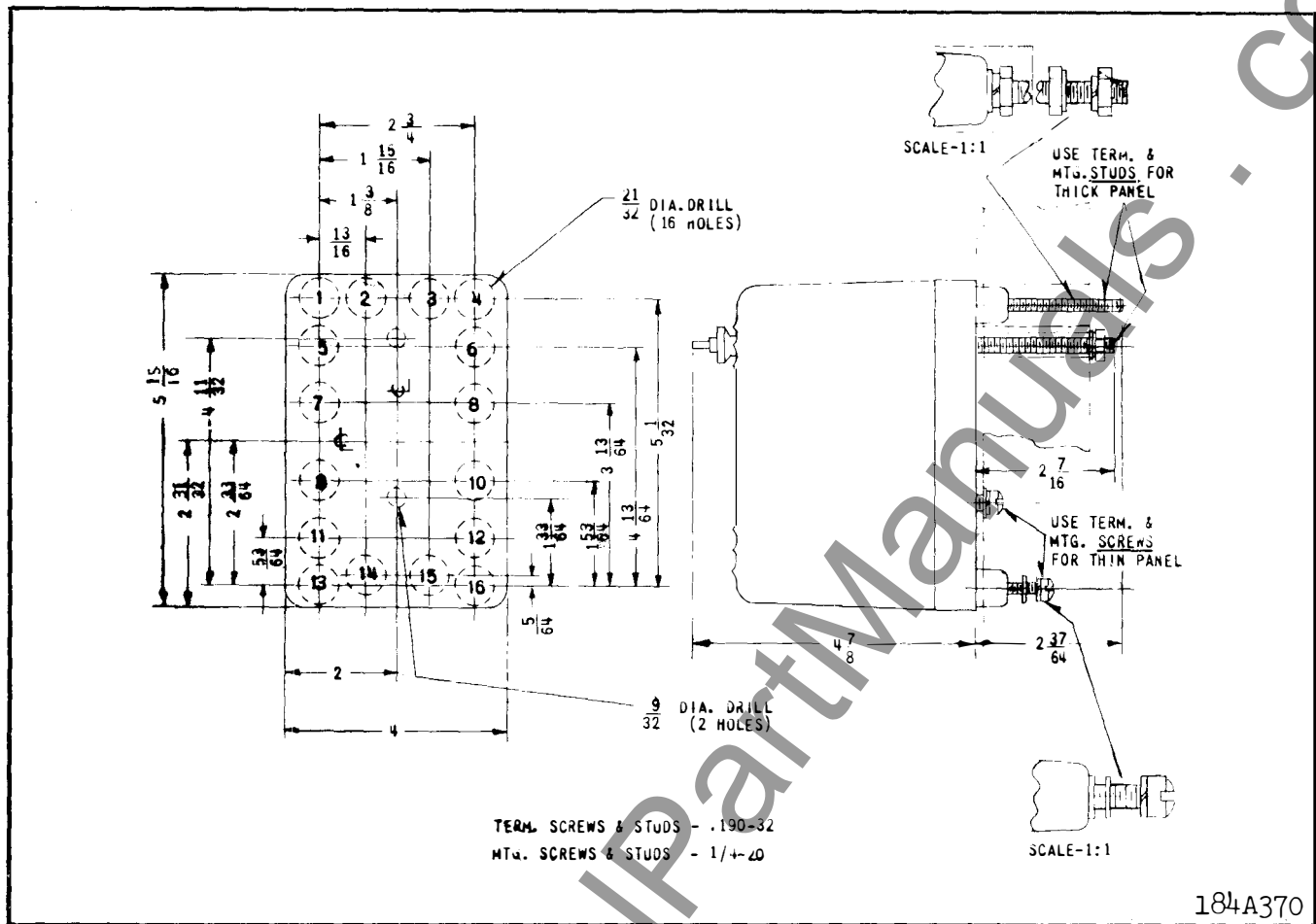


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that

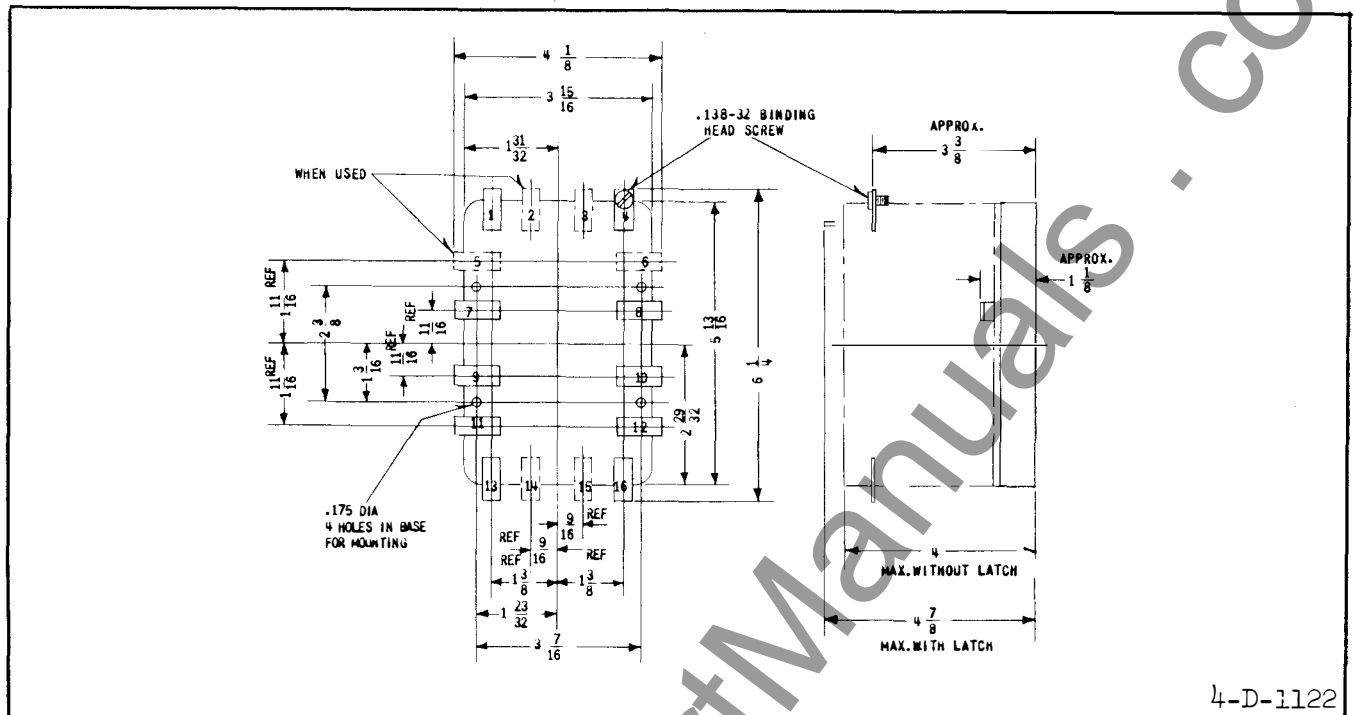


Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

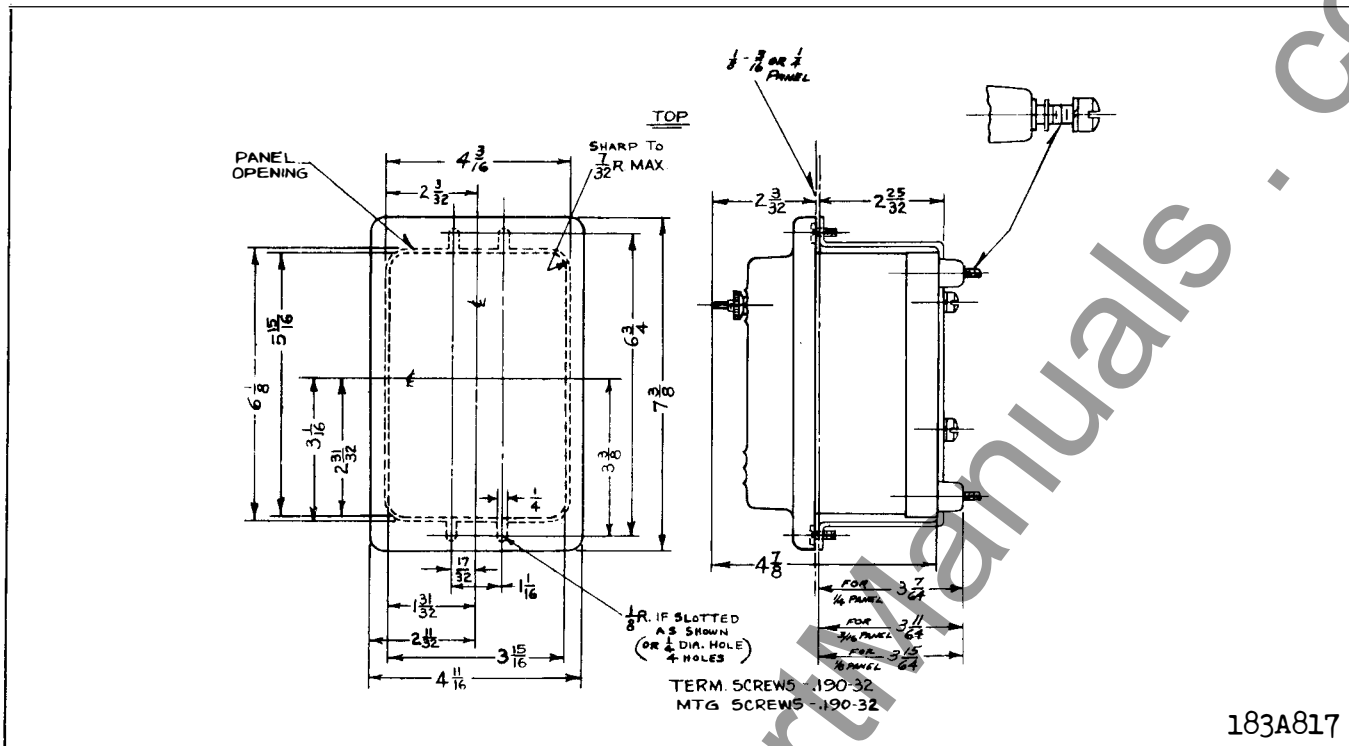


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand

* edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the * electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

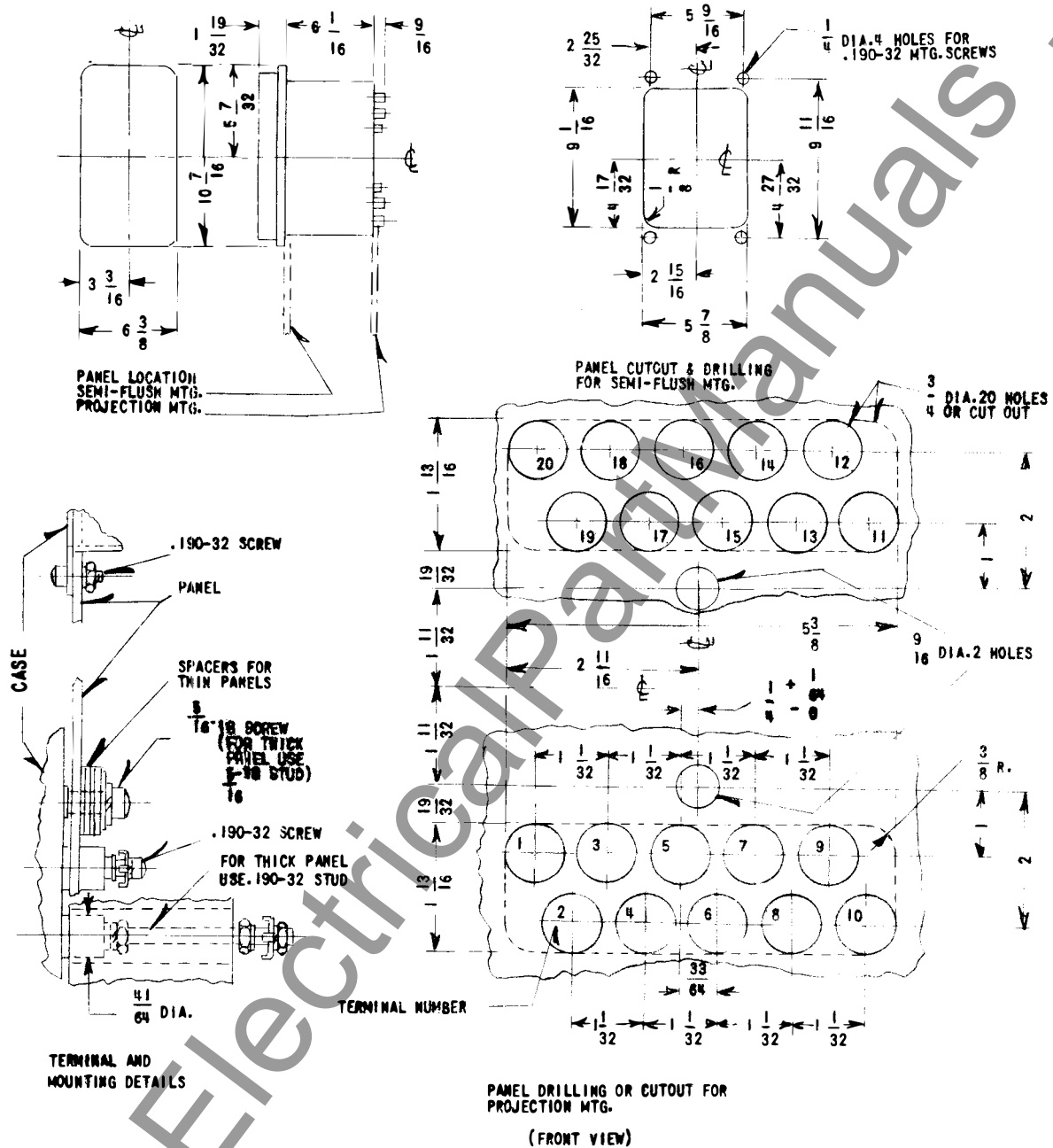
Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

Δ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	



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Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see "ADJUSTMENTS AND MAINTENANCE") it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

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CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

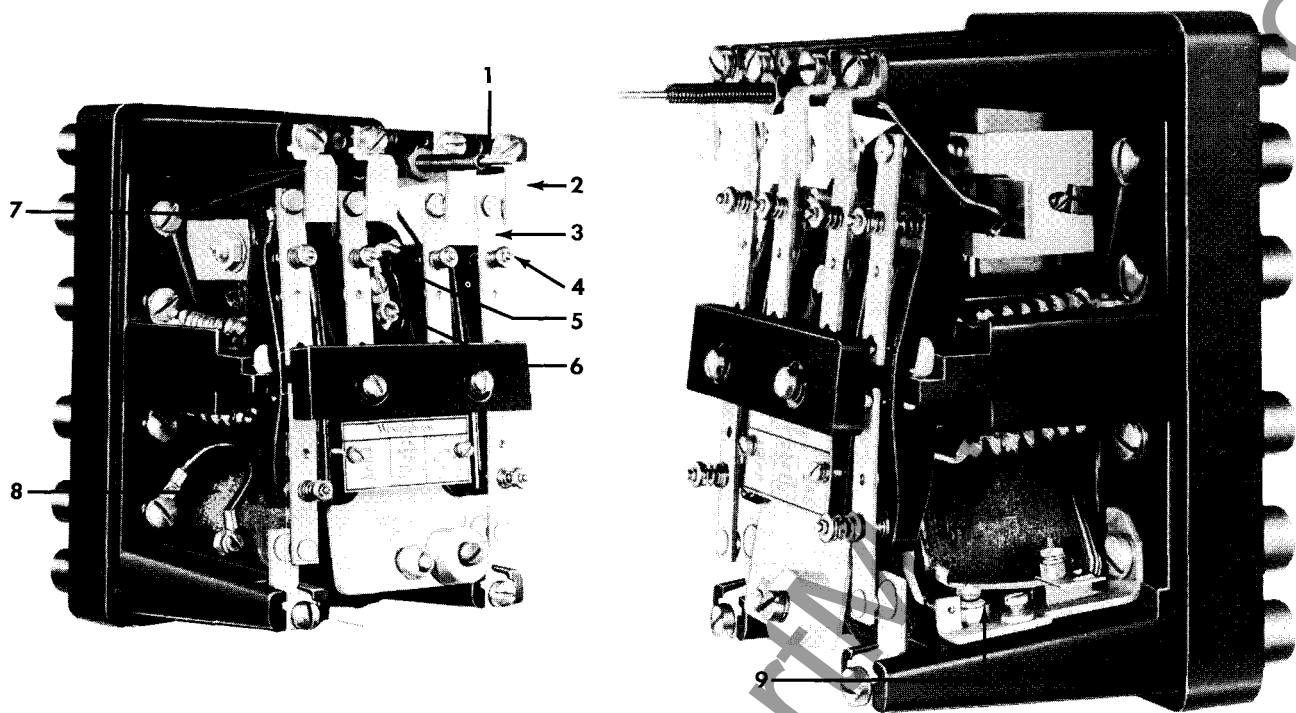


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

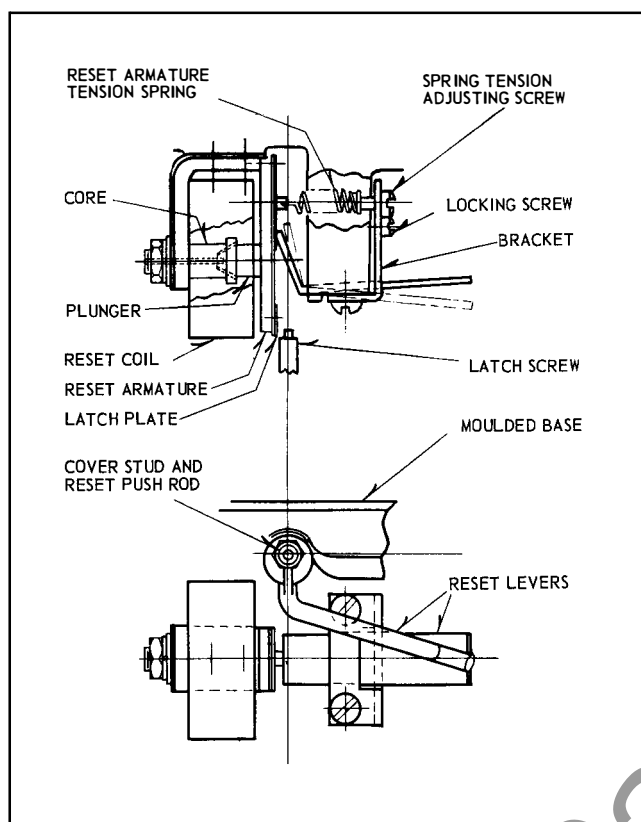


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

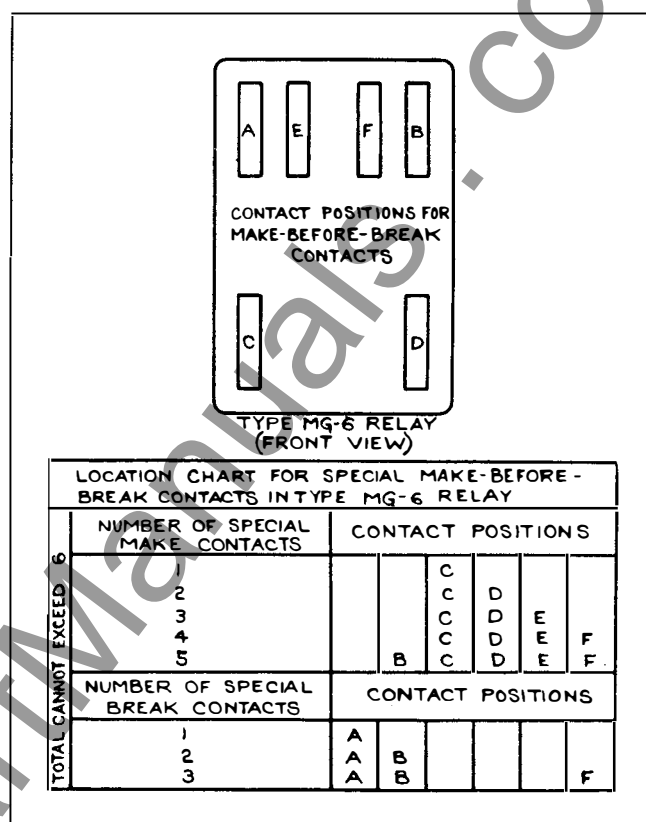


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

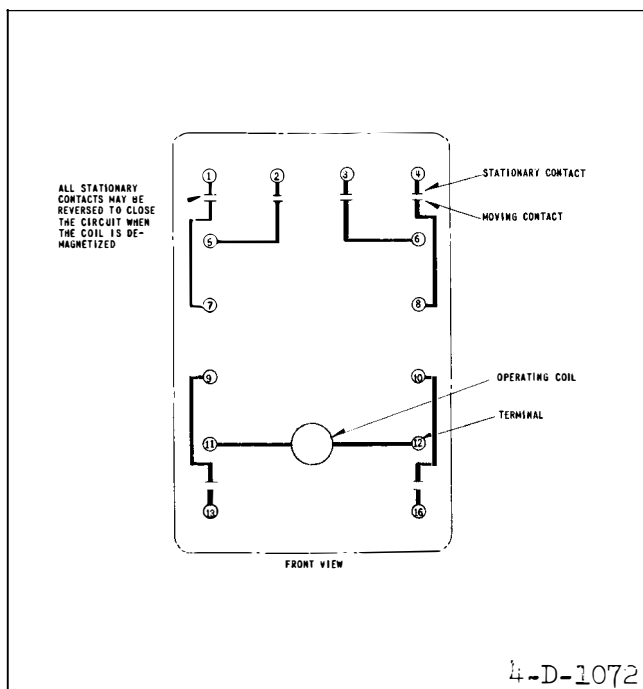


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

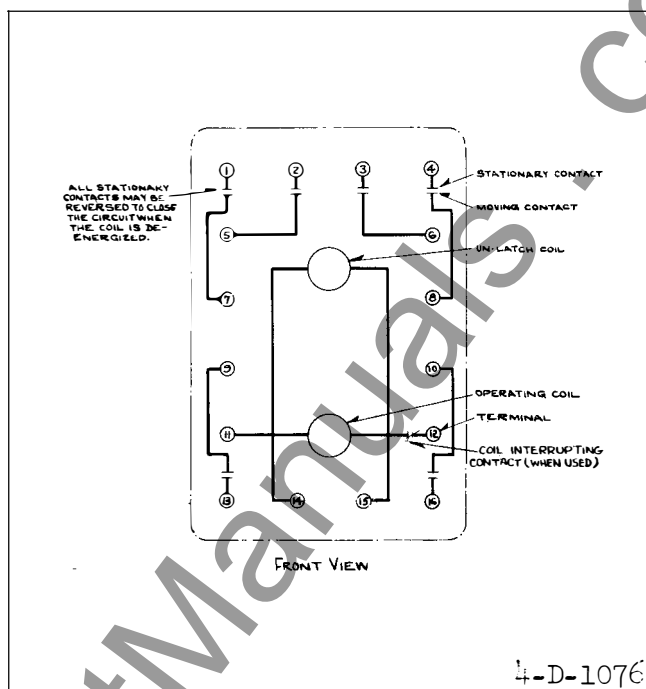


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the F'T22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

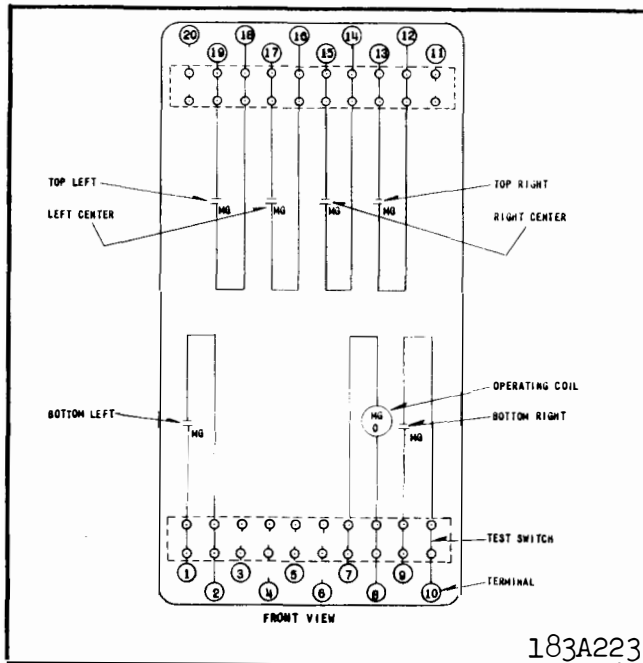


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

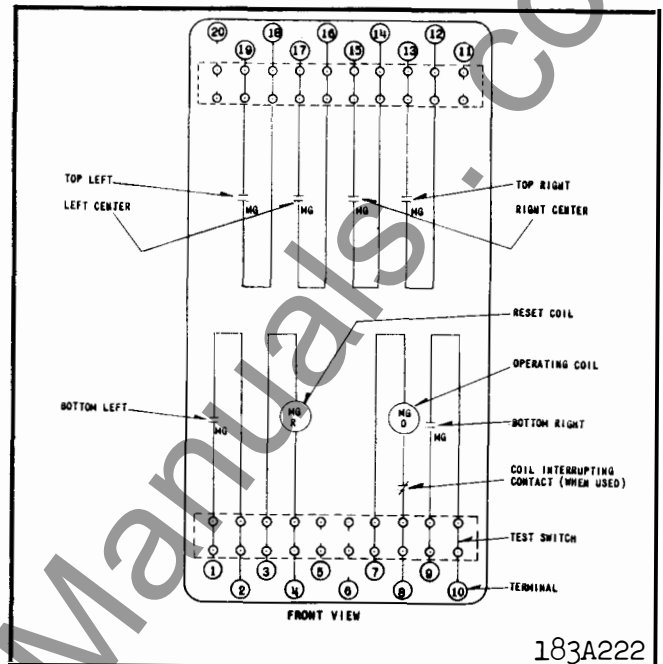


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

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

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

*

Coil Resistance (at 25° C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208

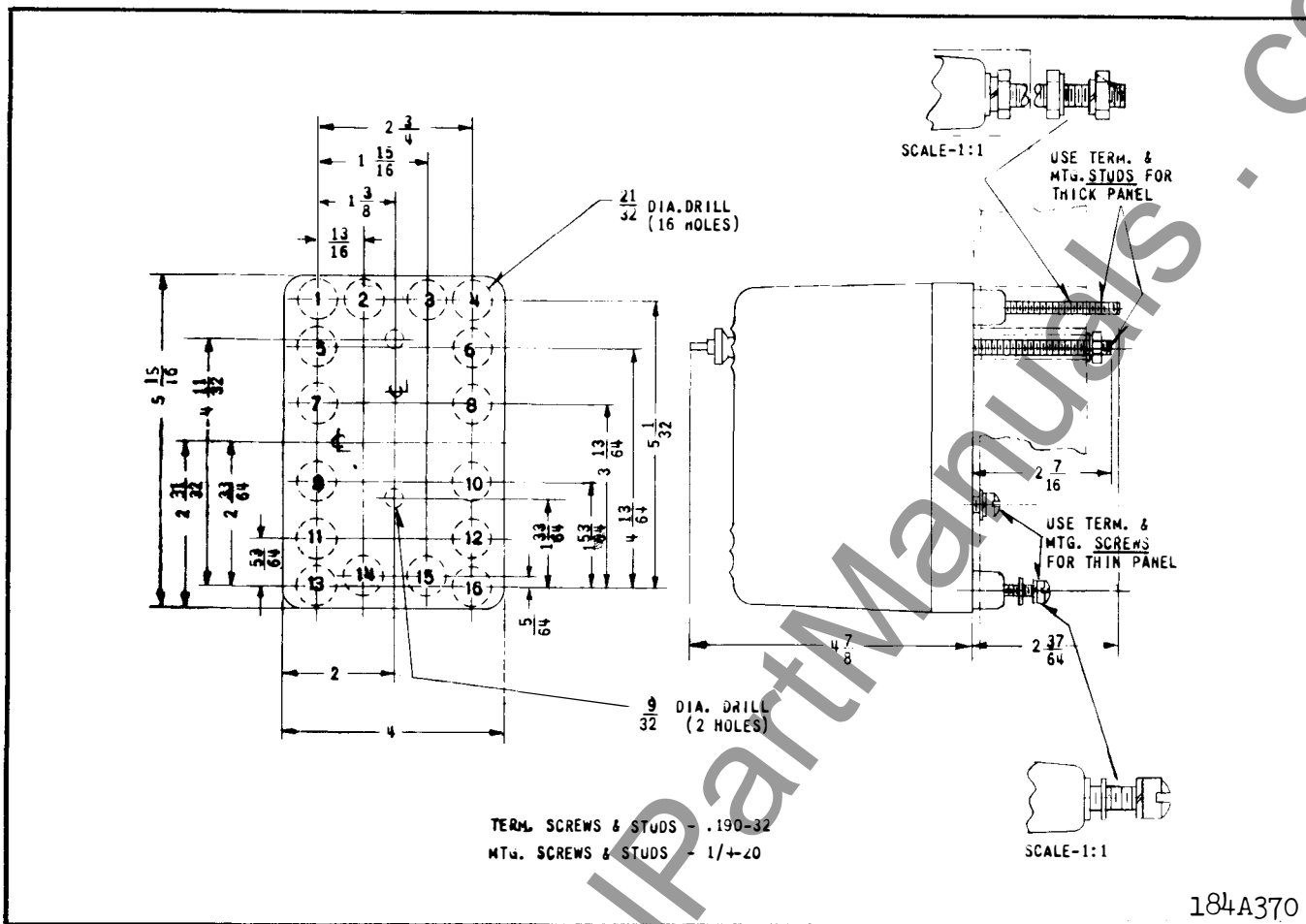


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

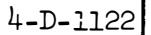
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately 1/16" follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about 1/16". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

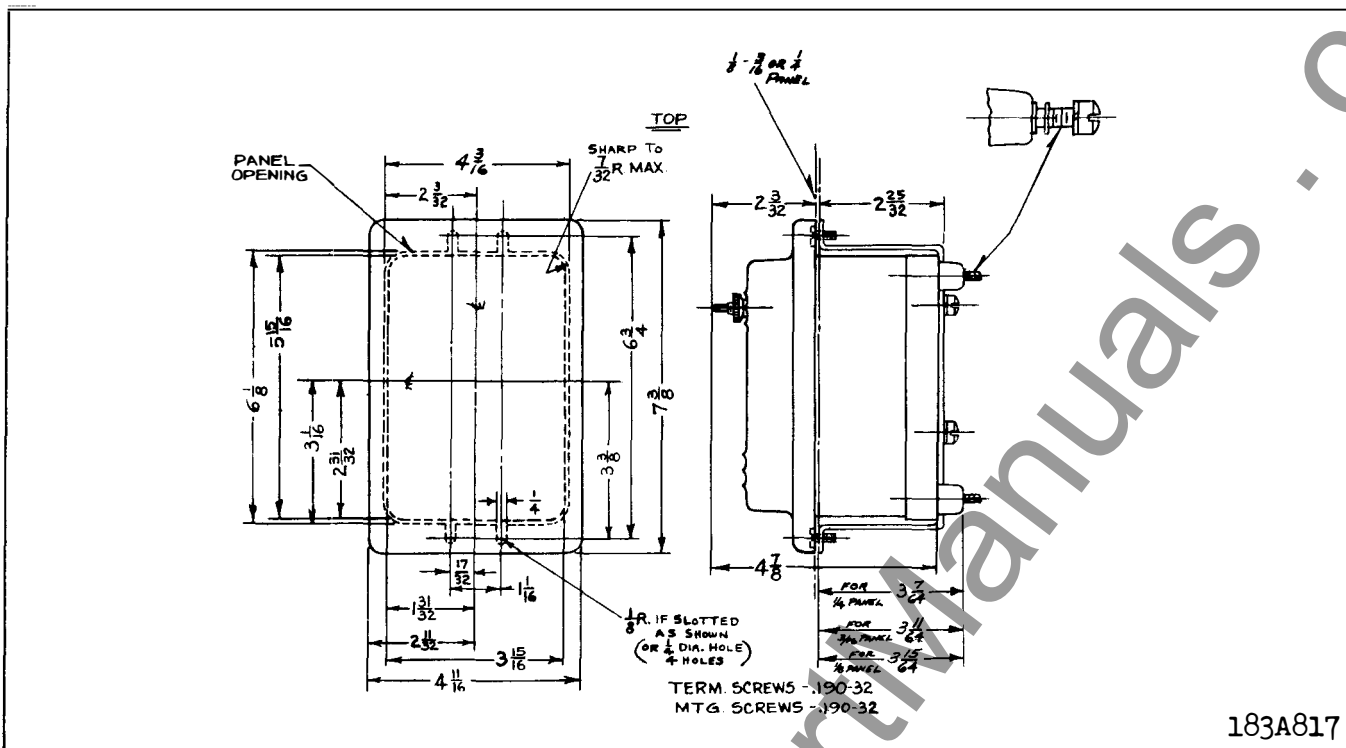


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand

* edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the * electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

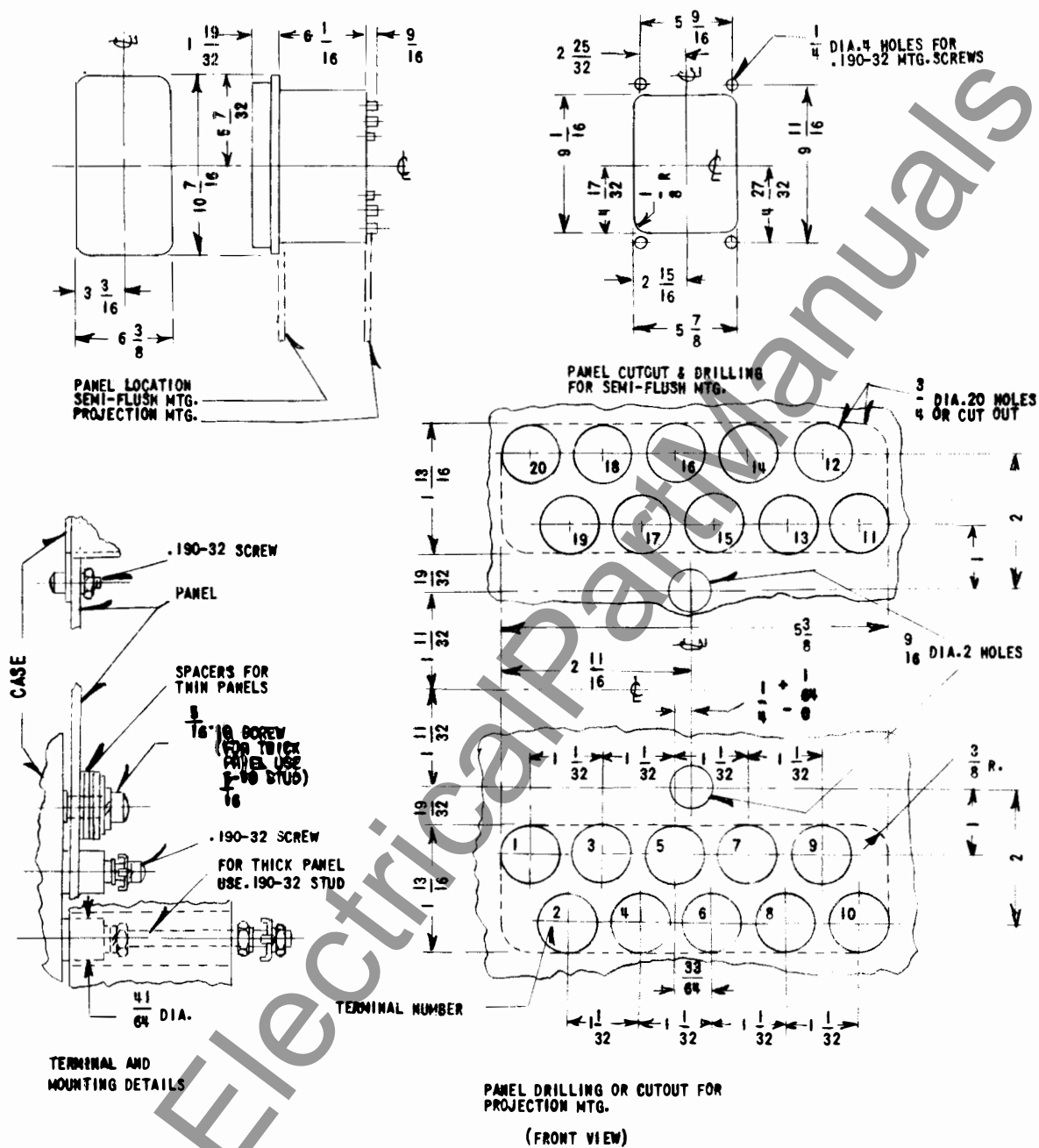
Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

△ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	



183A158

Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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RELAY-INSTRUMENT DIVISION

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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.)

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1E

*Denotes change from superseded issue.

EFFECTIVE JANUARY 1968

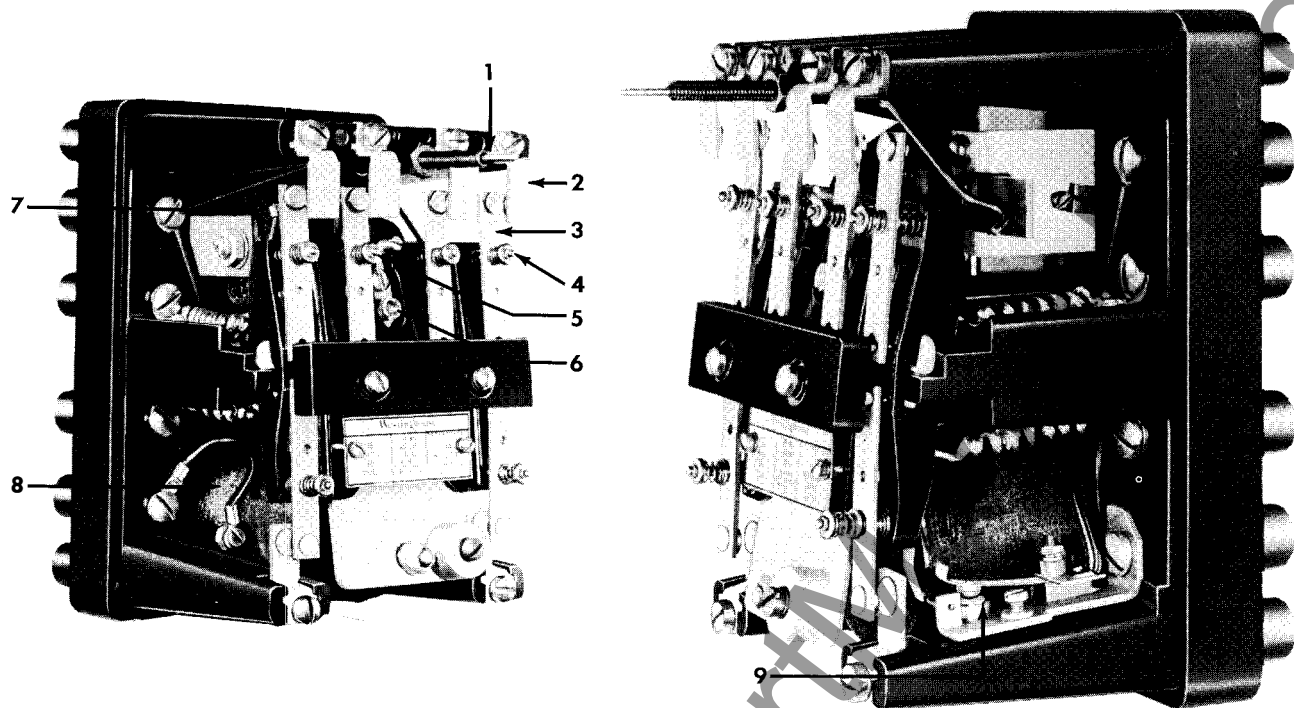


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

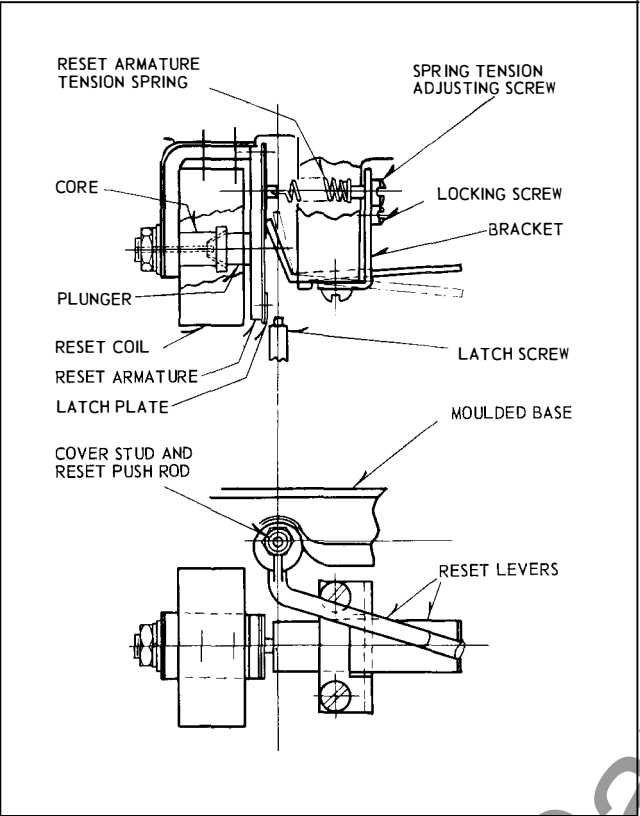


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

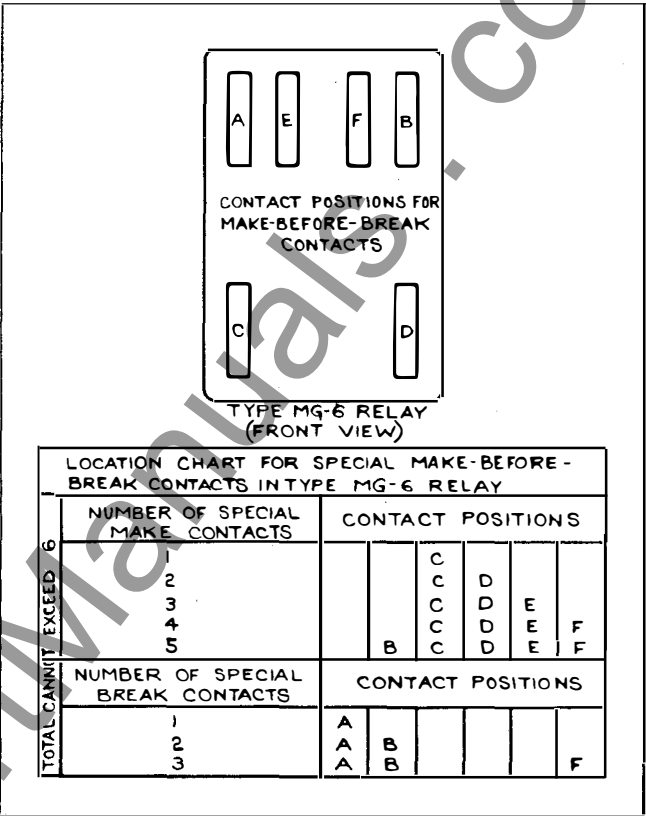


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

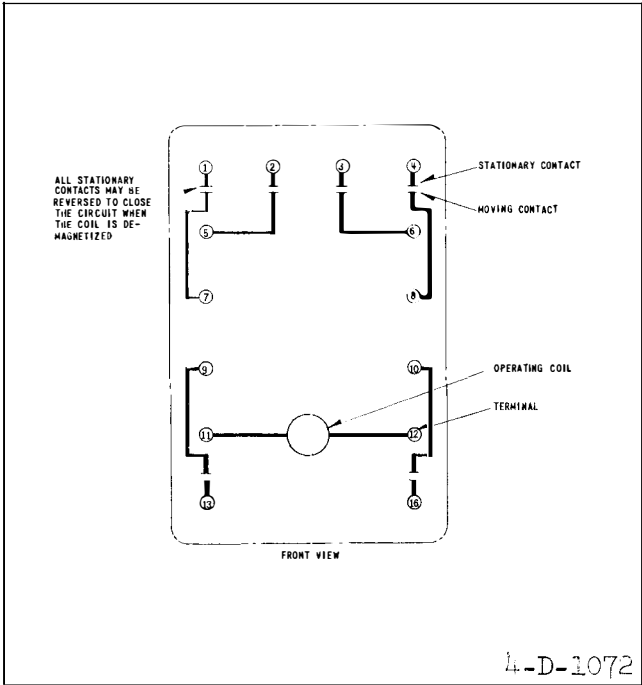


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

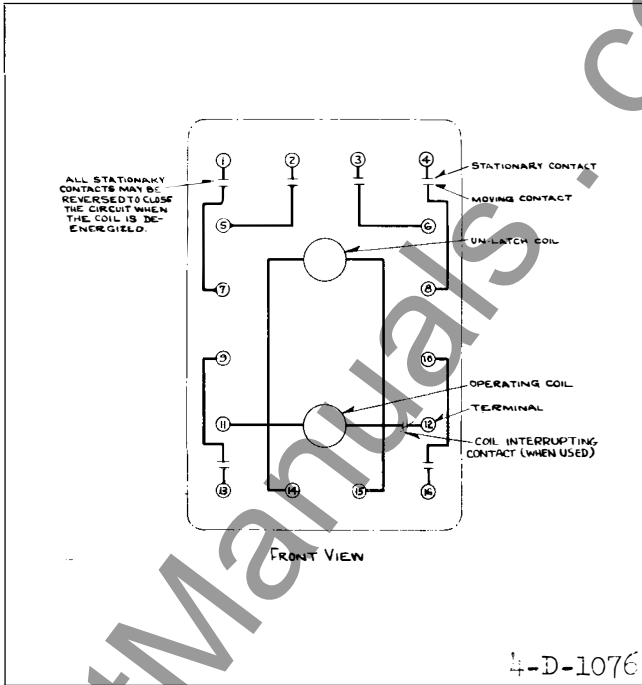


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

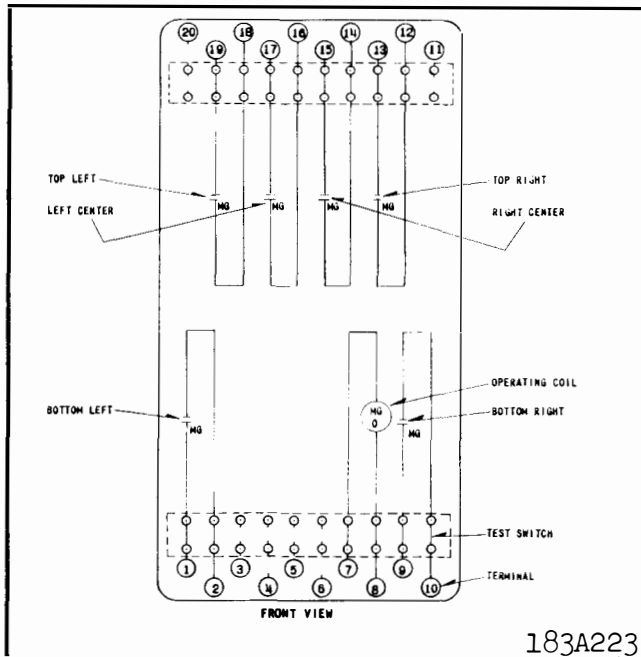


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

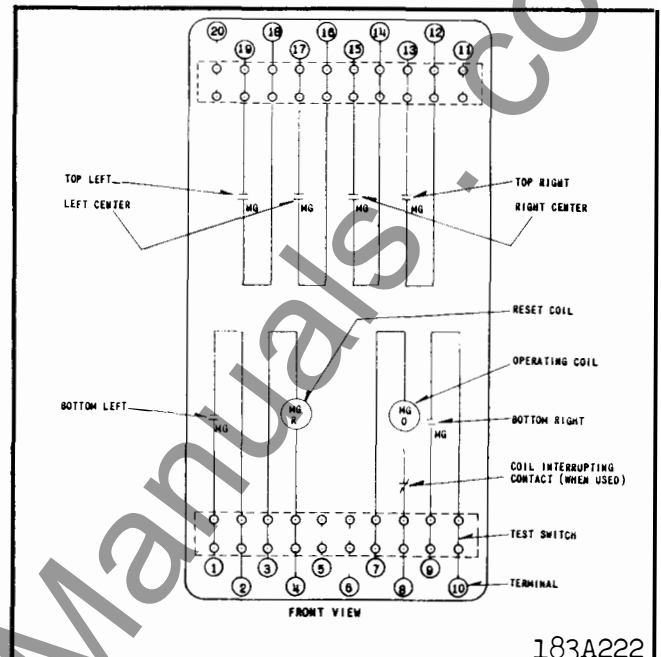


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

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

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

*

Coil Resistance (at 25°C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208

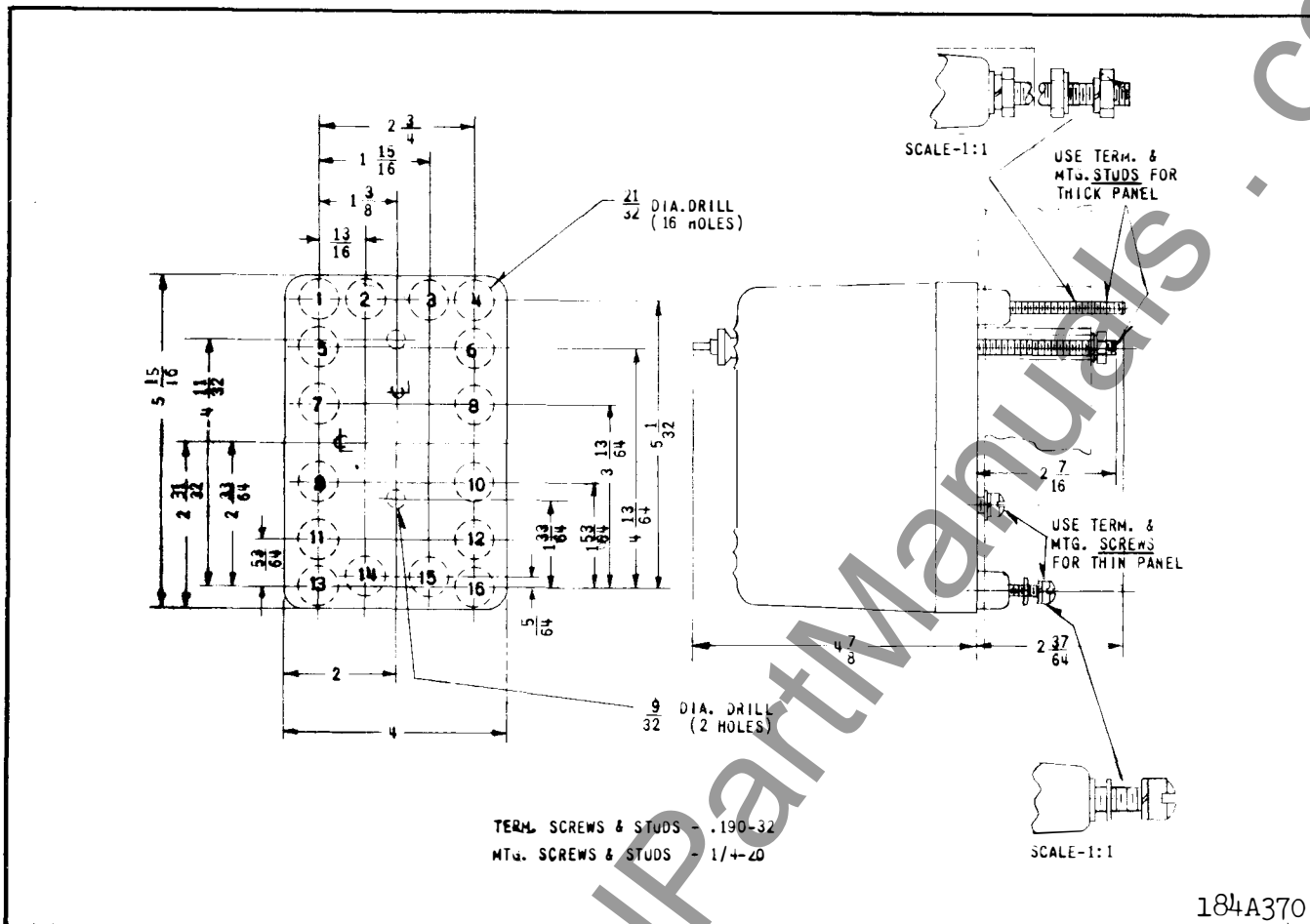


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follow approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that

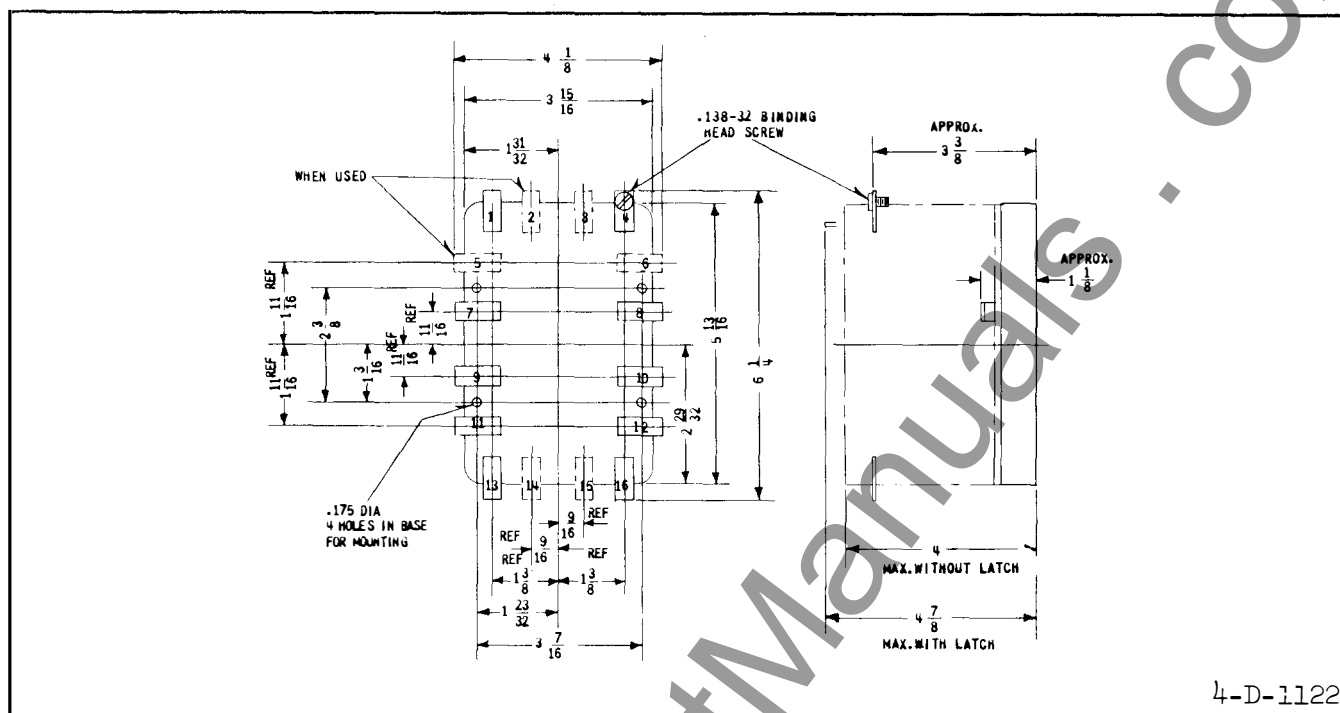


Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about $1\frac{1}{2}$ turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

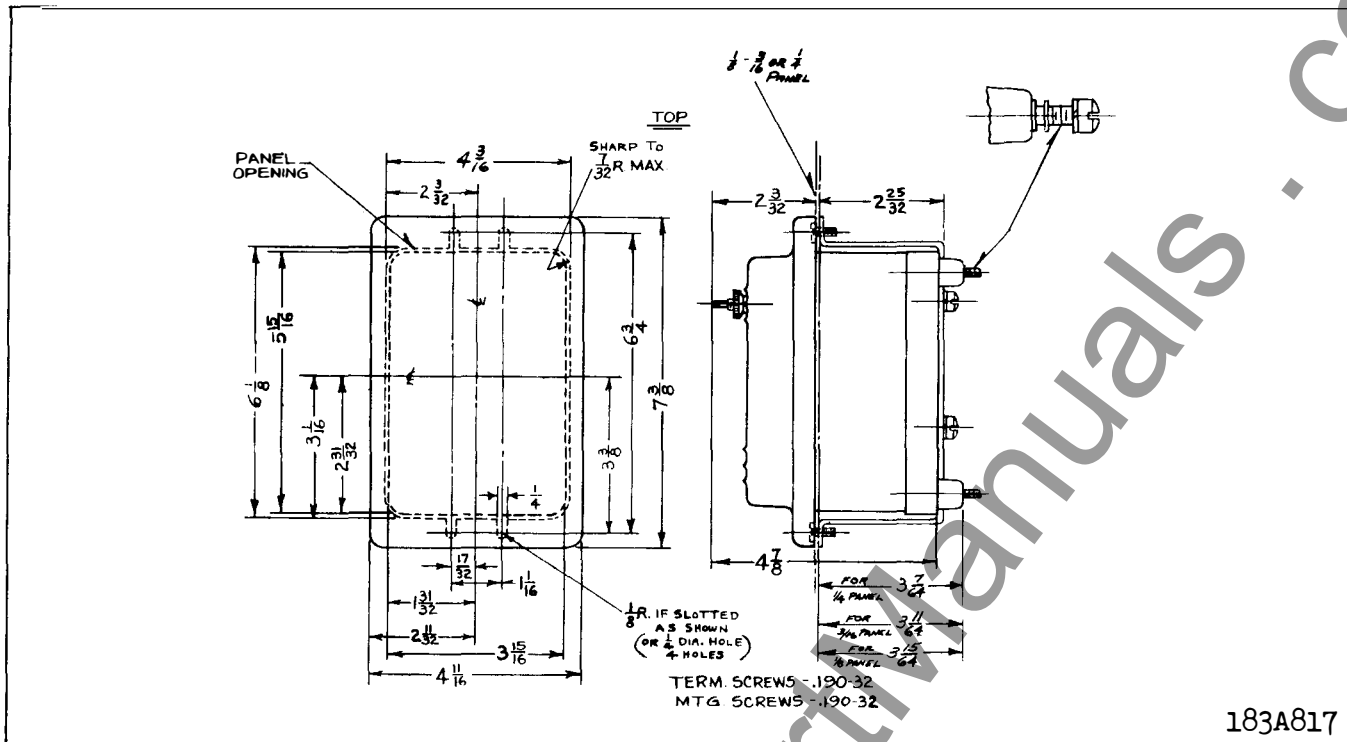


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand

* edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the *electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

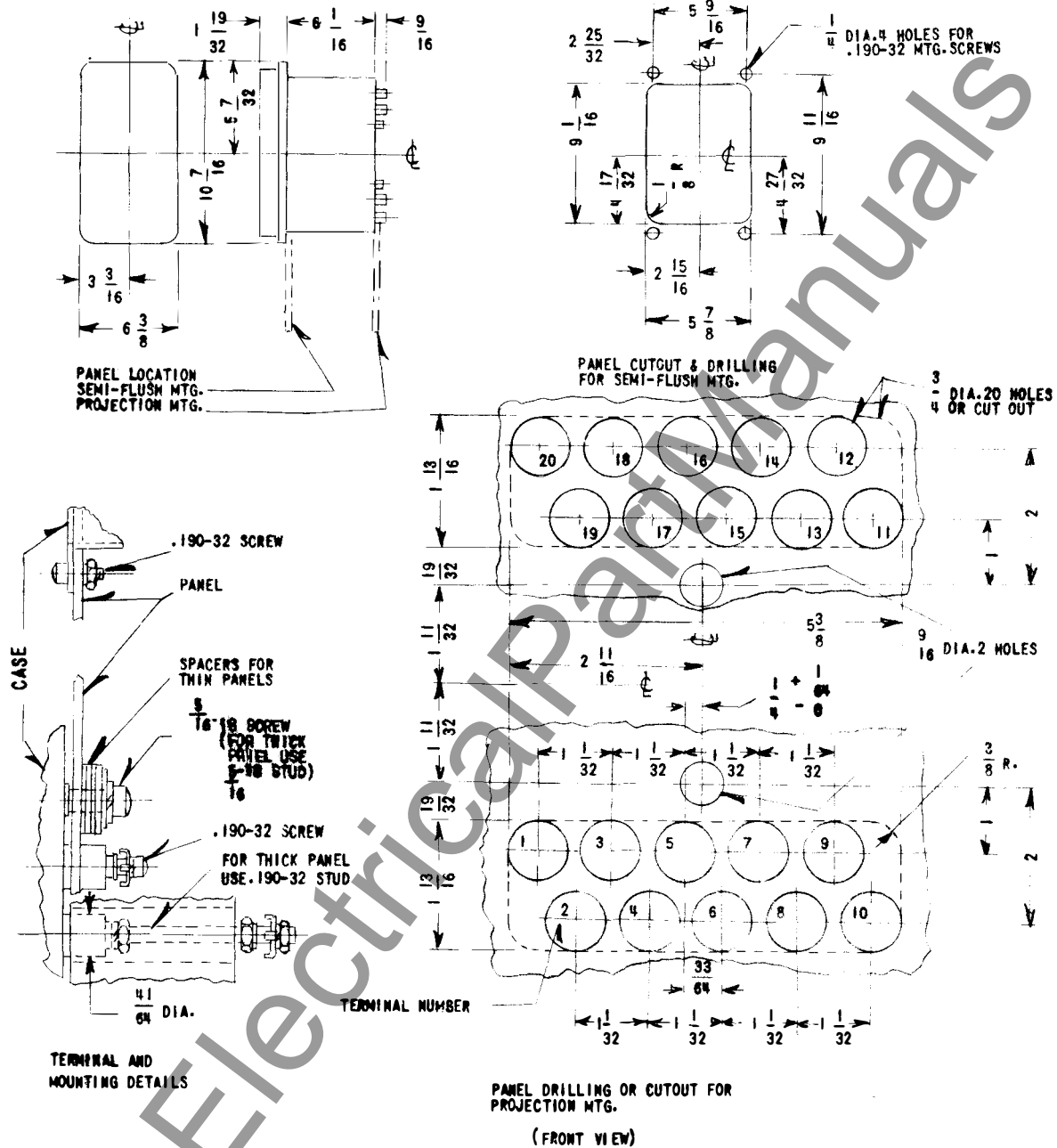
Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

△Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	



183A158

Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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RELAY-INSTRUMENT DIVISION

NEWARK, N. J.

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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1E

*Denotes change from superseded issue.

EFFECTIVE JANUARY 1968

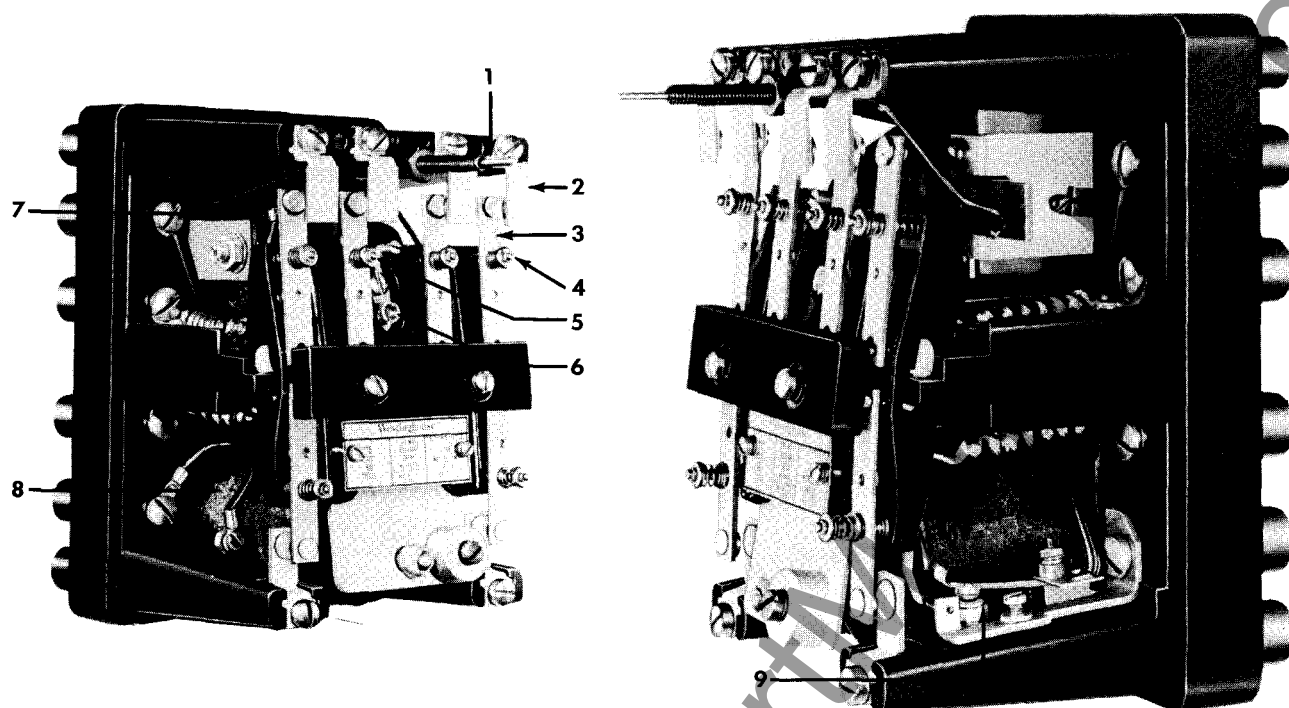


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

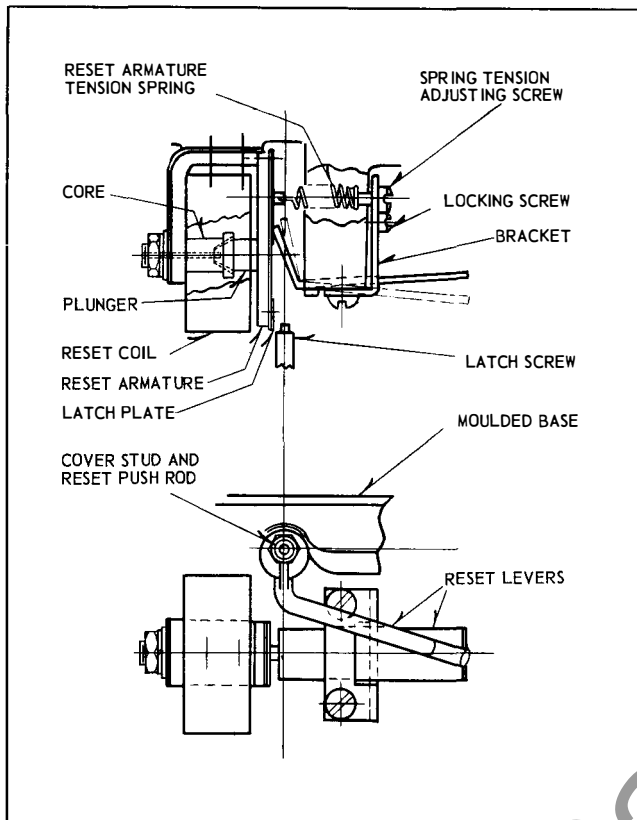


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

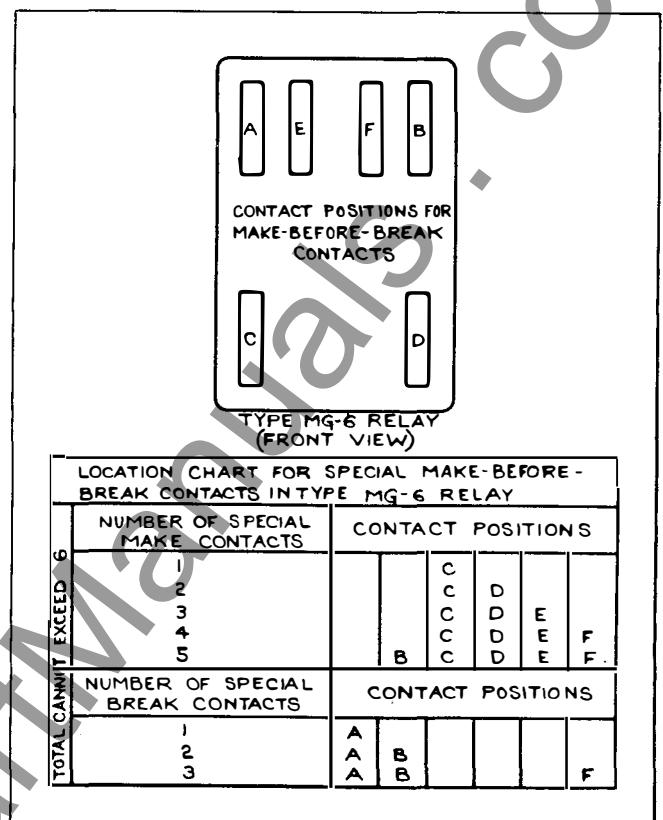


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

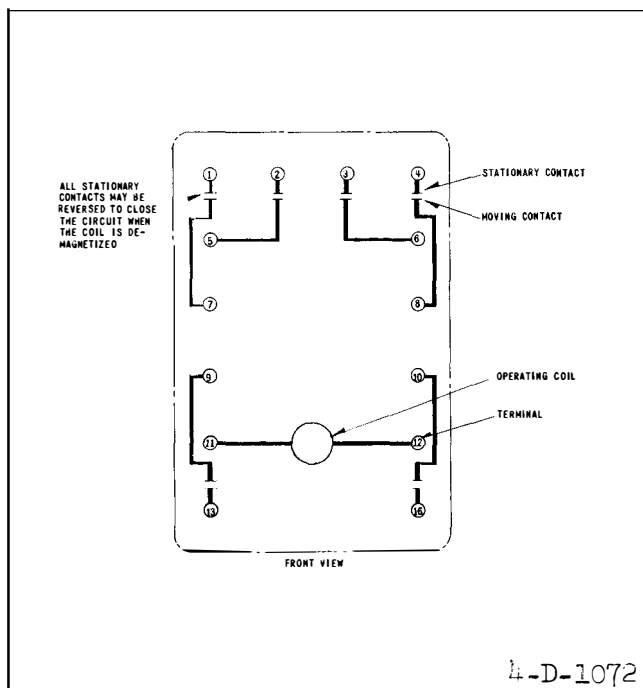


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

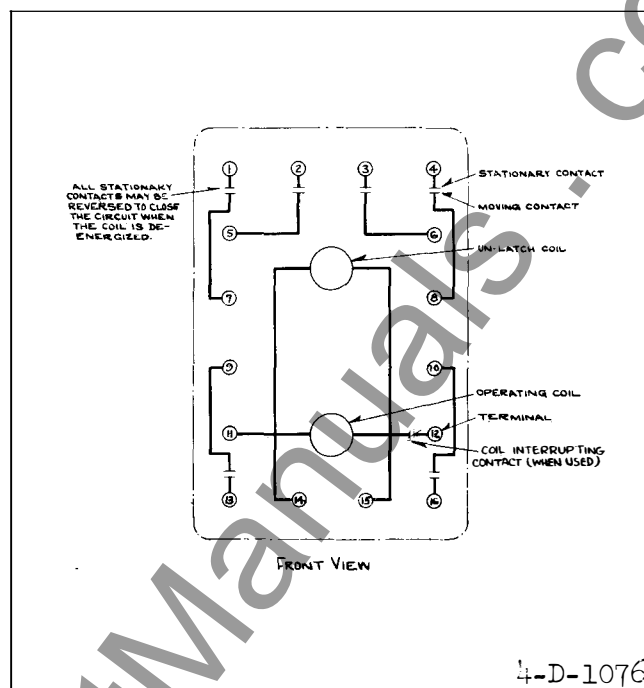


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the F'T22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

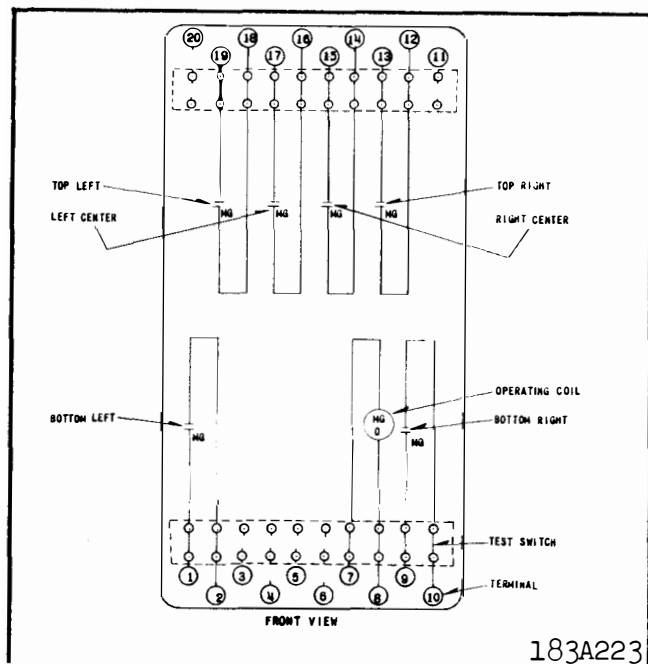


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

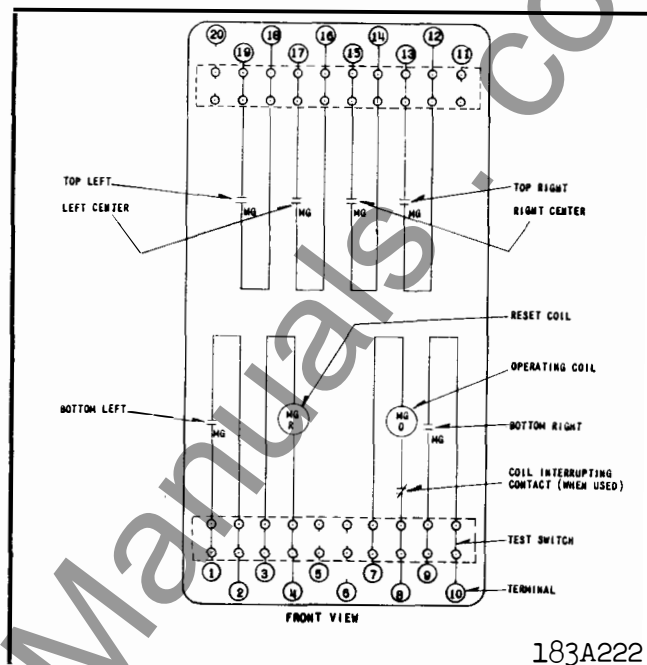


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

For detailed F'T case information refer to I.L. 41-076.

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

*

Coil Resistance (at 25°C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208

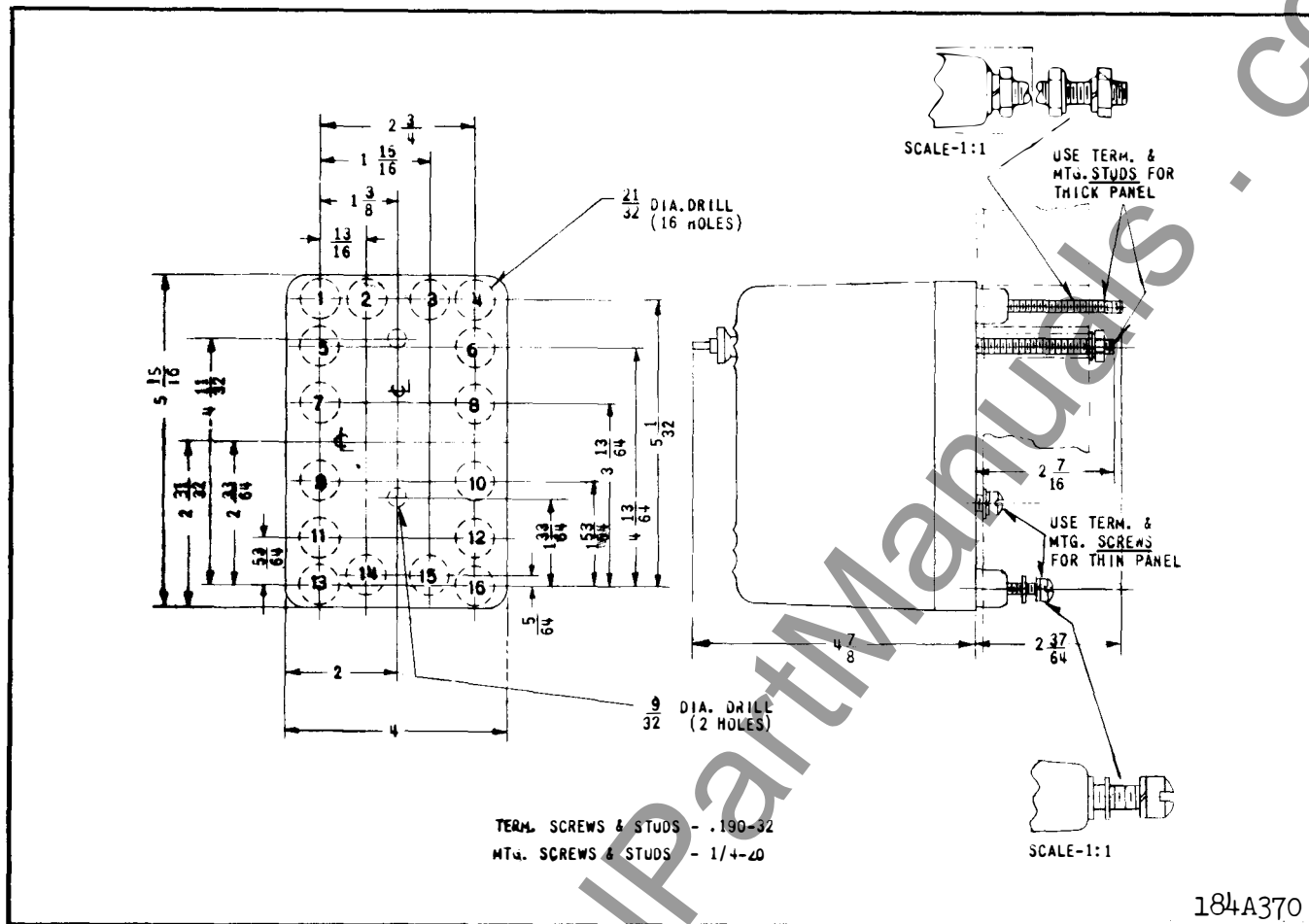


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

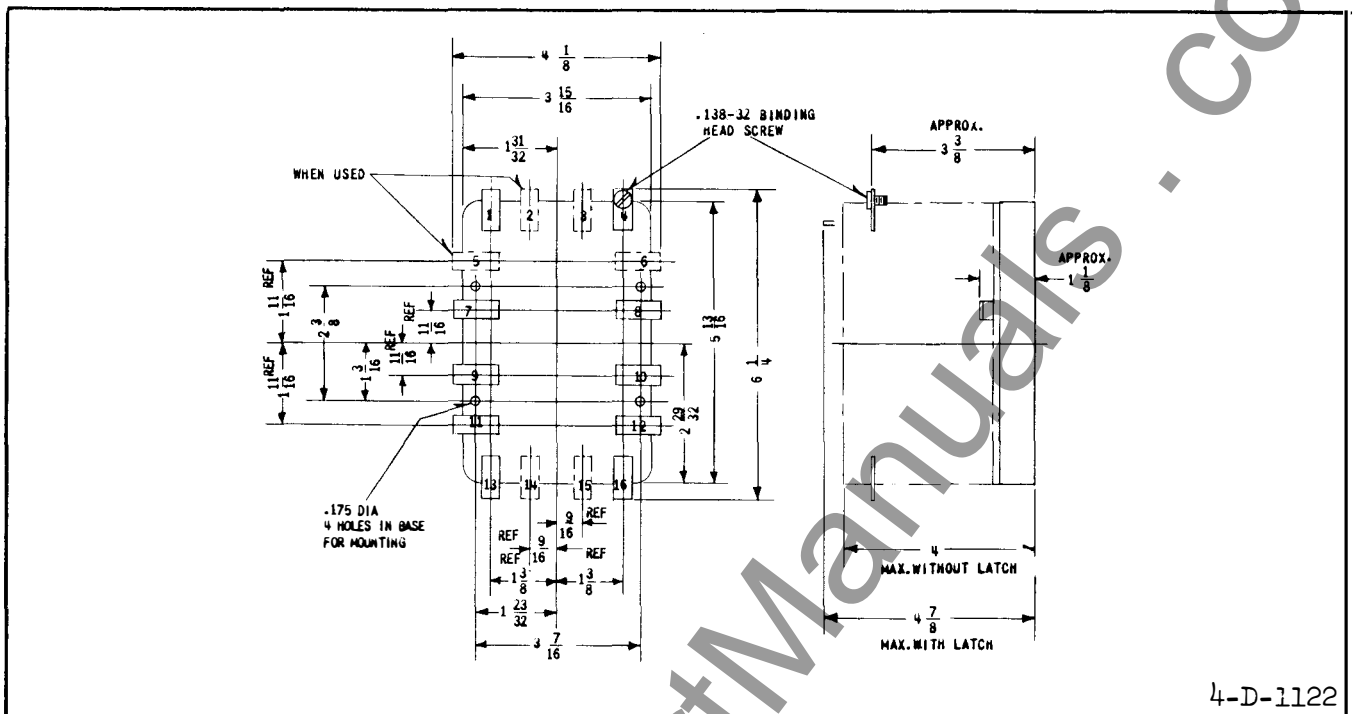
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



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Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about $1\frac{1}{2}$ turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

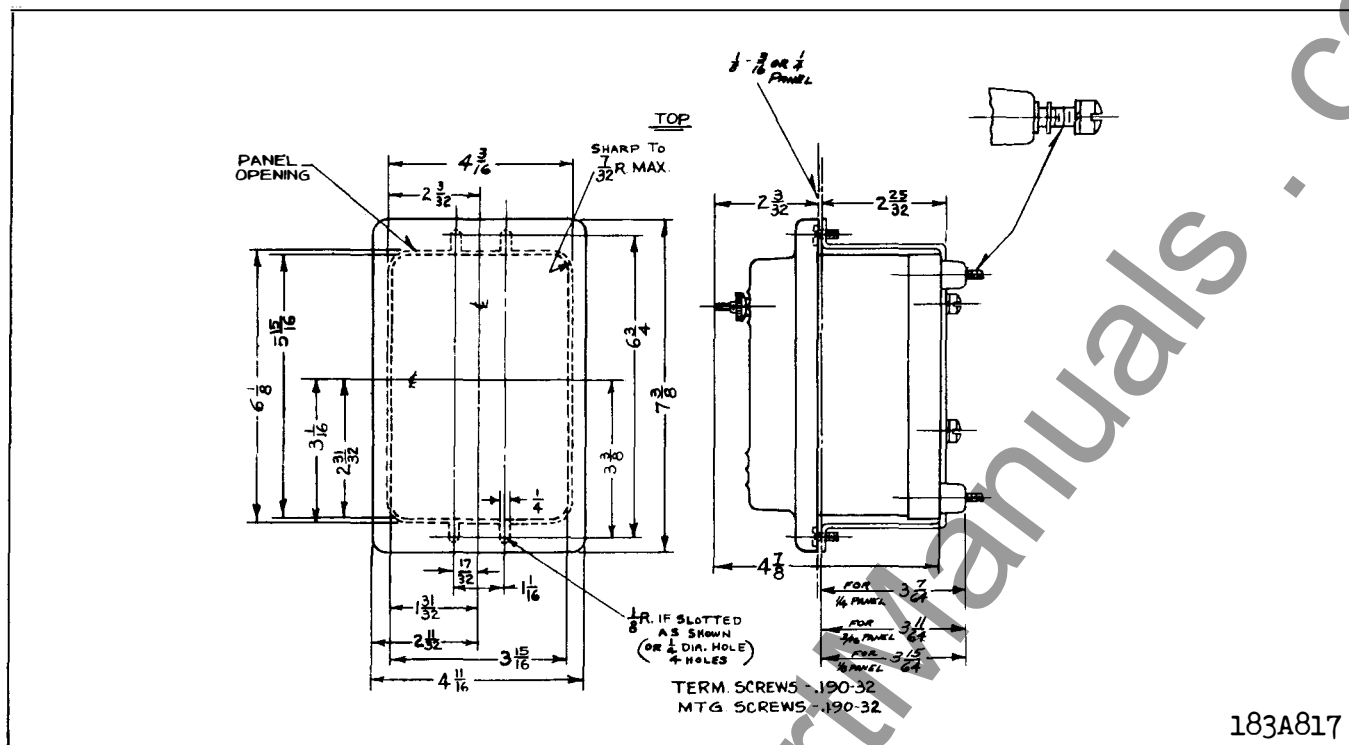


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the *electromagnet is .010 to .015 inch. ♦ With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

△ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	

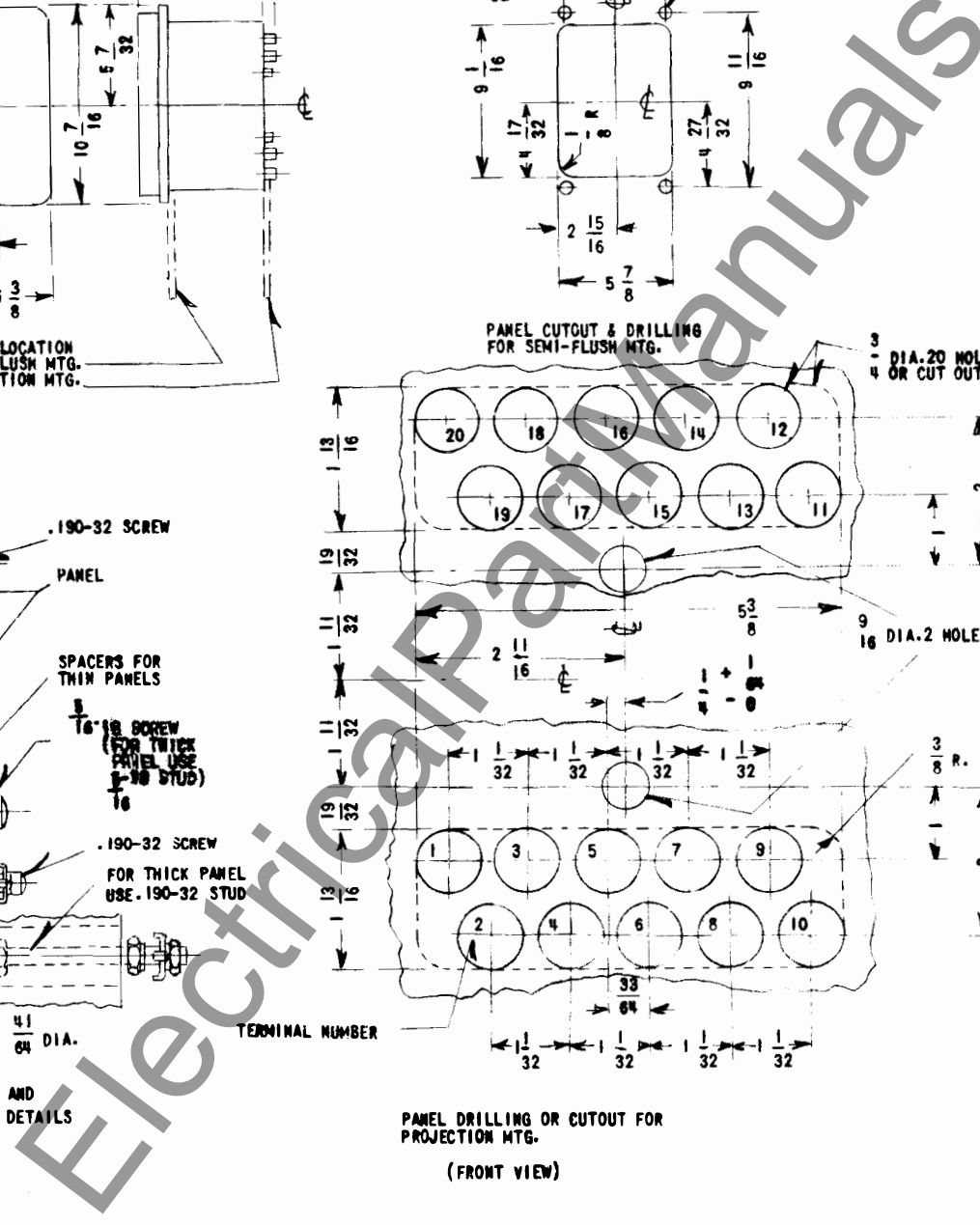


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay In Type FT22 Case.

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WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION

NEWARK, N. J.

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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see "ADJUSTMENTS AND MAINTENANCE") it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.)

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1E

*Denotes change from superseded issue.

EFFECTIVE JANUARY 1968

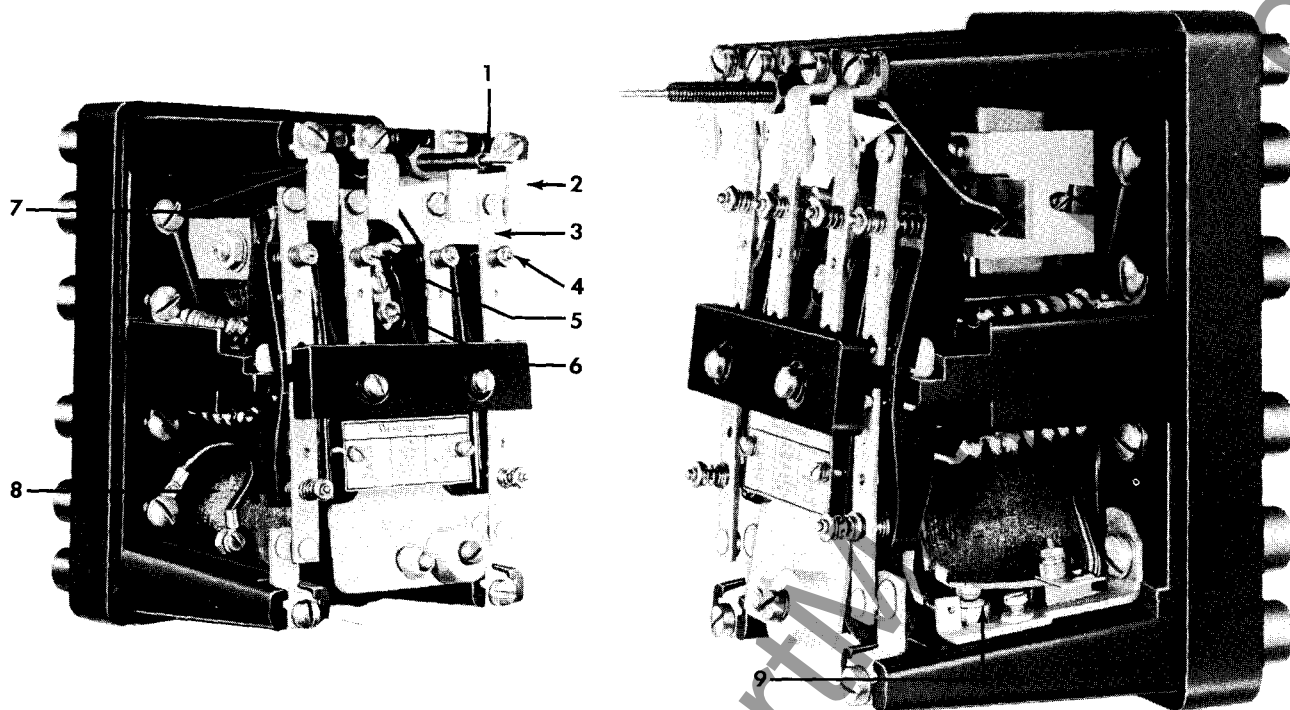


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons welded to brackets which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

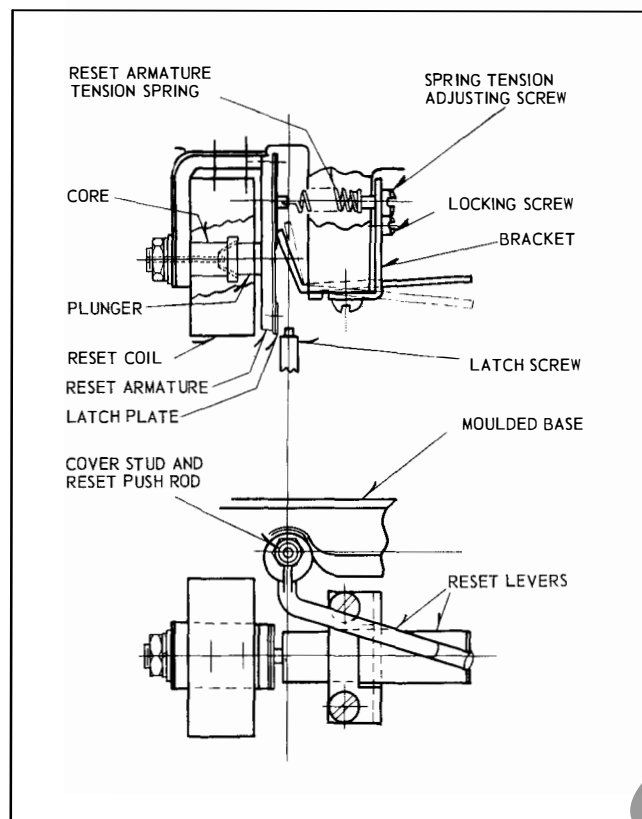


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

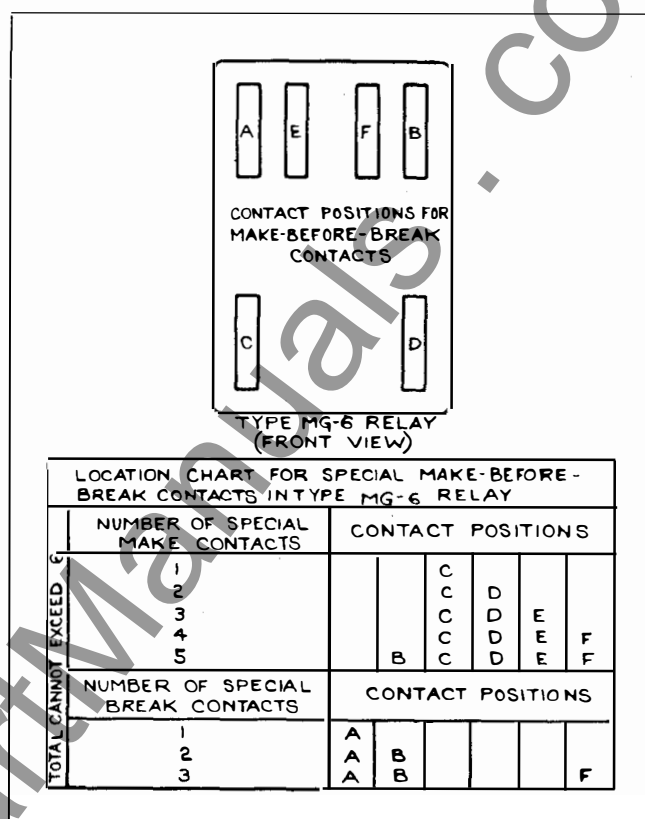


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

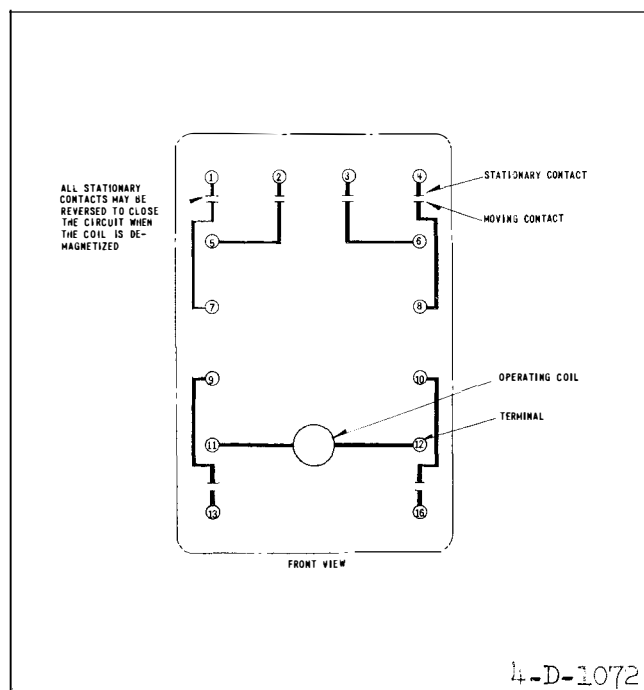


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

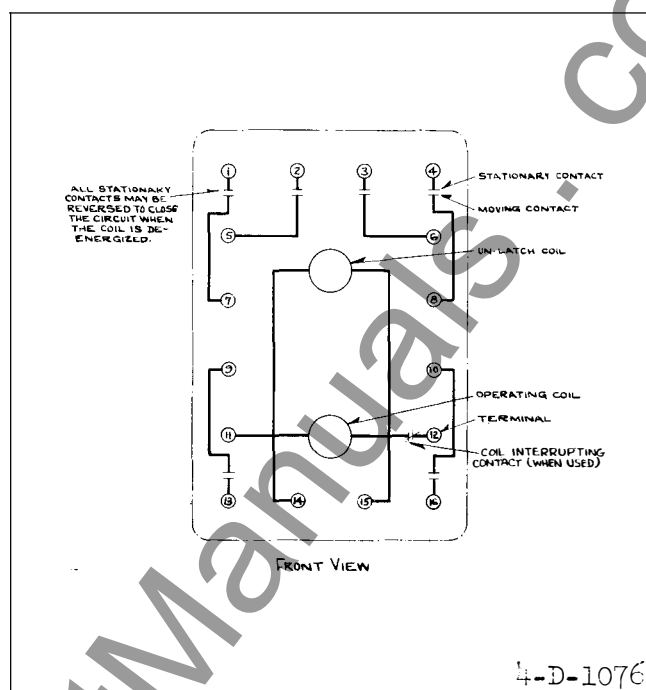


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

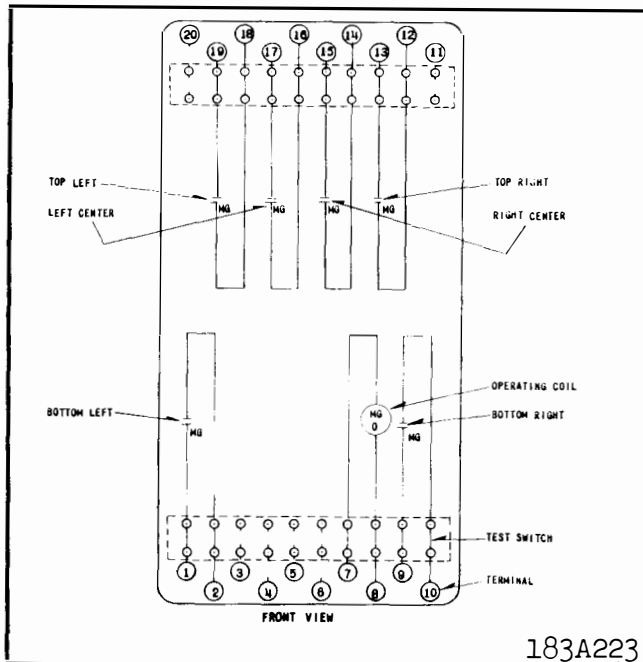


Fig. 6. Internal Schematic of the Type MG-6 Relay, With-out Electrical Reset, in FT22 Case.

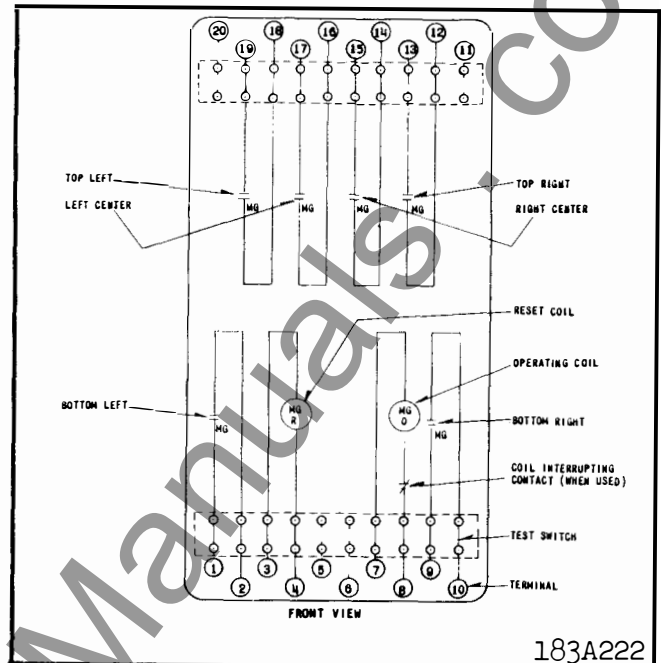


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

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

The type MG-6 relay for a-c can be used with any combination of ccontacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

*

Coil Resistance (at 25° C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208

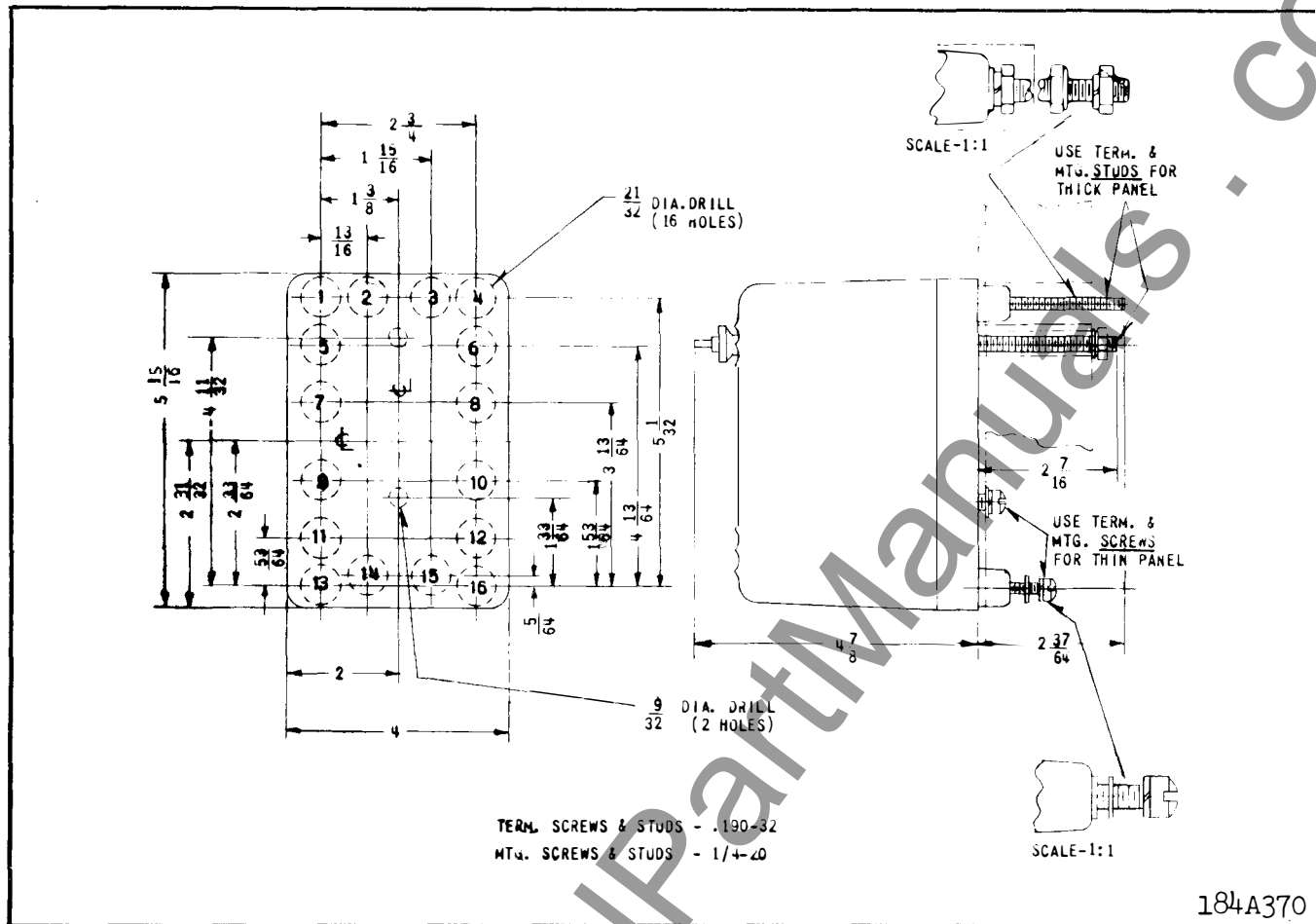


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

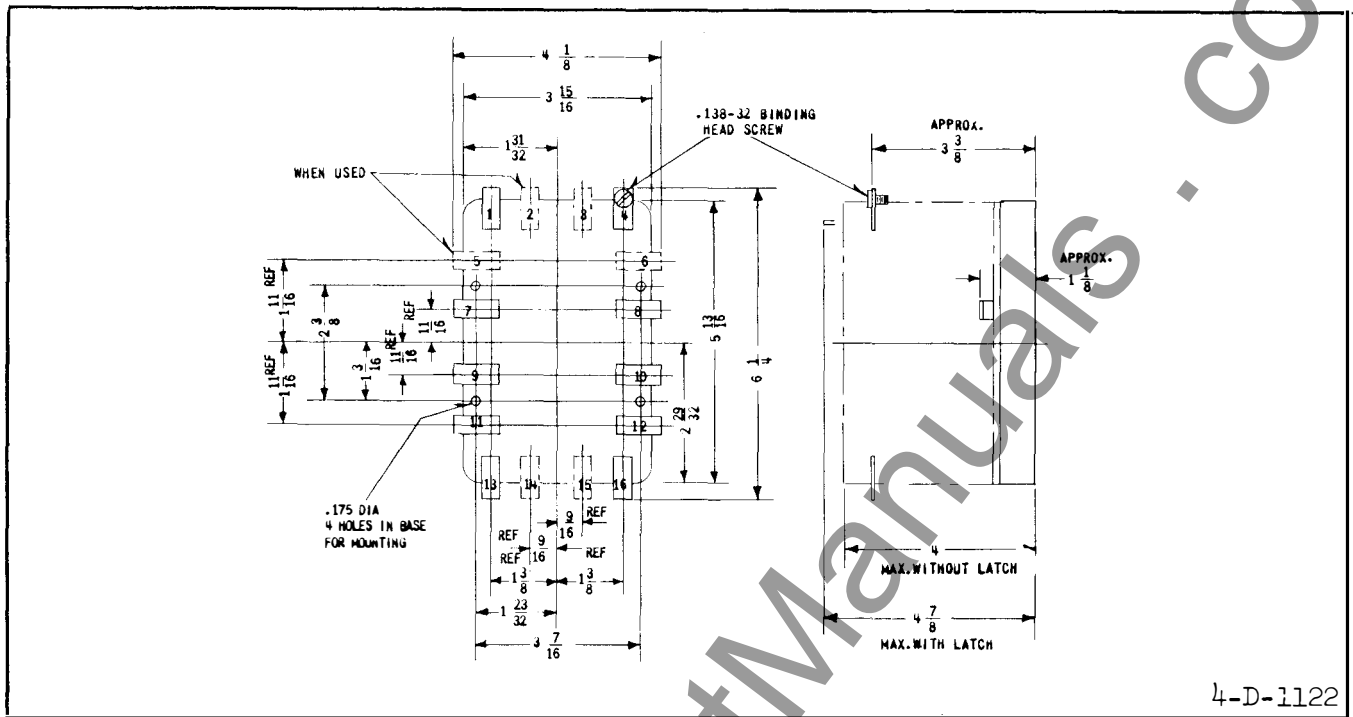
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



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Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

when the armature is in contact with it the lower edge of the armature is $7/16$ " above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32$ " for the make contacts and $1/16$ " for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8$ " for the make contacts and $3/32$ " for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16$ " follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16$ ". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

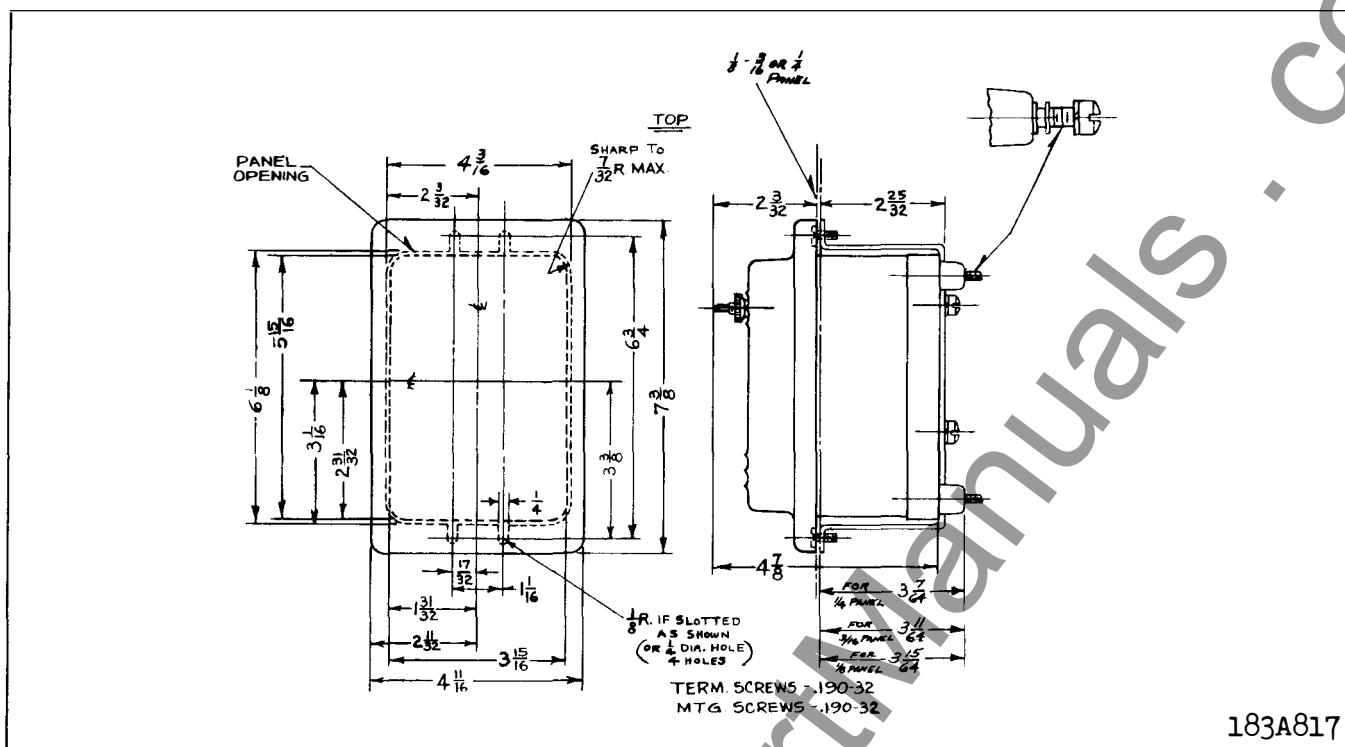


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A slight amount of medium viscosity slushing oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be reapplied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand

* edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the *electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

Δ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	

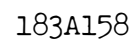


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

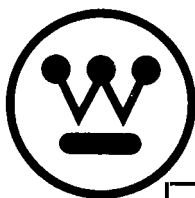
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WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION

NEWARK, N. J.

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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

SUPERSEDES I.L. 41-753.1F

*Denotes change from superseded issue.

EFFECTIVE MARCH 1971

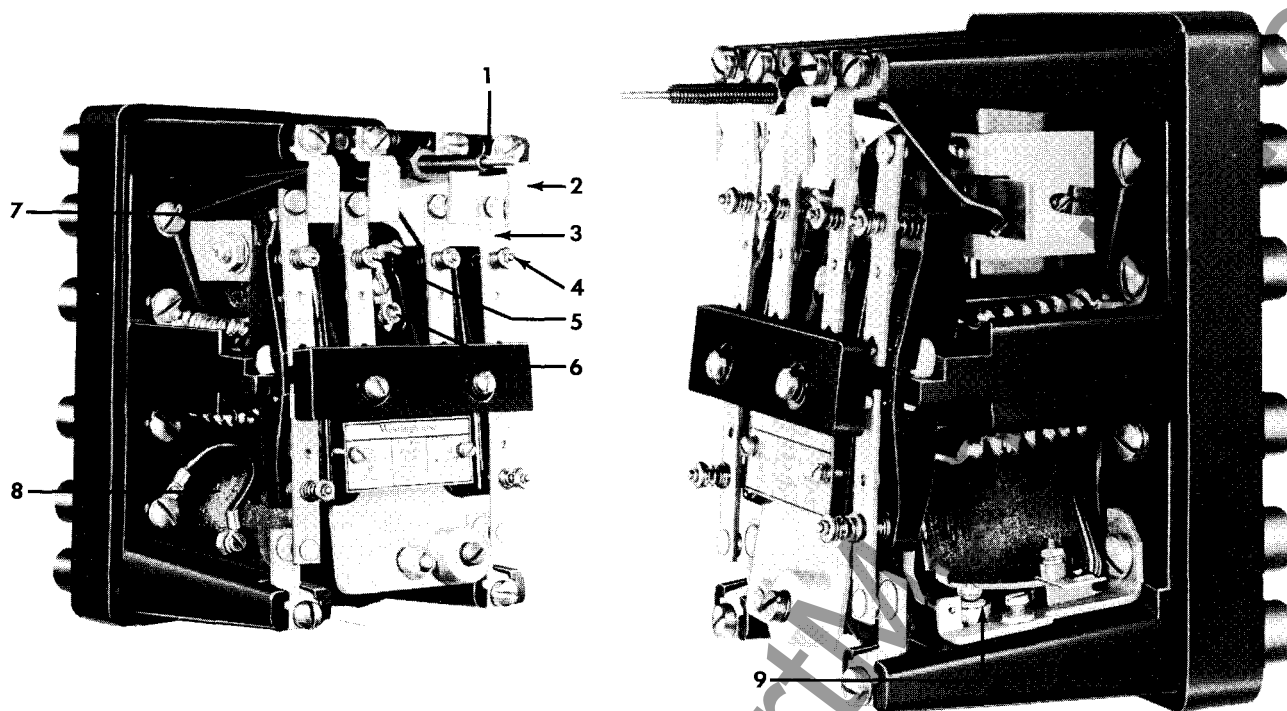


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

* The stationary contacts consists of large silver buttons which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

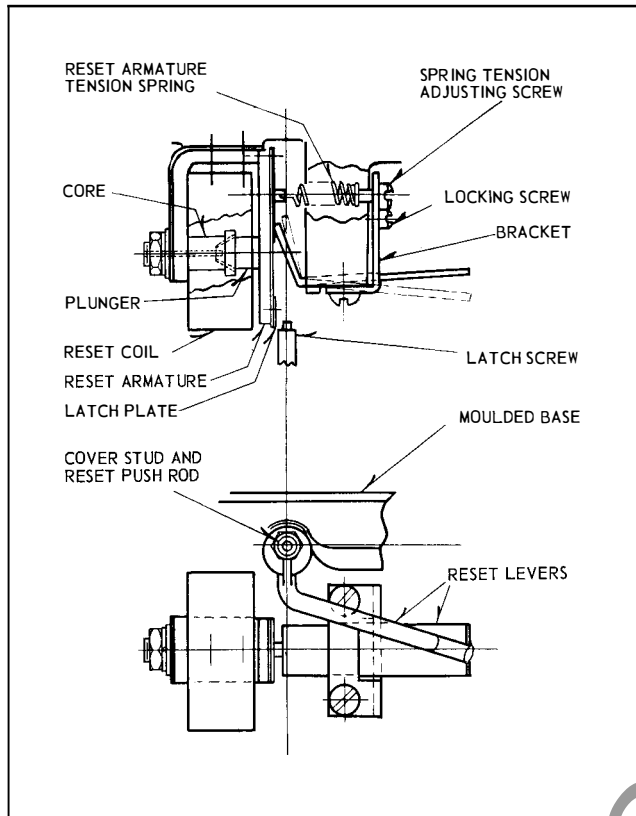


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

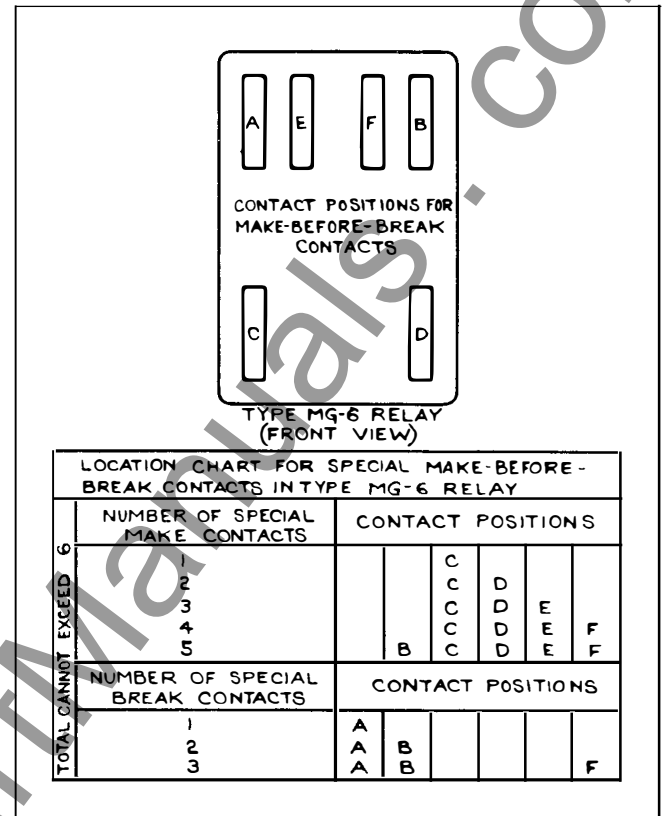


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

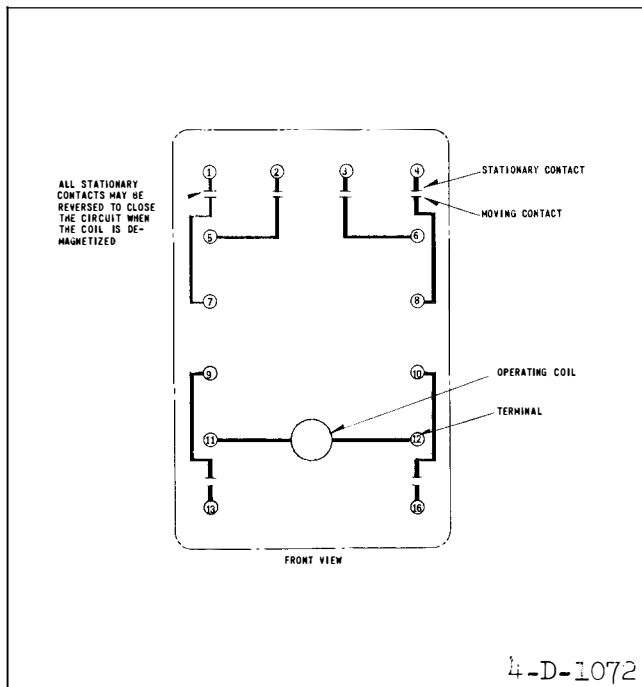


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

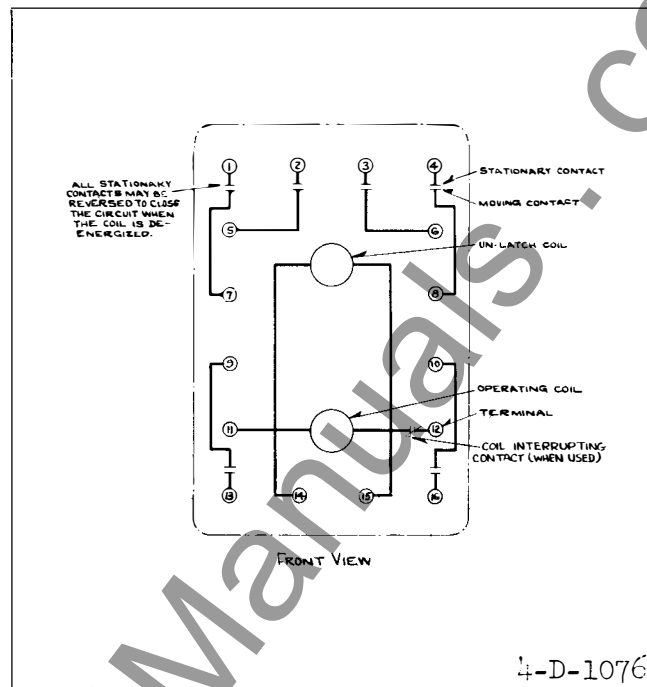


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

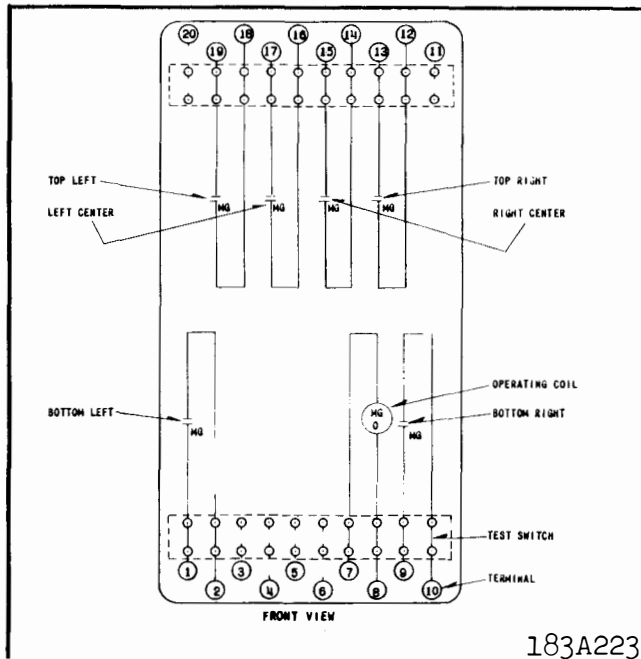


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

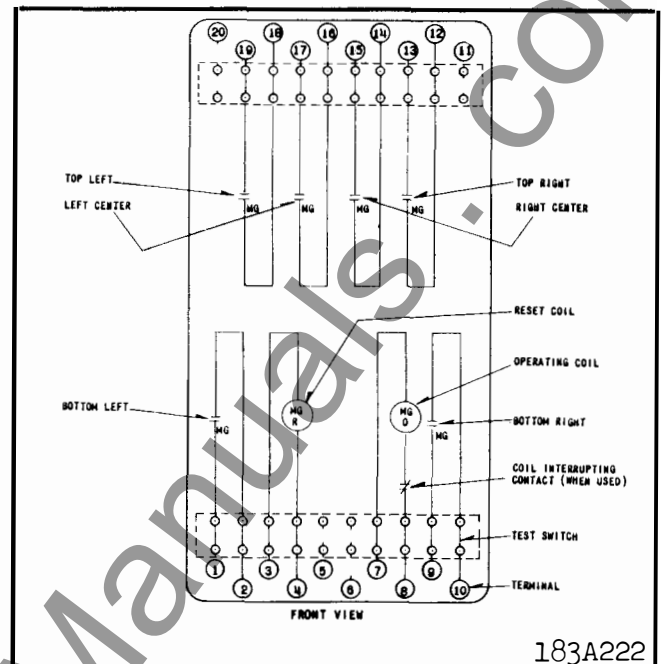


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

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

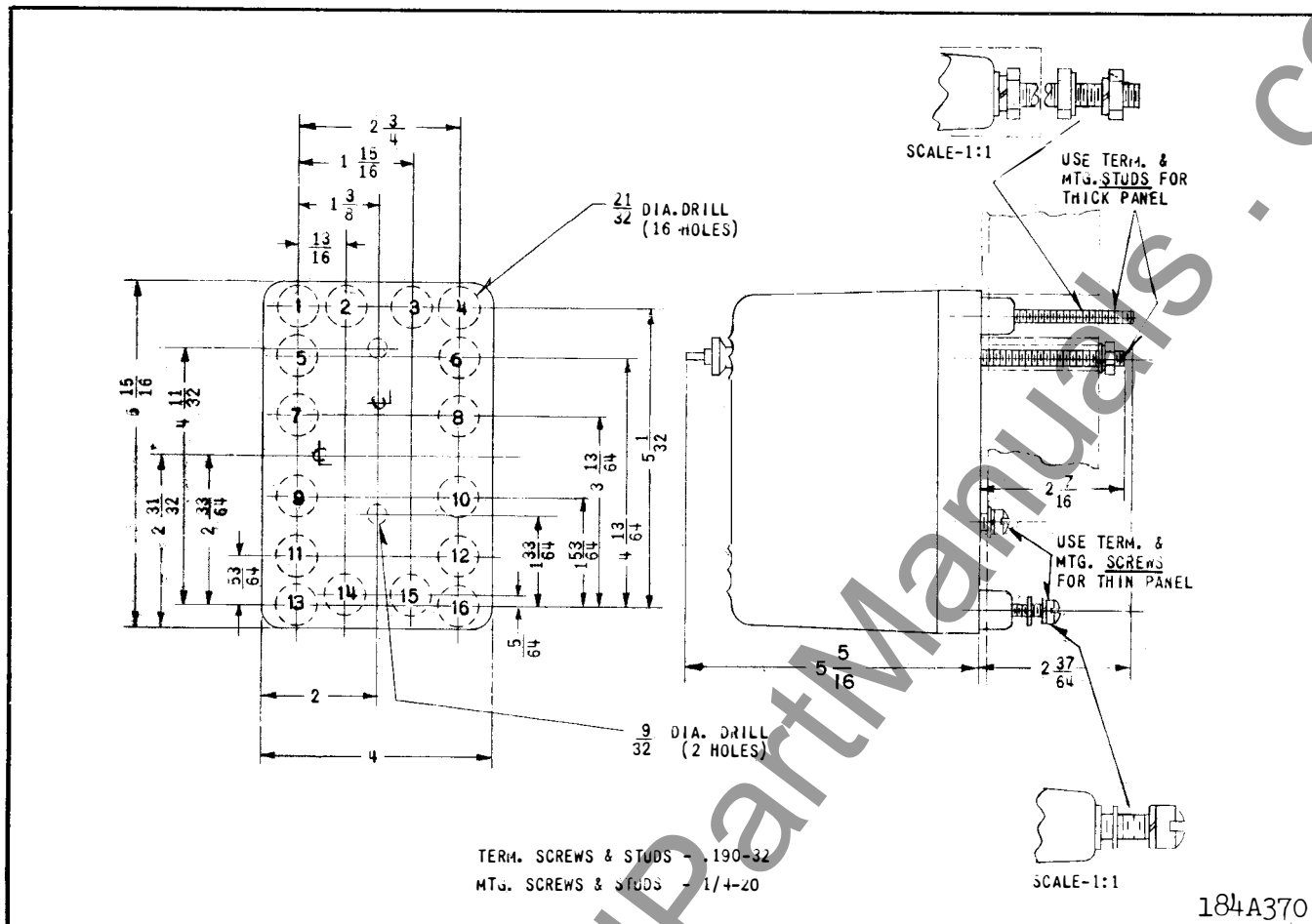
The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

Coil Resistance (at 25° C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208



* Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

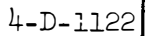
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that

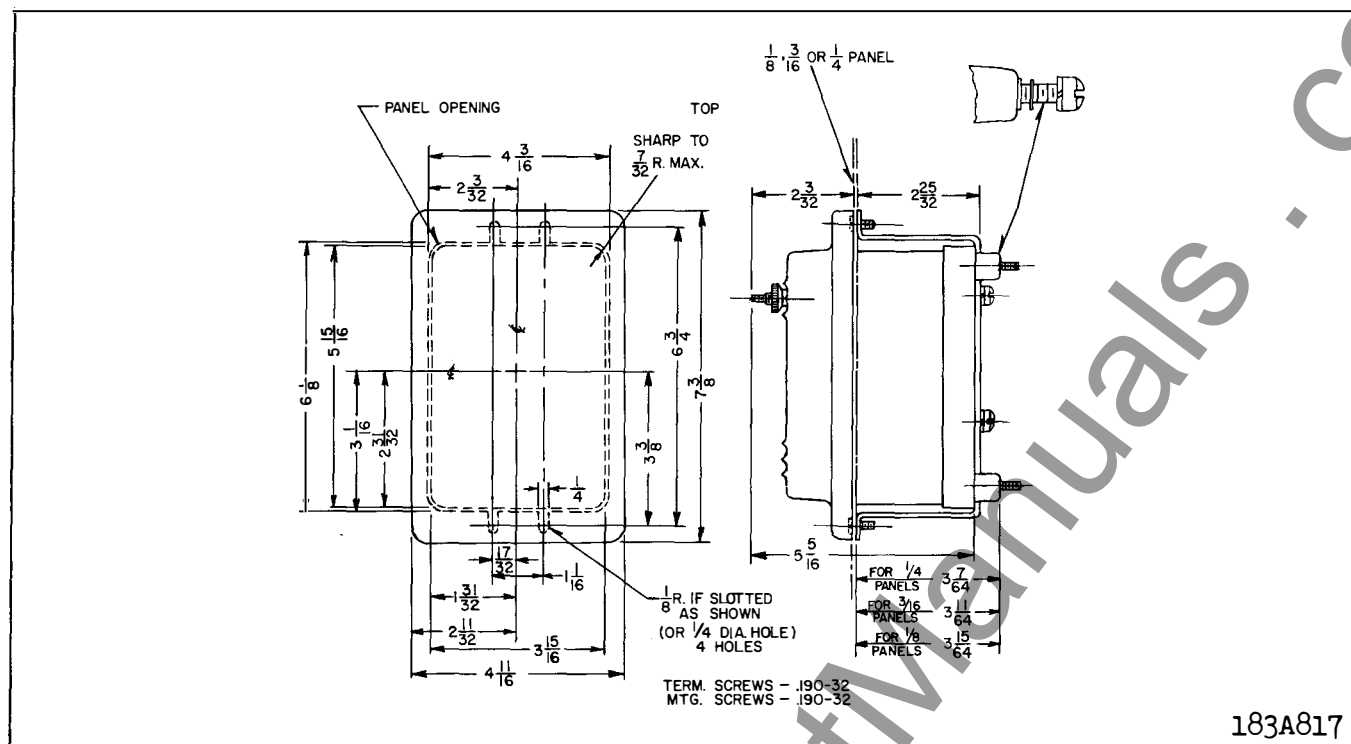


* when the armature is in contact with it, the lower edge of the armature is 7/16" above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately 1/16" follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about 1/16". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments



* Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

- * A small amount of silicone oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be re-applied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

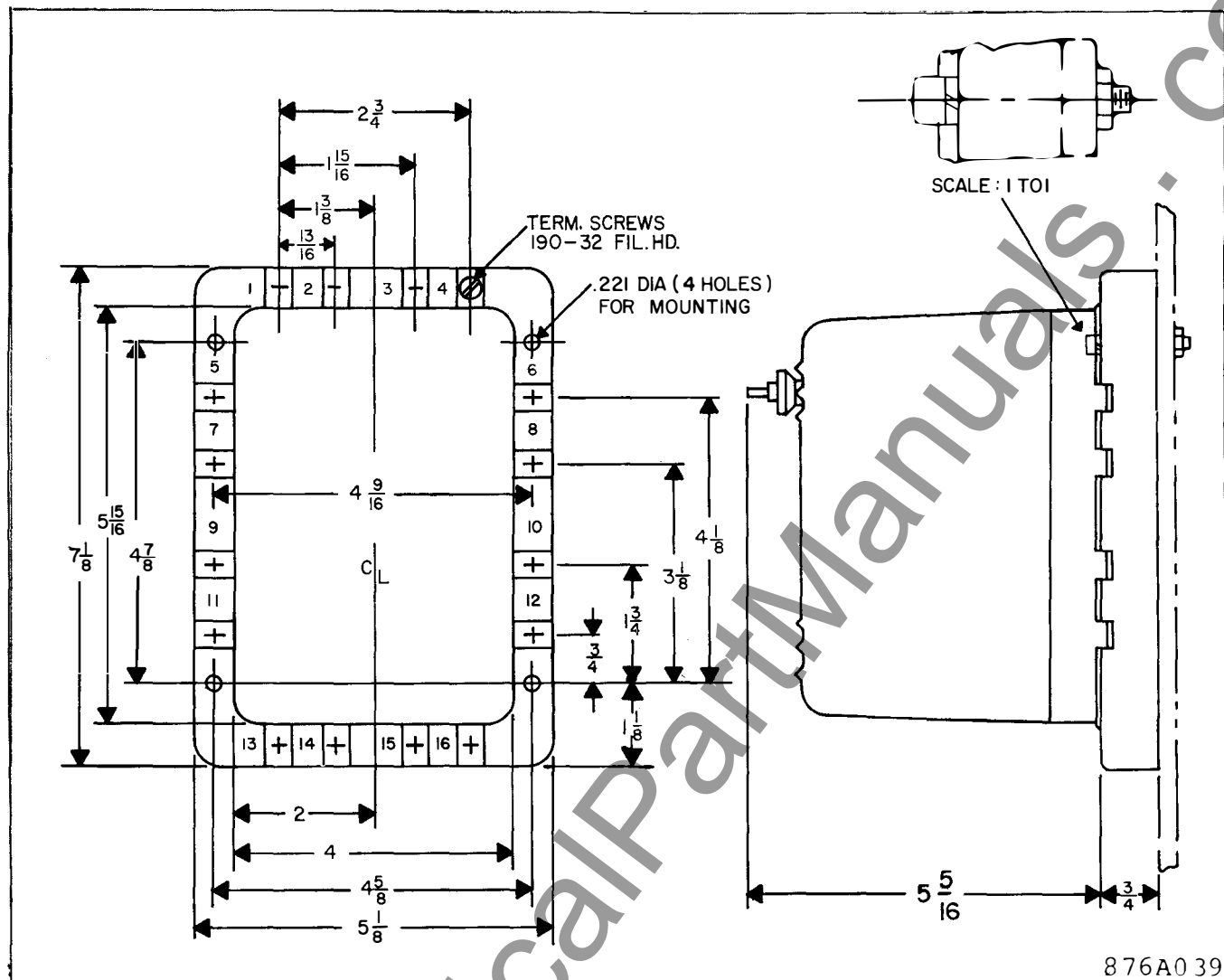
Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

Δ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	



* Fig. 11. Relay Type MG-6 Front Connected with Cover Outline and Drilling Plan

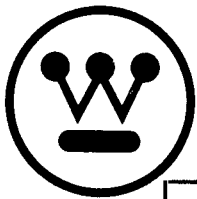




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RELAY-INSTRUMENT DIVISION

NEWARK, N. J.

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TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

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of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

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SUPERSEDES I.L. 41-753.1F

*Denotes change from superseded issue.

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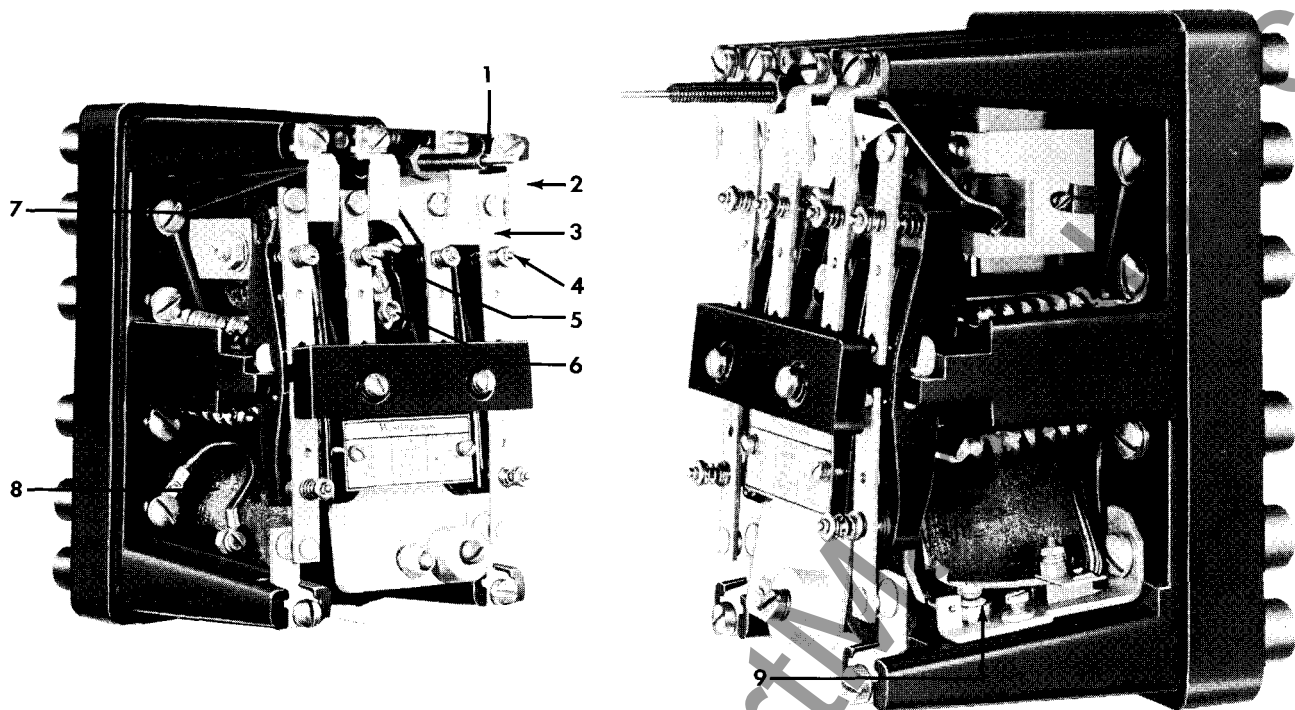


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

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tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

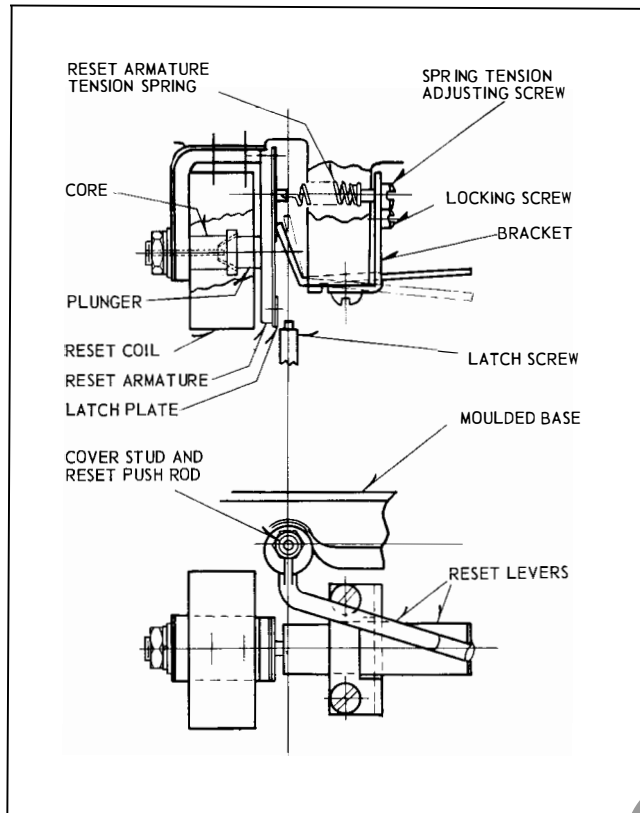


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

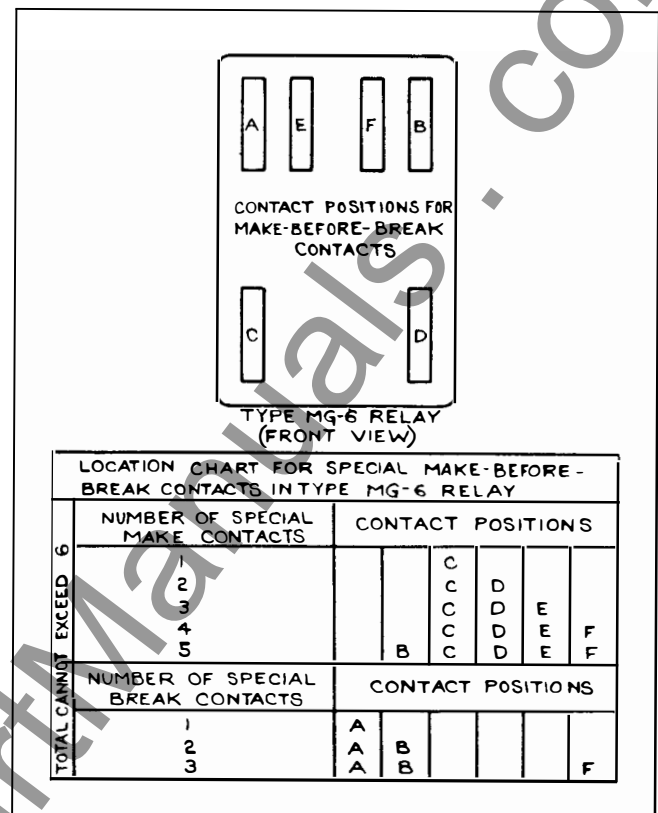


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

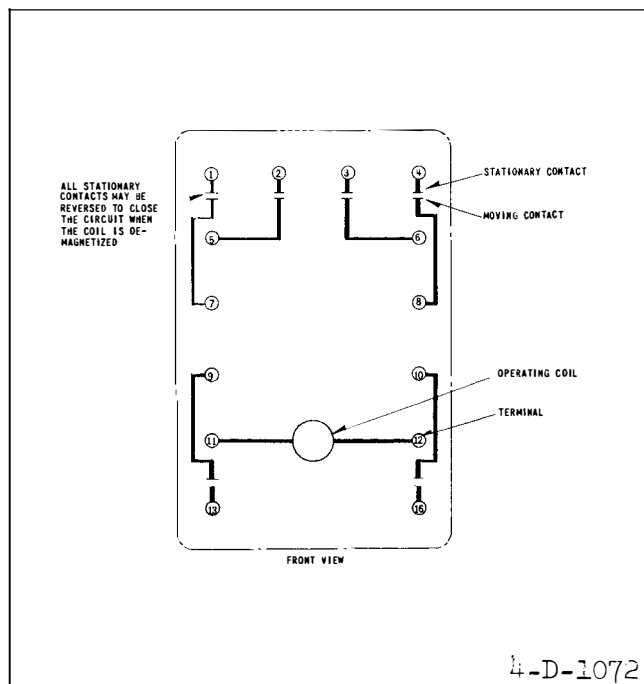


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

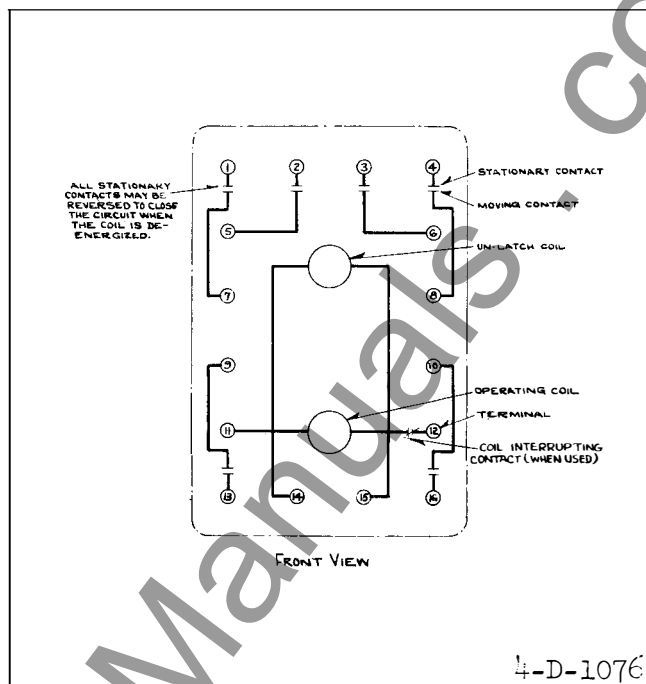


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

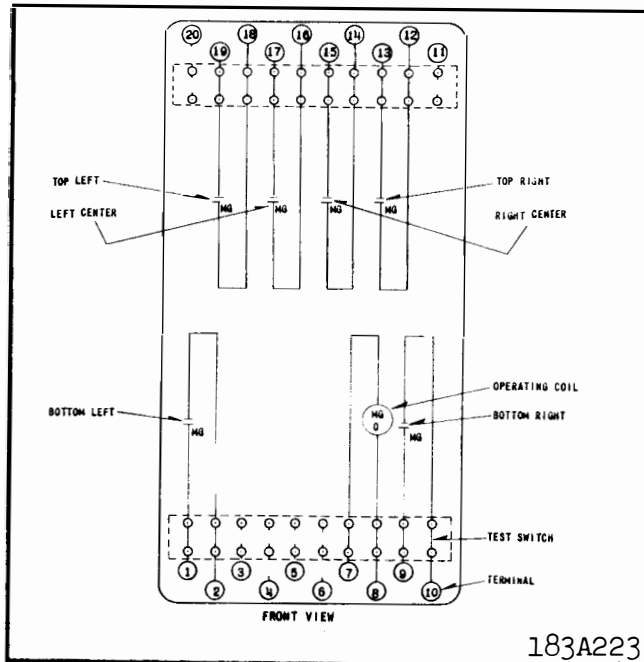


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

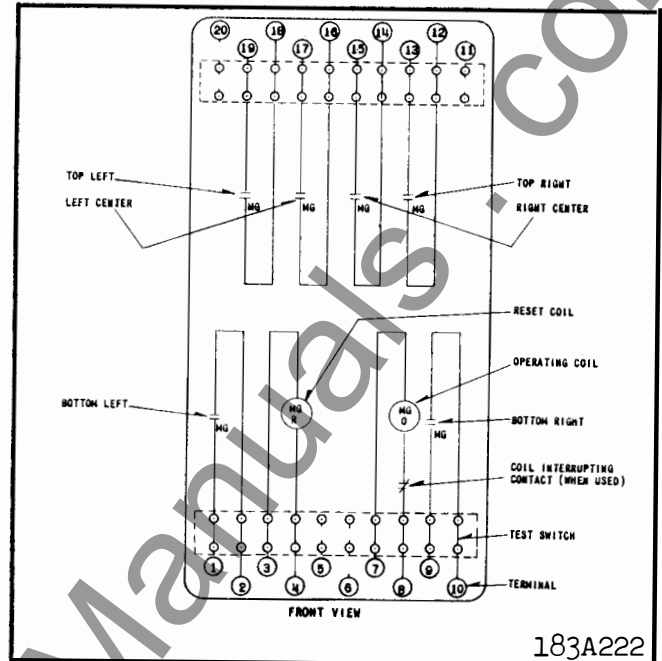
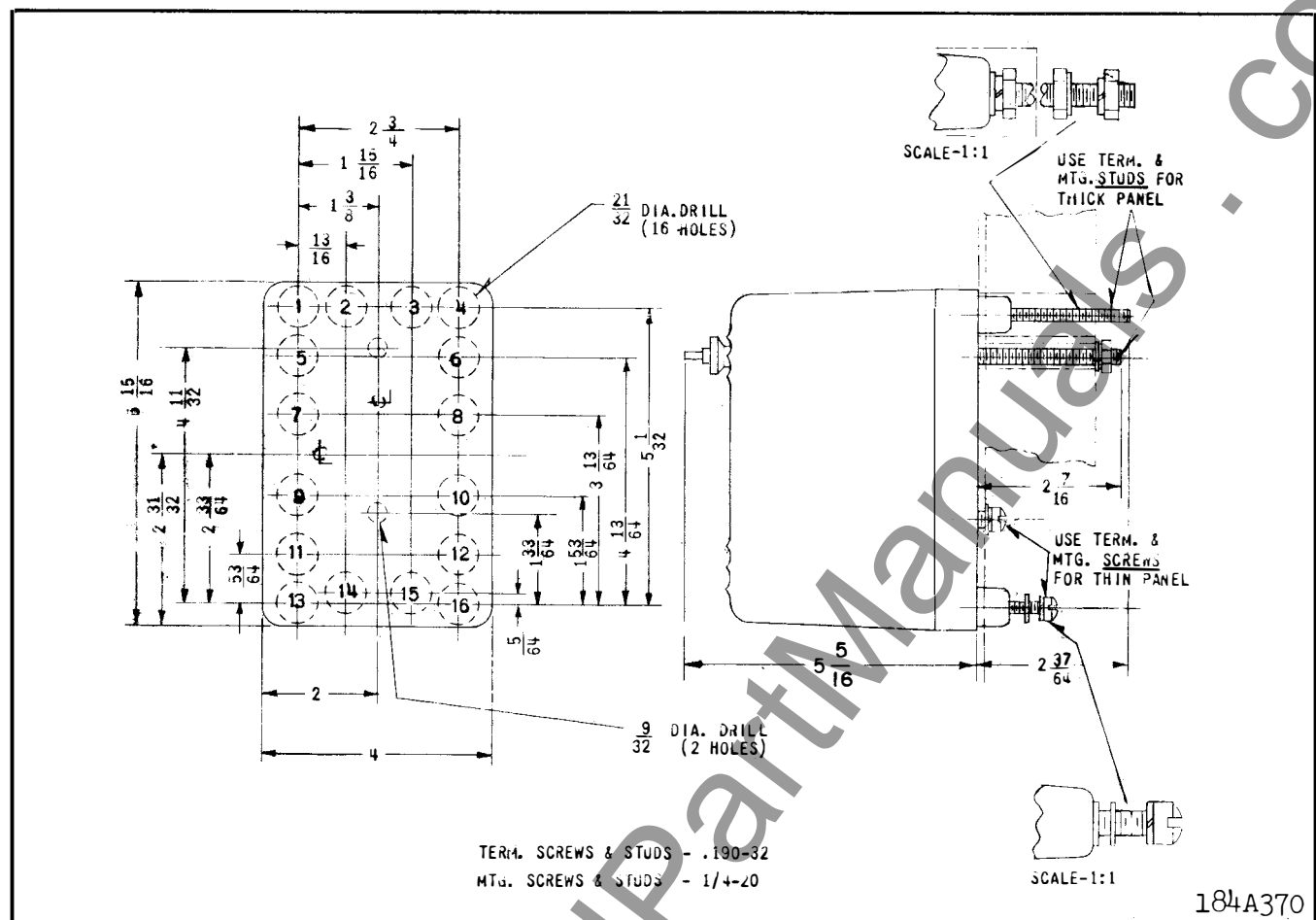


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

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

Coil Resistance (at 25° C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208



* Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

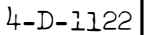
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that

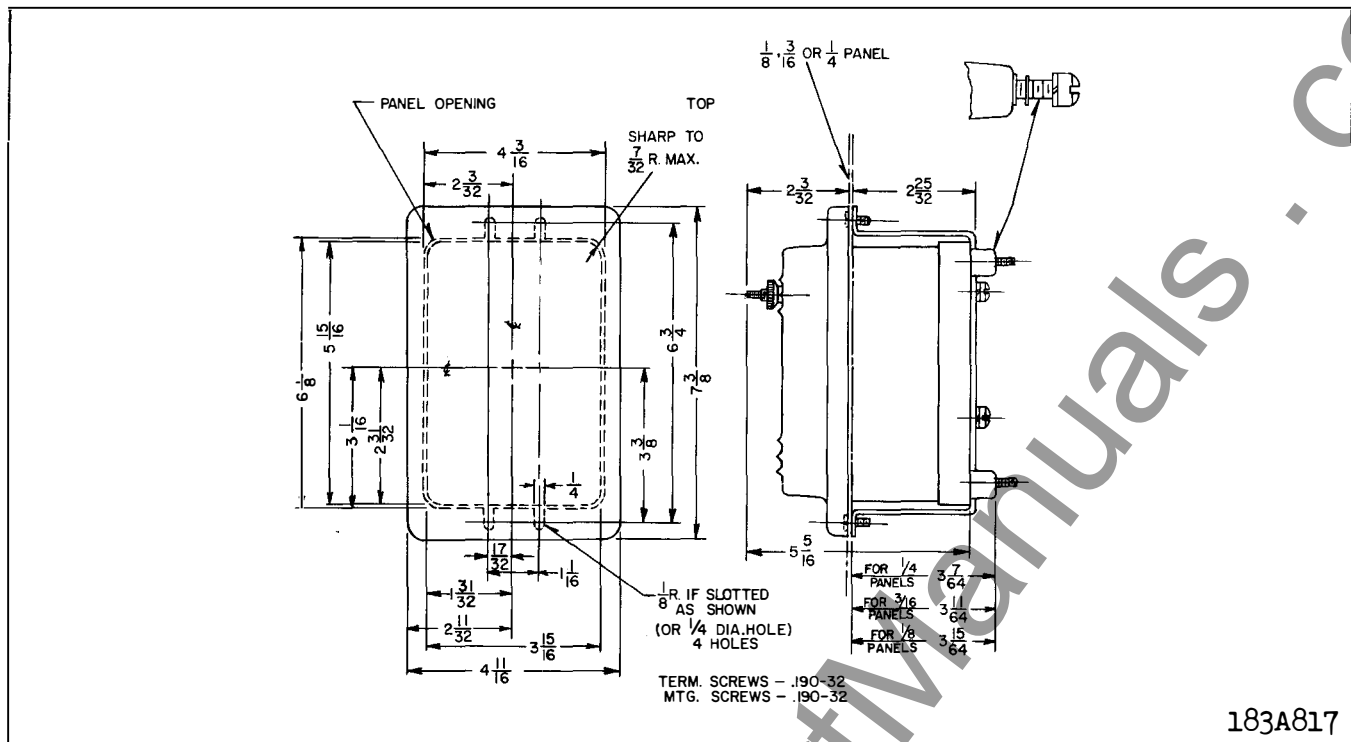


* when the armature is in contact with it, the lower edge of the armature is 7/16" above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately 1/16" follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about 1/16". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments



* Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

- * A small amount of silicone oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be re-applied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

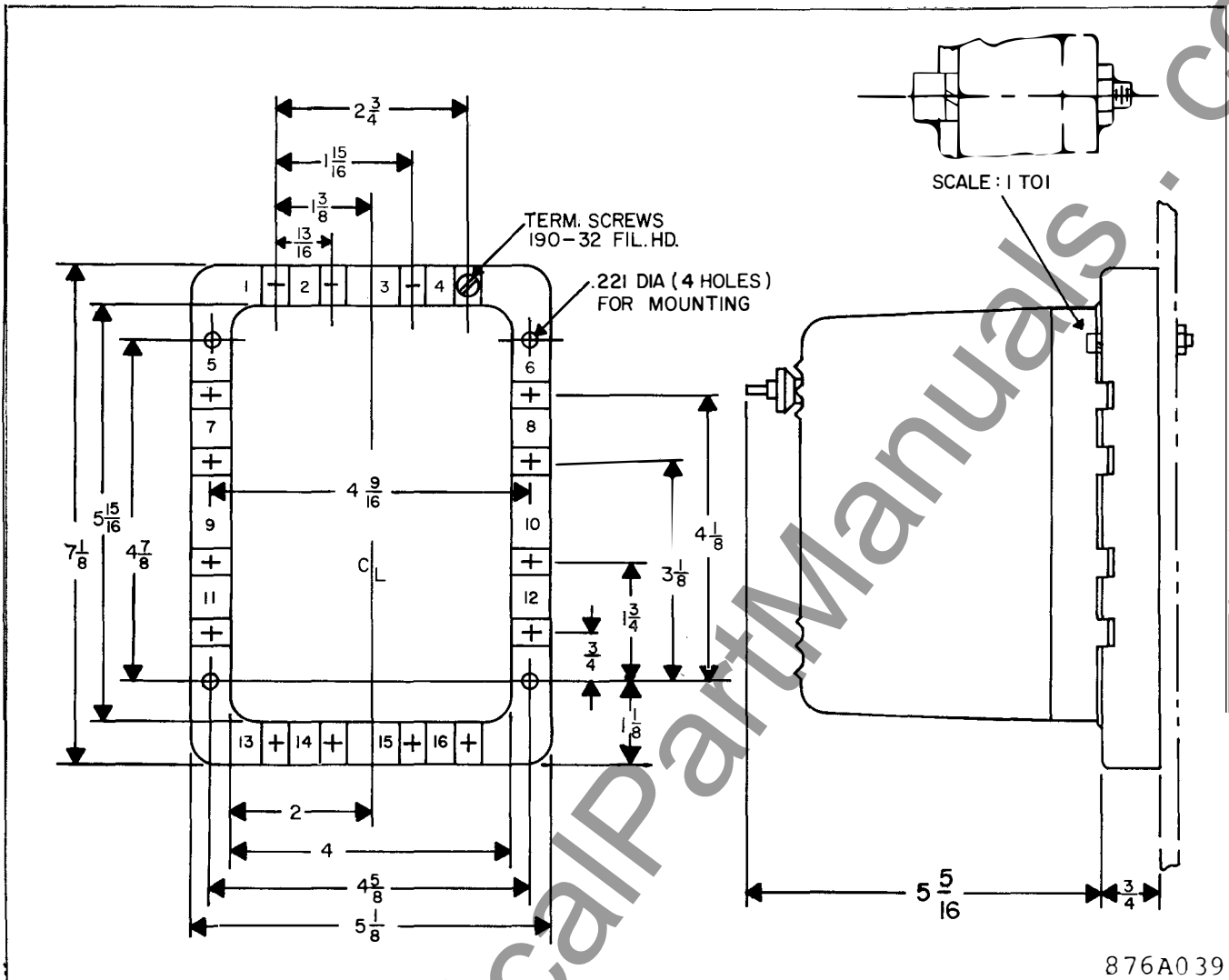
Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

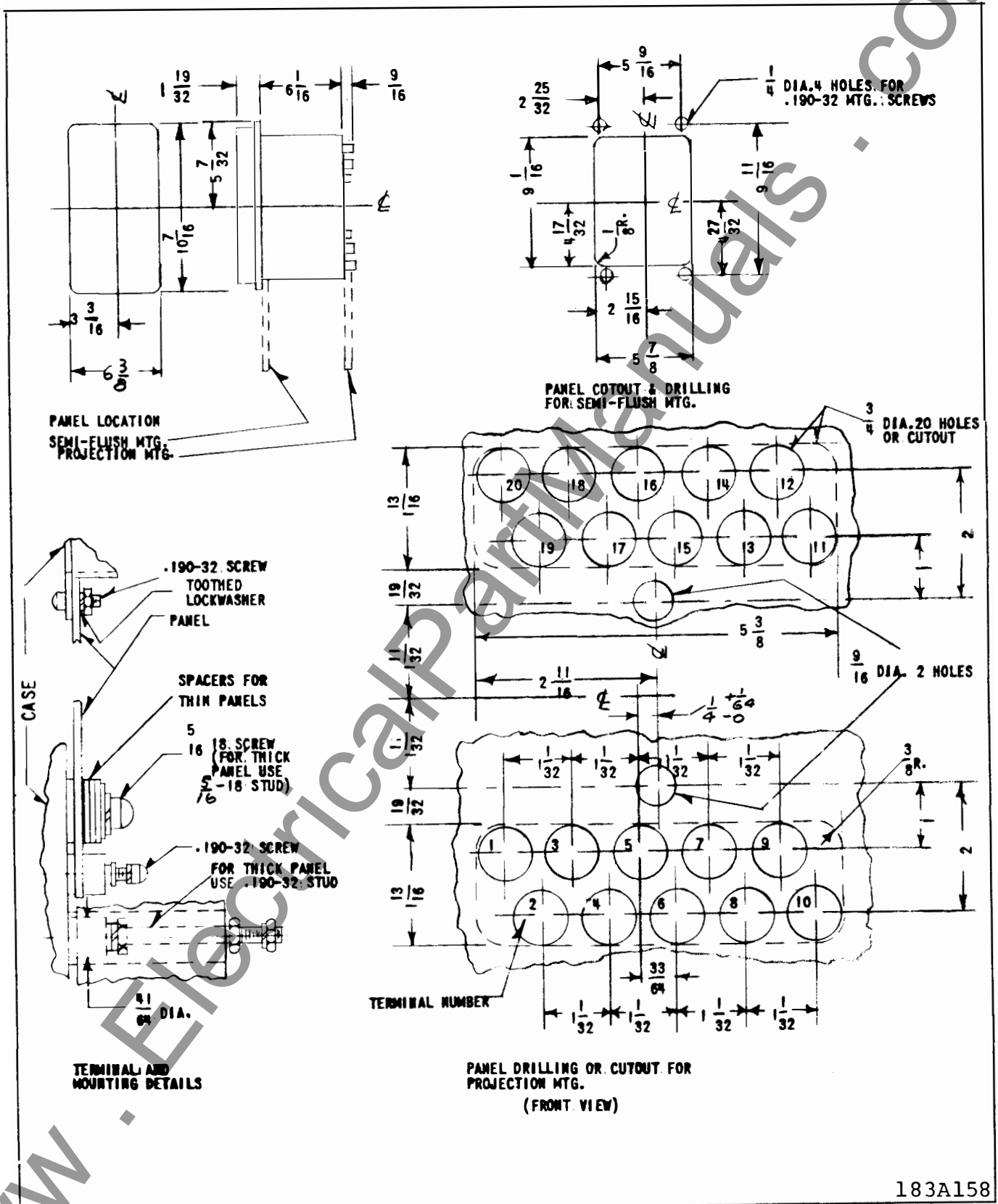
Δ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	



* Fig. 11. Relay Type MG-6 Front Connected with Cover Outline and Drilling Plan



183A158

Fig. 12. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.



WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION

NEWARK, N. J.

Printed in U.S.A.



INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

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The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

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EFFECTIVE FEBRUARY 1973

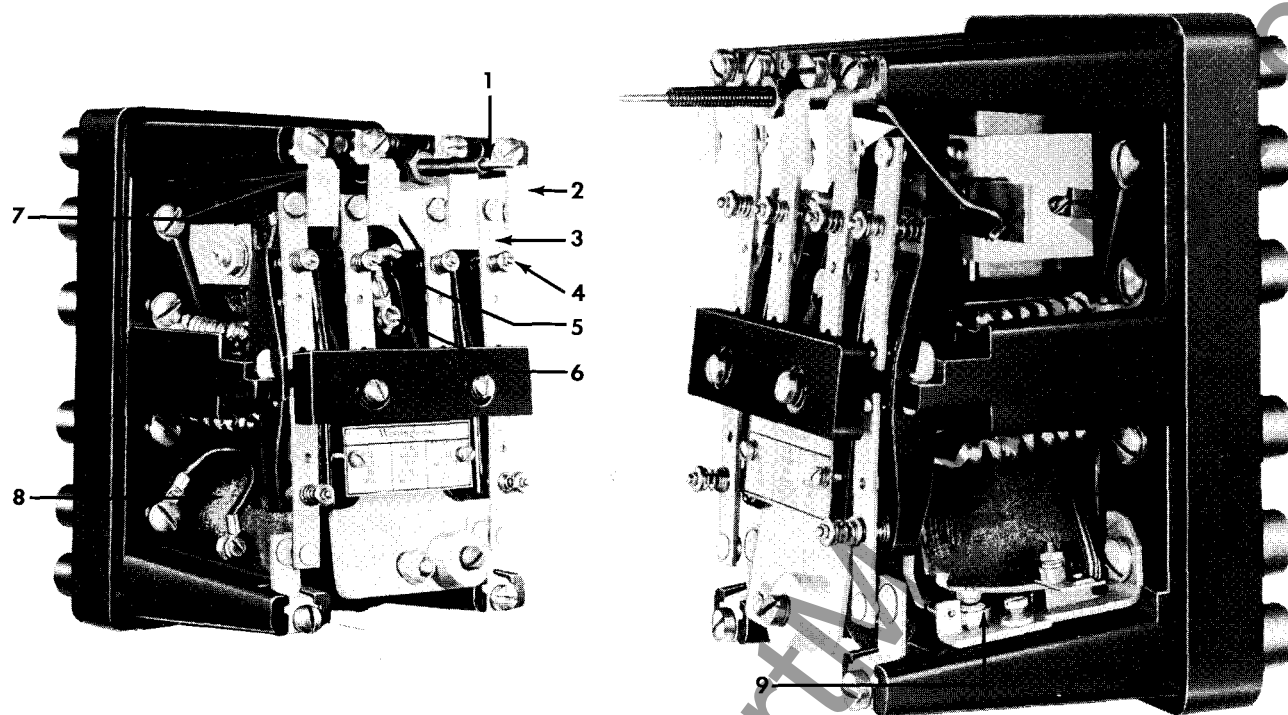


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

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The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

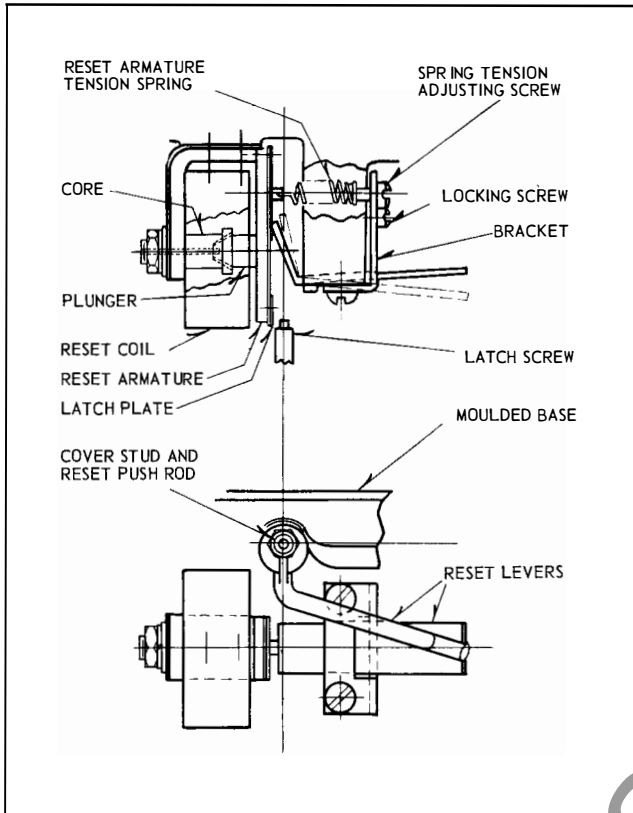


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

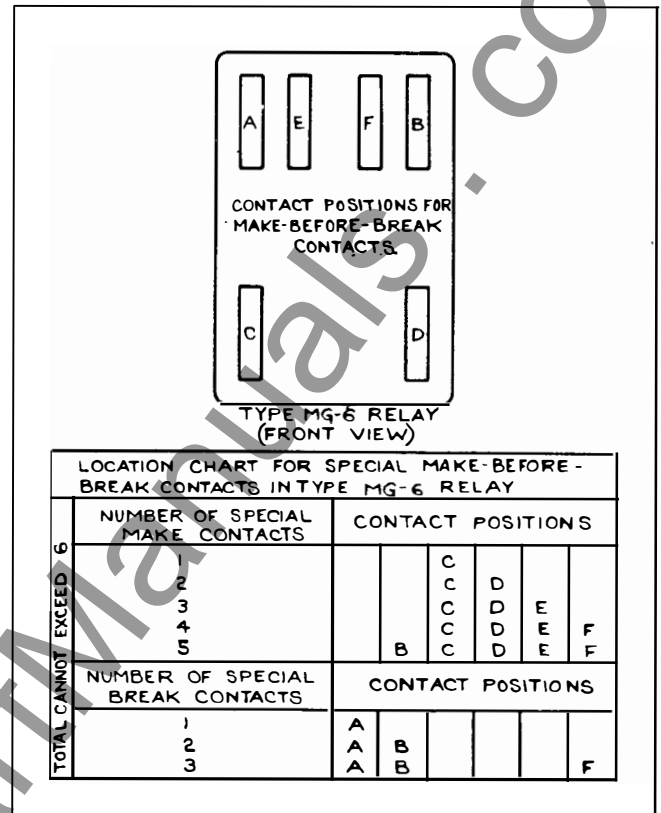


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

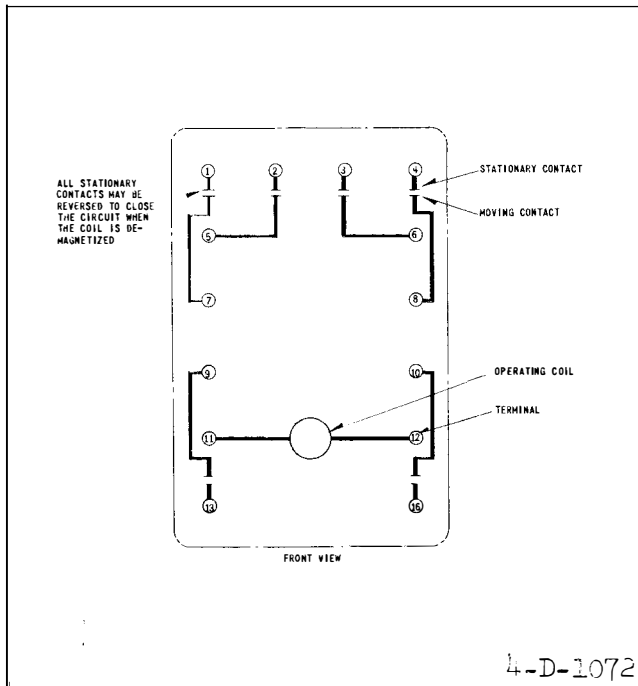


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the F'T22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

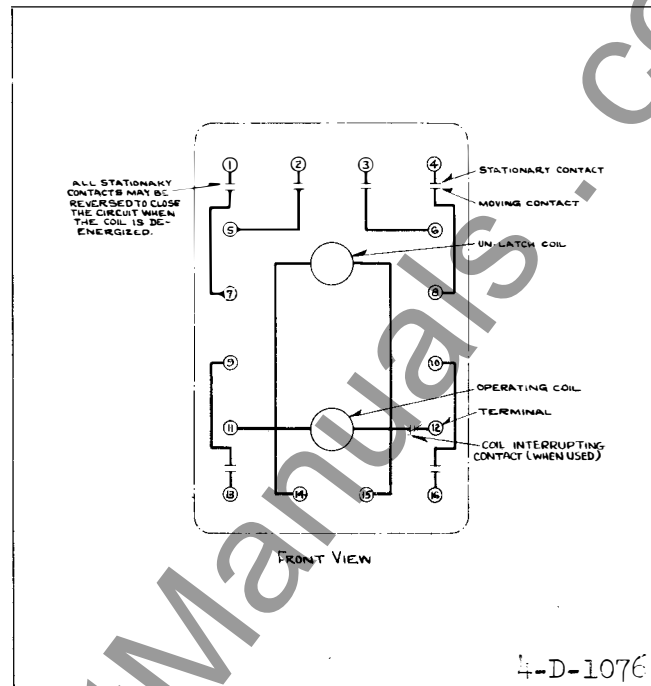


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

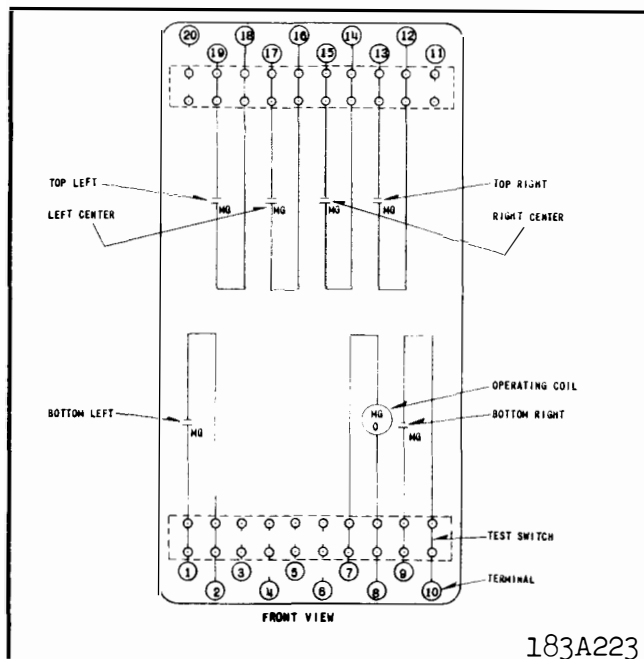


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

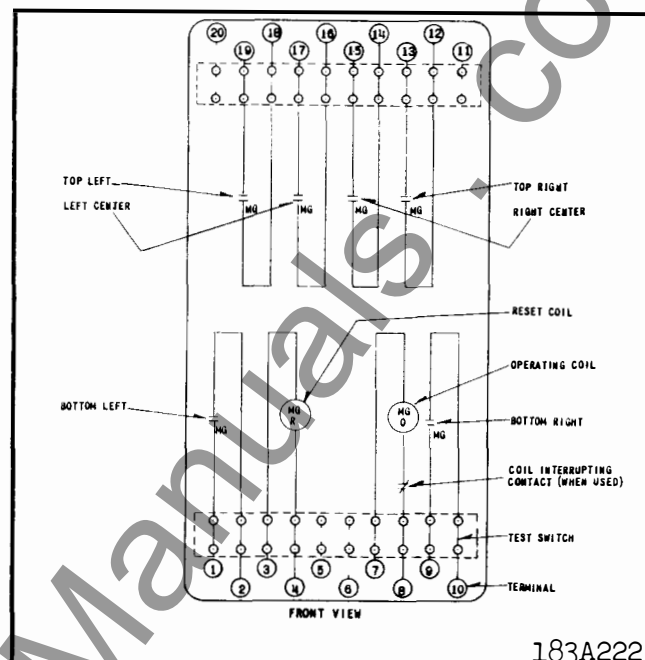


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

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

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

Coil Resistance (at 25° C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208

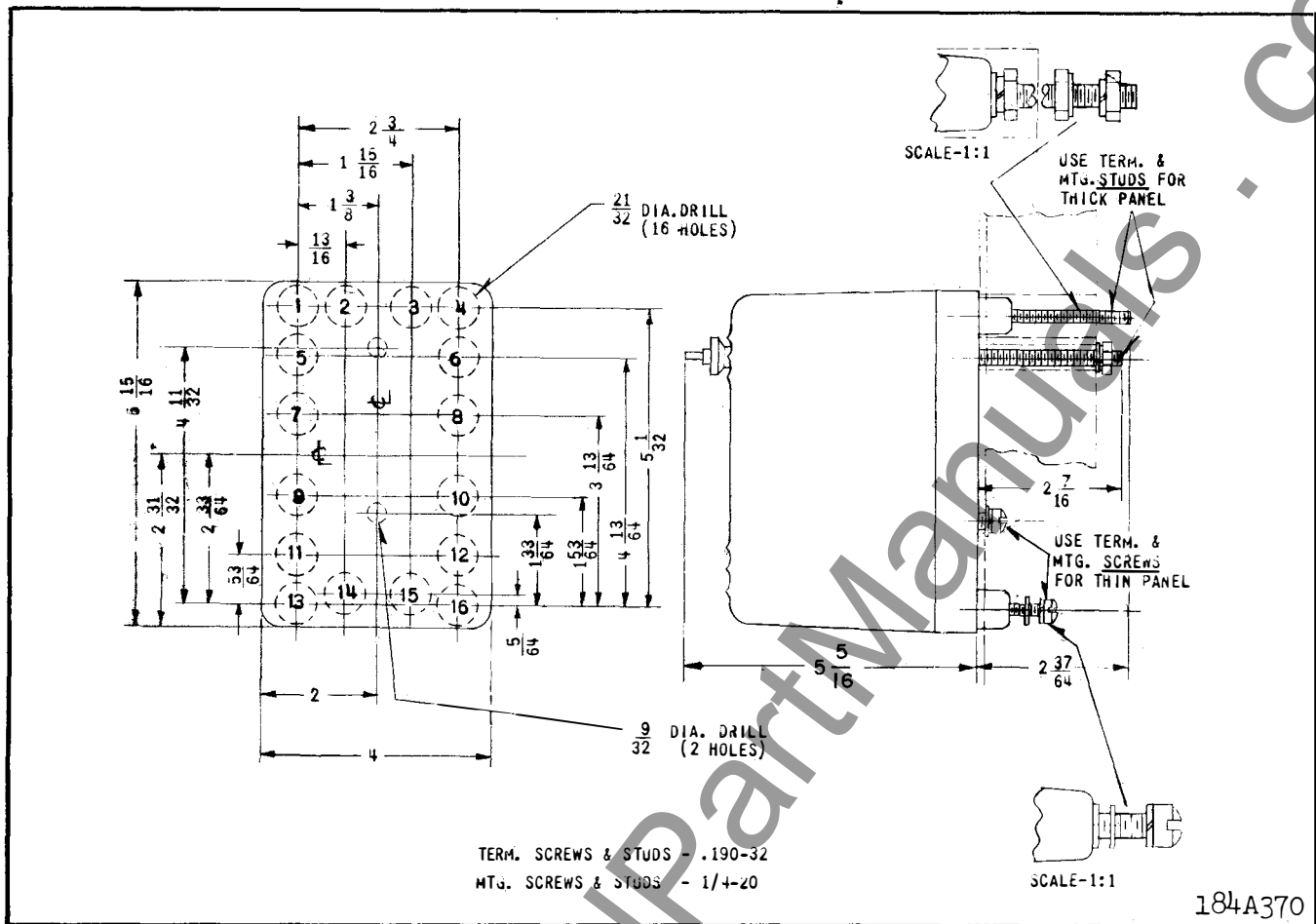


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

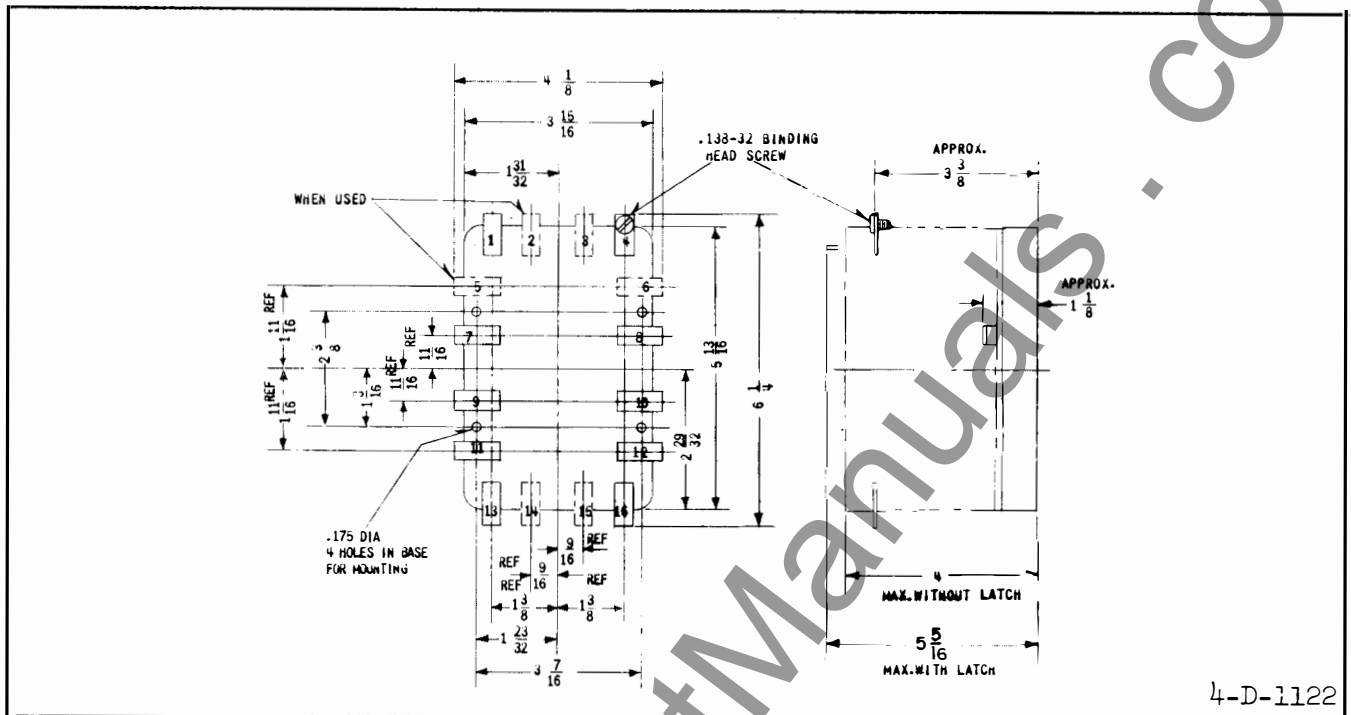
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



4-D-1122

Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

when the armature is in contact with it, the lower edge of the armature is $7/16''$ above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32''$ for the make contacts and $1/16''$ for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8''$ for the make contacts and $3/32''$ for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16''$ follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16''$. With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

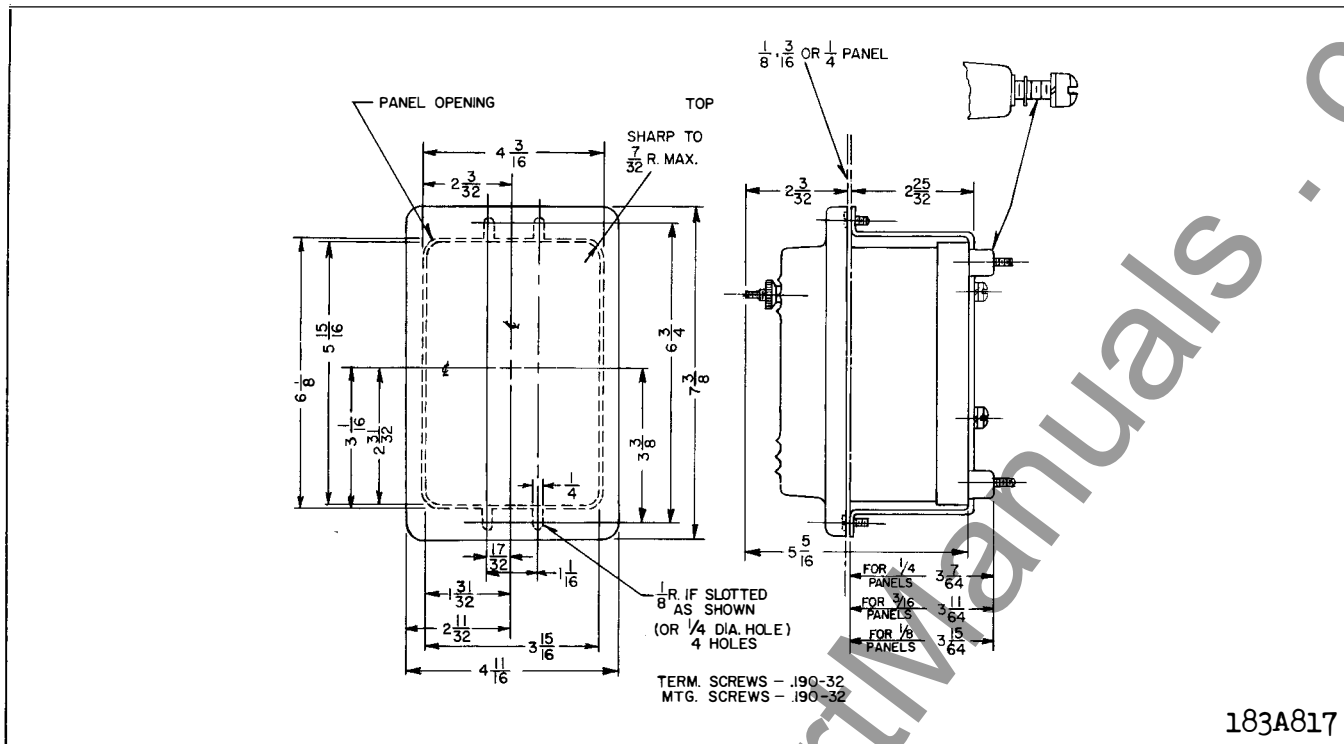


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A small amount of silicone oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be re-applied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

Δ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	

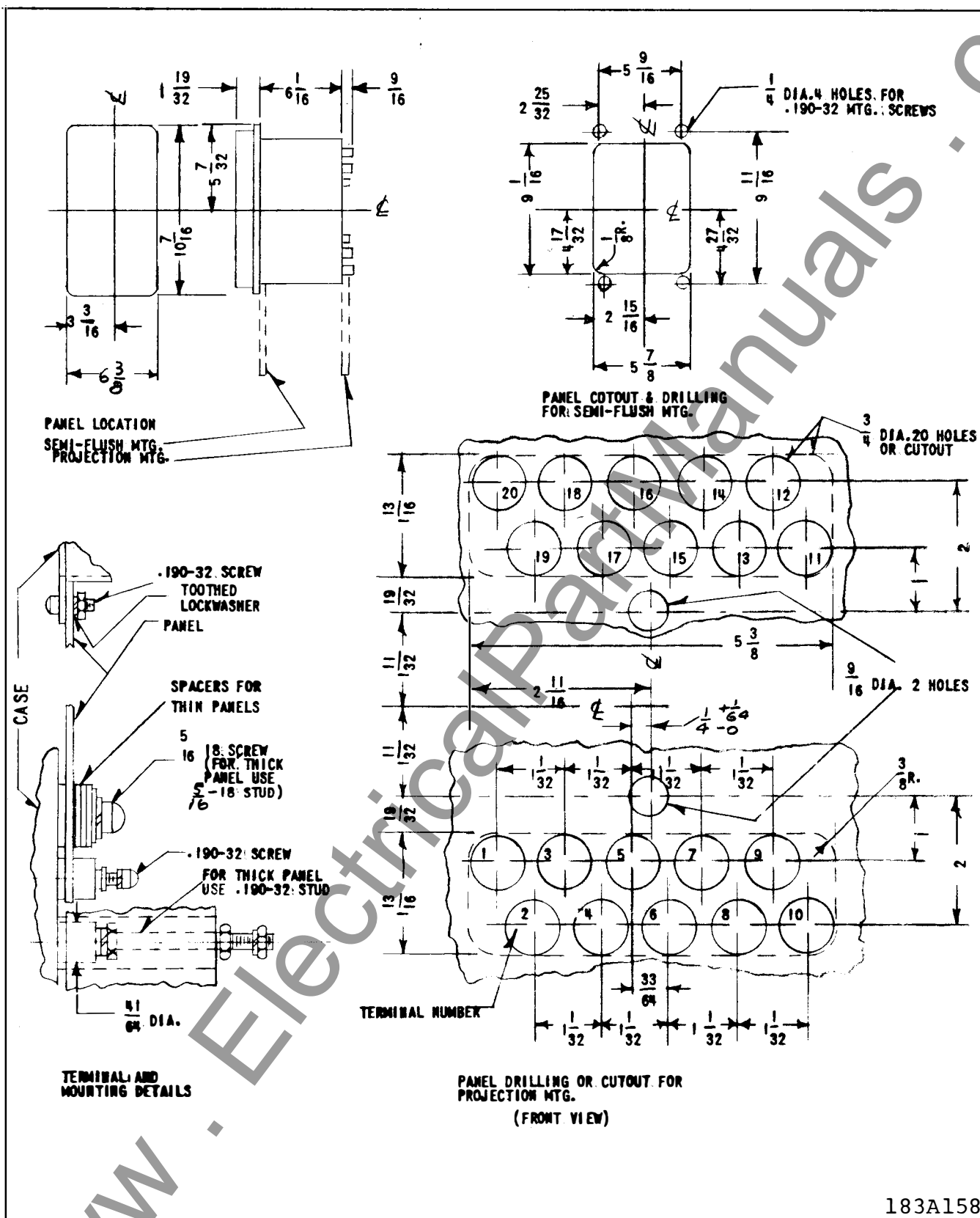


Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION

NEWARK, N. J.

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INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the D-C MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.)

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on A-C. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on D-C, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

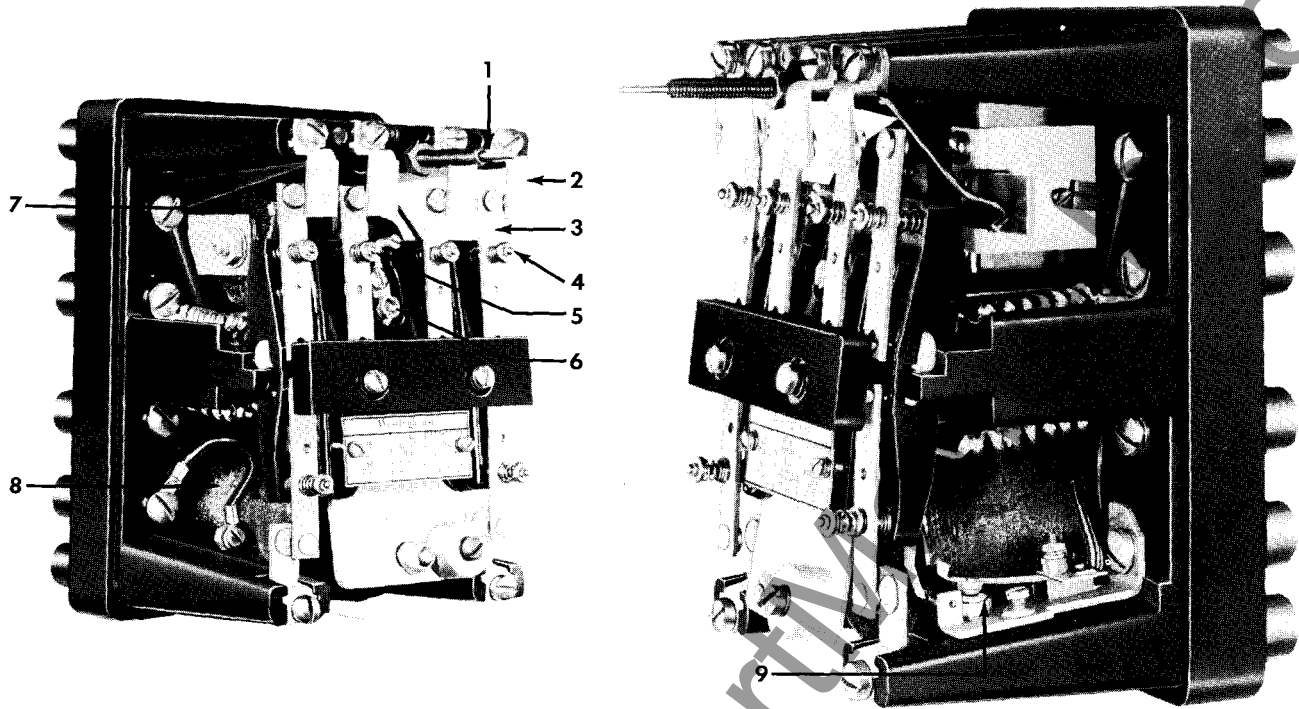


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consists of large silver buttons which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

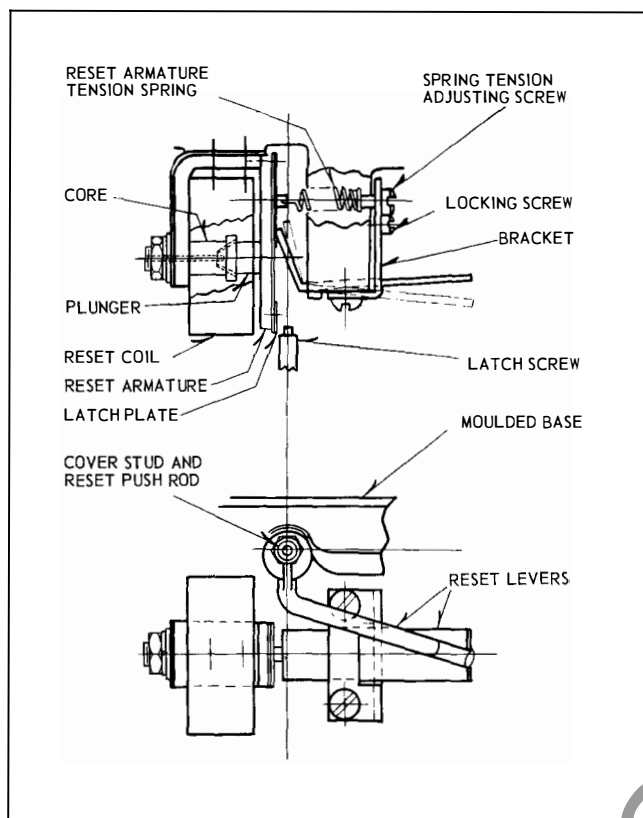


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

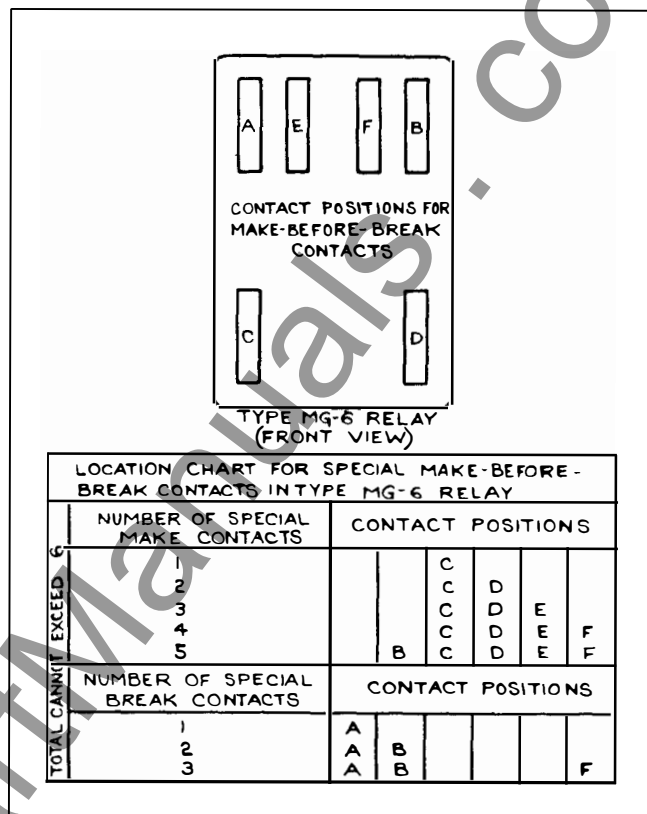


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

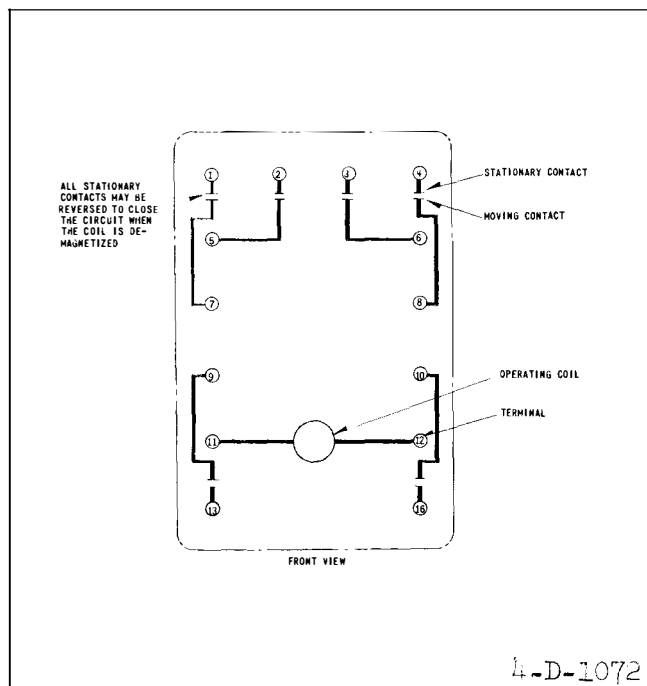


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

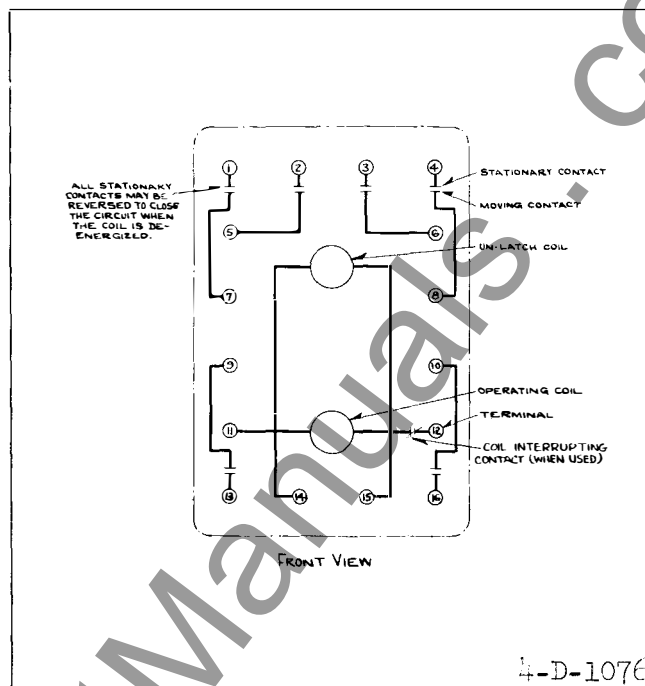


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the F'T22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on a-c and 5 cycles on d-c (on a 60 cycle basis) when energized at the rated voltage.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on a-c, and the coil will stand this voltage safely for over two minutes if 60 cycles or 4 minutes if 25 cycles. (2) The time of the d-c relay can be reduced to slightly

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a d-c relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated d-c voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	Volts A-C
30	115
20	230
15	460
10	575

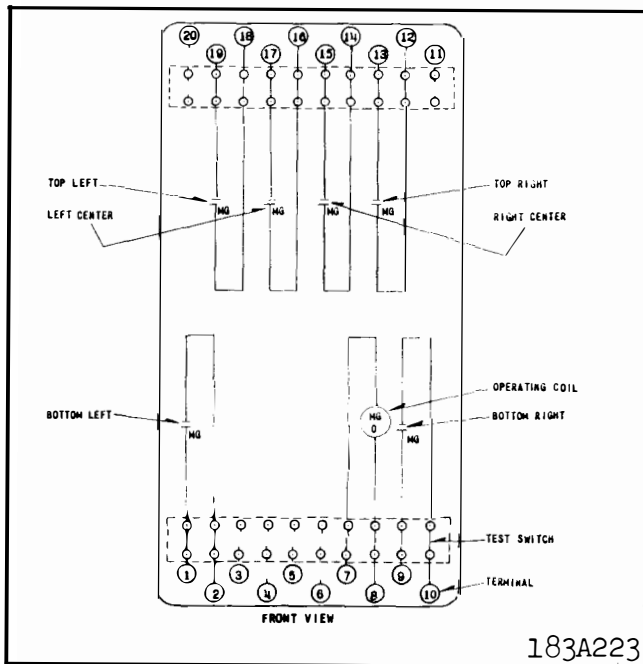


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

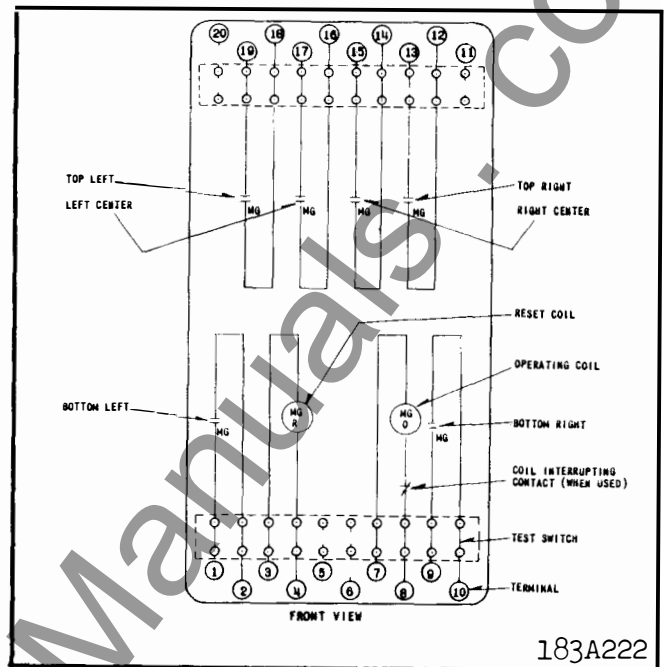


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	Volts D-C
30	12
15	24
10	32
8	48
3	125
1	250

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

The type MG-6 relay for a-c can be used with any combination of contacts, but the d-c relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

Coil Resistance (at 25° C) (± 10%)

Rating	Operating Coil		Reset Coil
	Ohms	Closed Gap Impedance	Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 cycle	19	354	91
208 volts, 60 cycle	67	1160	322
230 volts, 60 cycle	75	1410	364
460 volts, 60 cycle	305	5680	1445
575 volts, 60 cycle	495	8860	2208

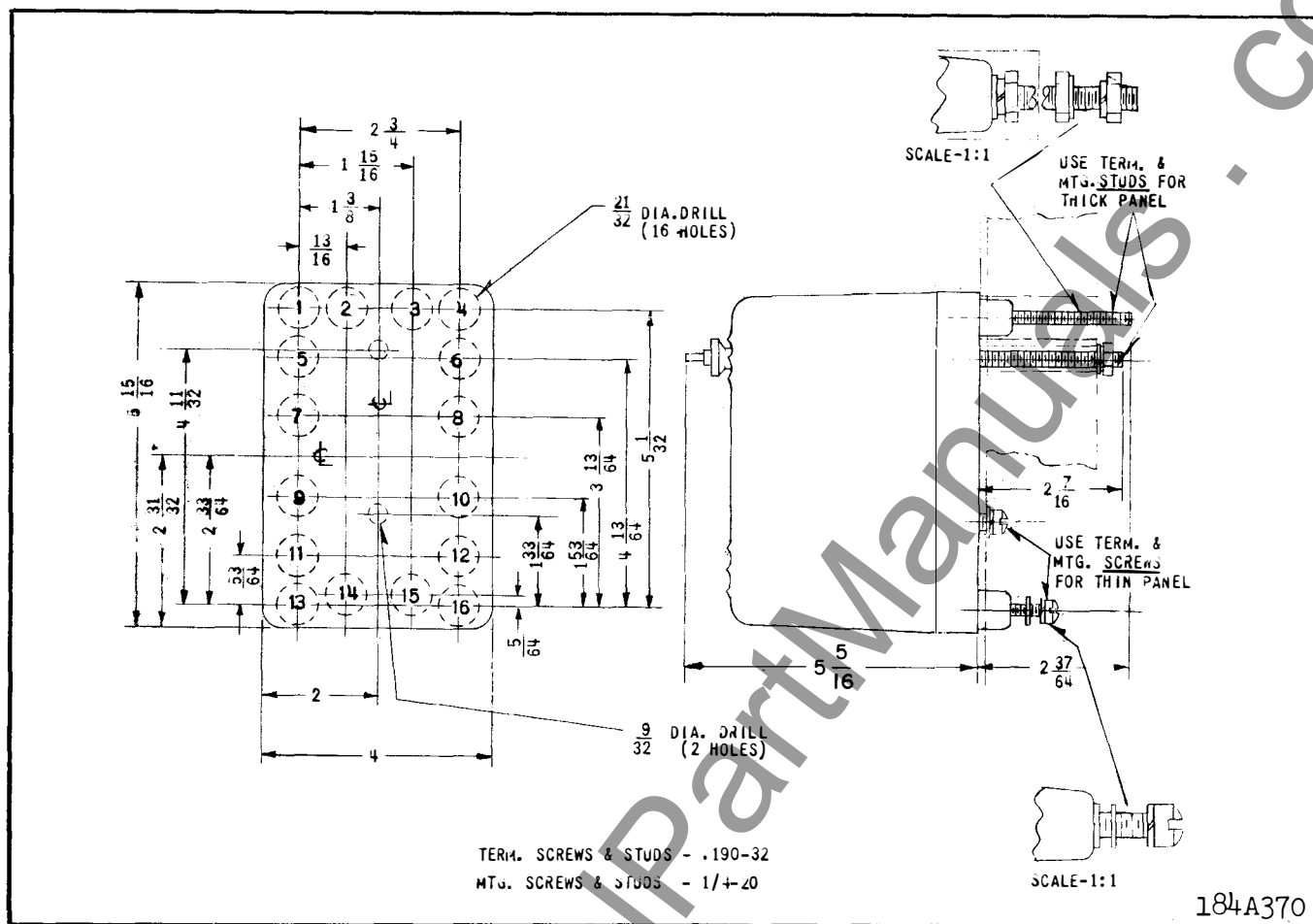


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

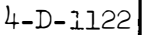
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



when the armature is in contact with it, the lower edge of the armature is 7/16" above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately 1/16" follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about 1/16". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

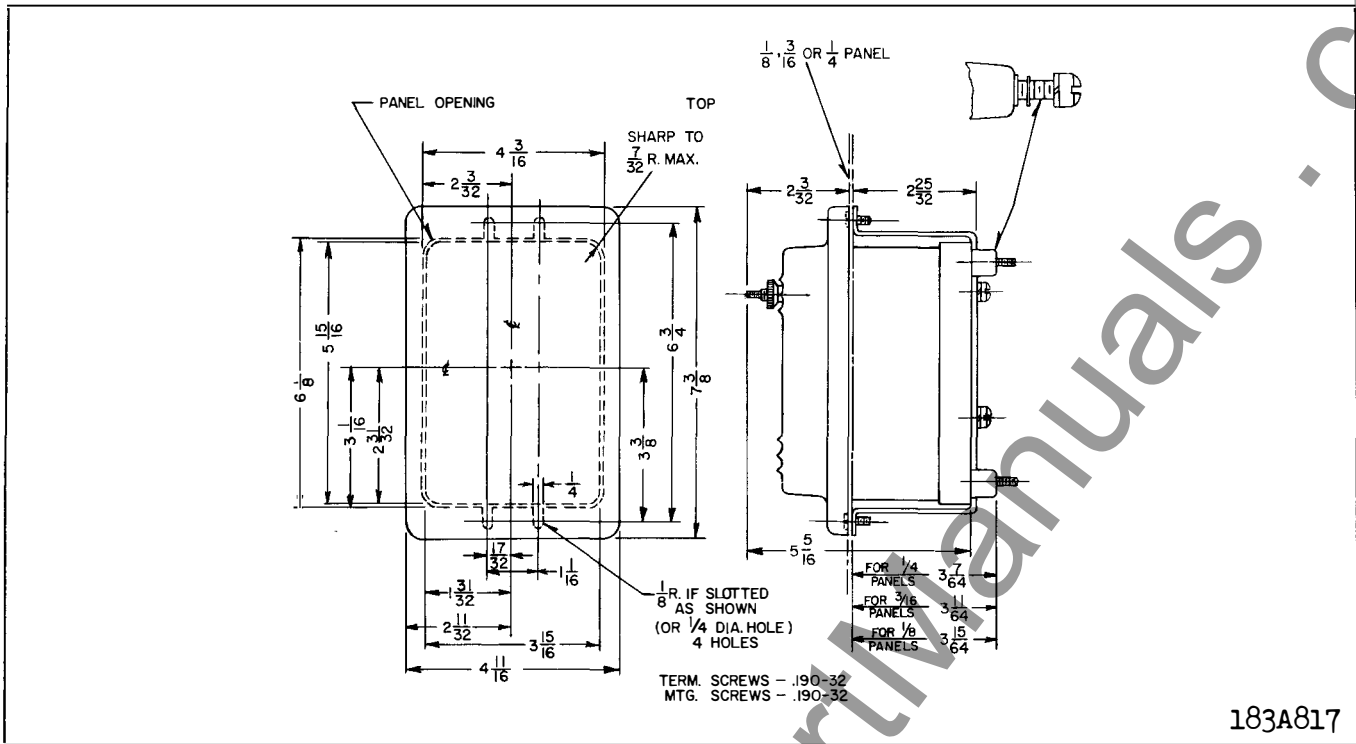


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A small amount of silicone oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be re-applied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

ENERGY REQUIREMENTS

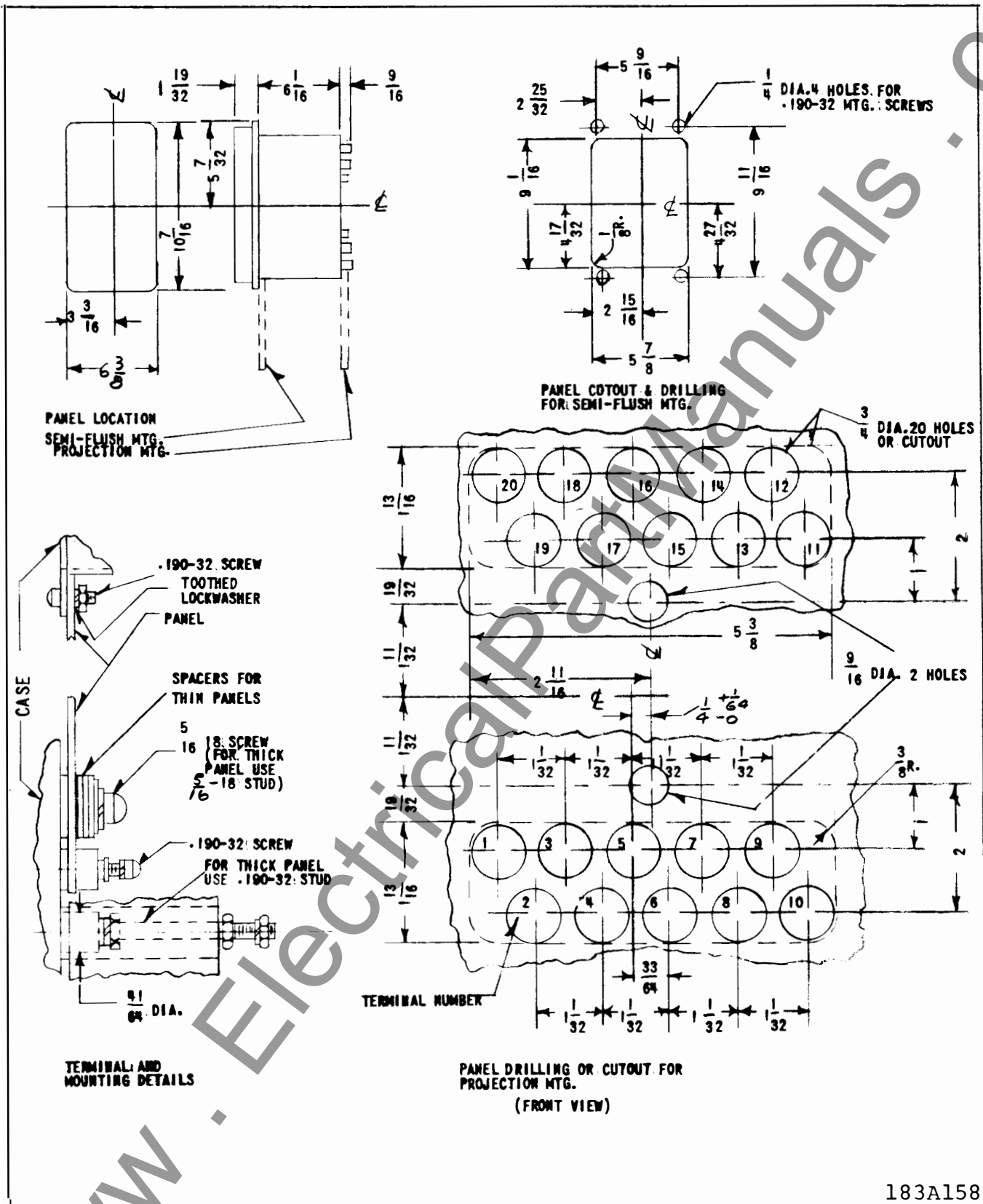
Operating Coil Burdens at rated Voltage

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
Δ 60	12	37	17.6	92
D-C	7.8 cold--		7.8 cold--	
D-C	6.5 hot--		6.5 hot--	

Δ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (cycles)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
D-C	66 cold--		68 cold--	



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Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

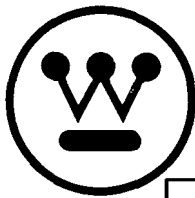
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WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION

NEWARK, N. J.

Printed in U.S.A.



INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the dc MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations. (e.g. 24 volt coil on 125 volt dc circuit.

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on ac. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on dc, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

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

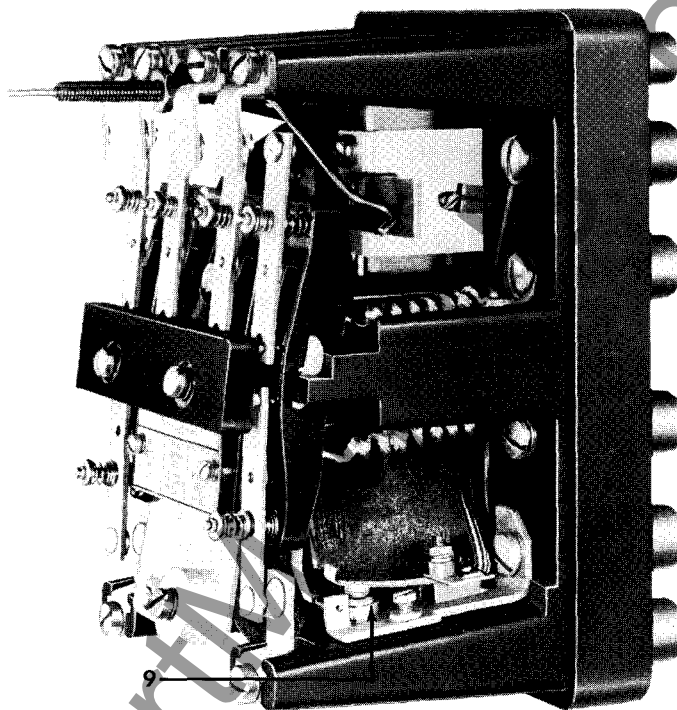
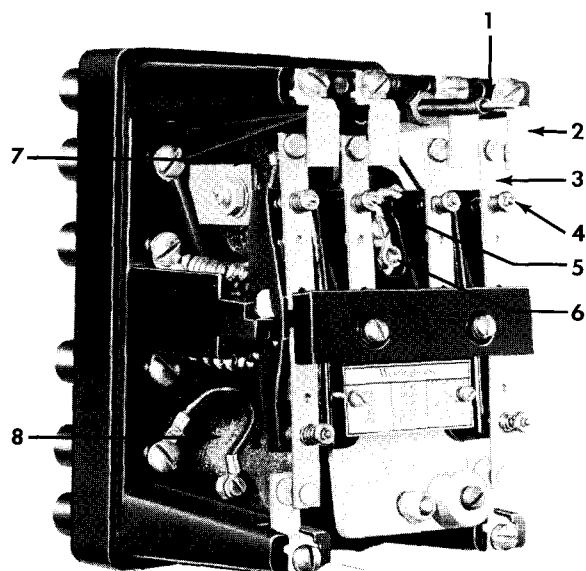


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consists of large silver buttons which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

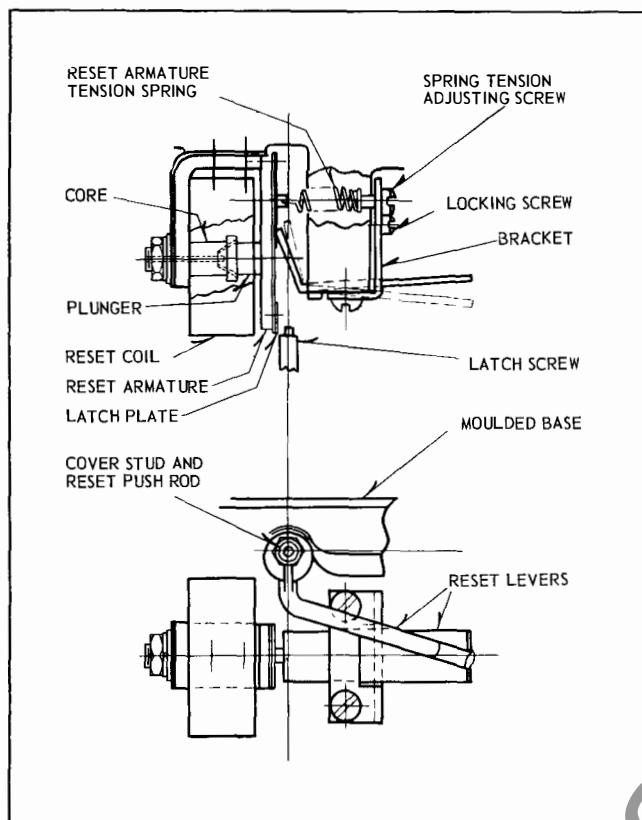


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

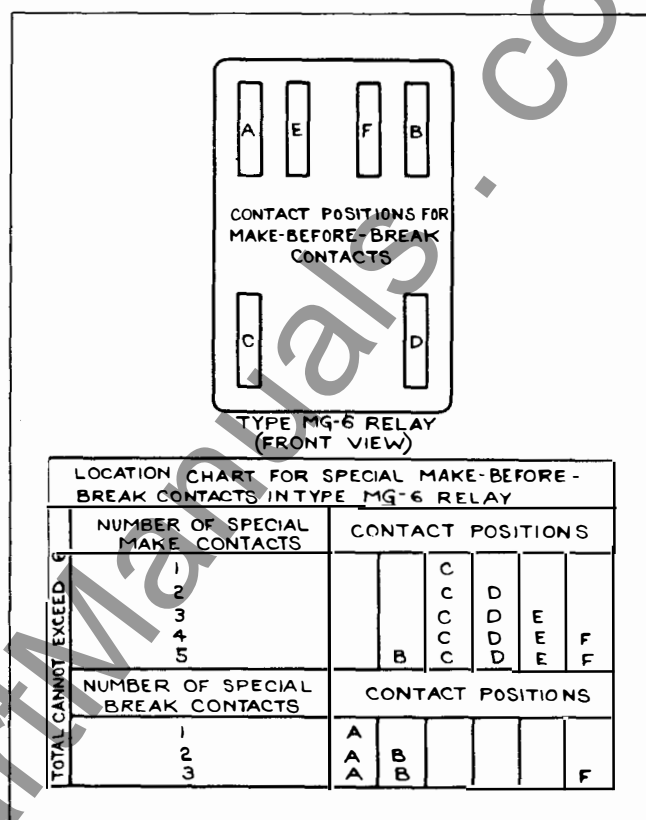


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

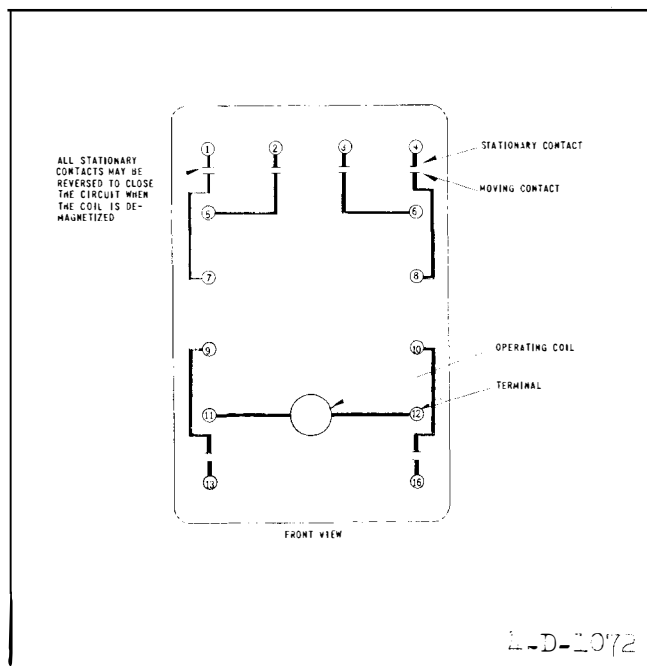


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

The type MG-6 relay has an operating time of approximately 2 cycles on ac and 5 cycles on dc (on a 60 hertz basis) when energized at the rated voltage.

* **50 Hz relay.** The operate and reset coils for 50 Hz MG-6 relay are different than the 60 Hz coils.

If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on ac, and the coil will stand this voltage safely for over two minutes if 60 hertz or 4 minutes if 25 hertz. (2) The time of the d-c relay can be reduced to slightly

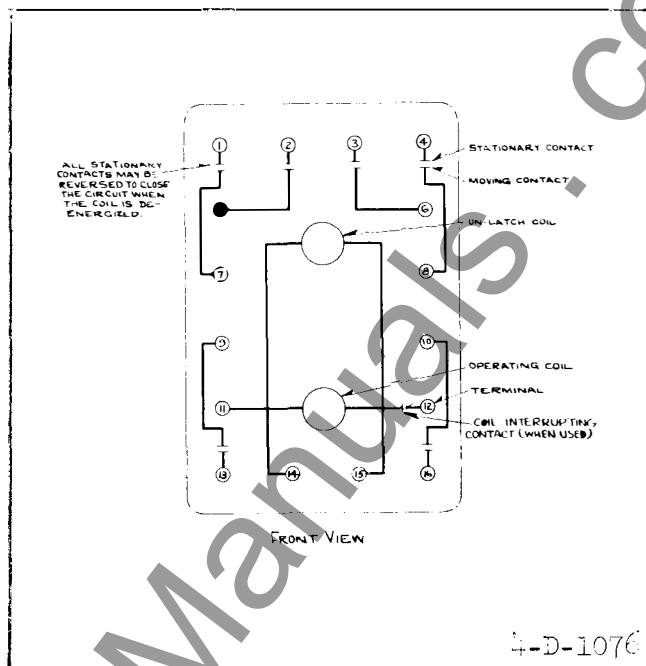


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a dc relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated dc voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	* Volts ac
30	115
20	230
15	460
10	575

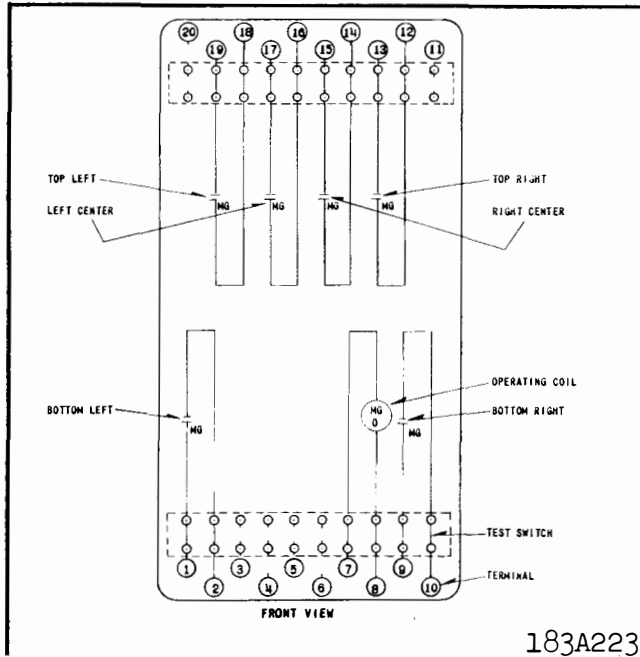


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

Current	* Volts dc
30	12
15	24
10	32
8	48
3	125
1	250

* The type MG-6 relay for ac can be used with any combination of contacts, but the dc relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

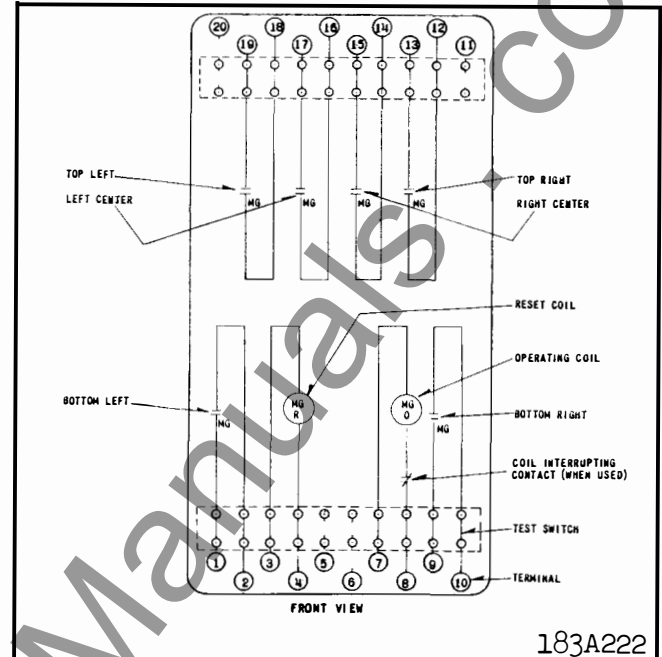


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

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

Coil Resistance (at 25° C) (± 10%)

* Rating	Operating Coil		Reset Coil
	dc Ohms	Closed Gap Impedance	dc Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 Hertz	19	354	91
208 volts, 60 Hertz	67	1160	322
230 volts, 60 Hertz	75	1410	364
460 volts, 60 Hertz	305	5680	1445
575 volts, 60 Hertz	495	8860	2208
115 volts, 50 Hertz	26	....	138
230 volts, 50 Hertz	105	....	550
460 volts, 50 Hertz	465	....	2200
575 volts, 50 Hertz	660	....	3550

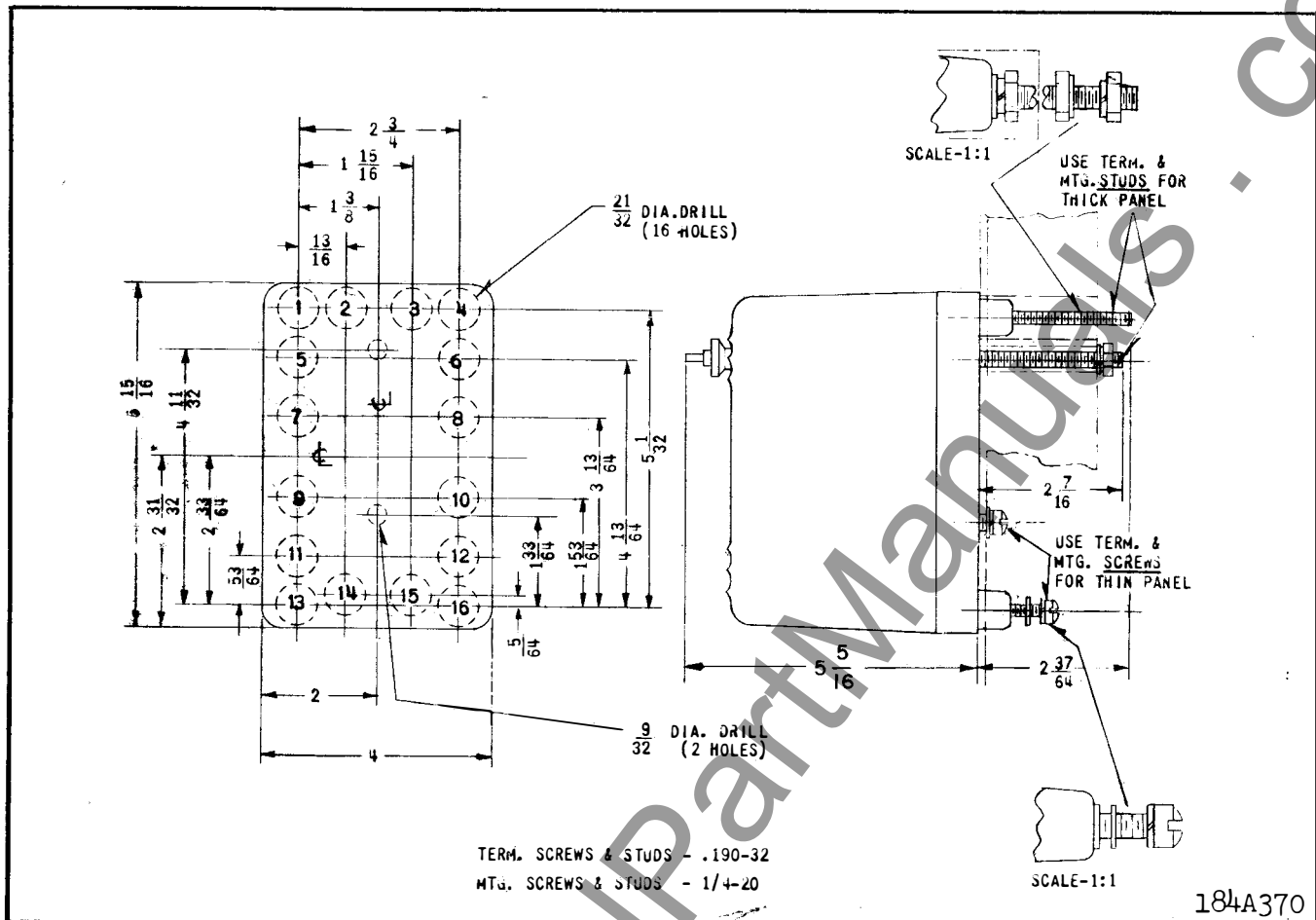


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follows approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that

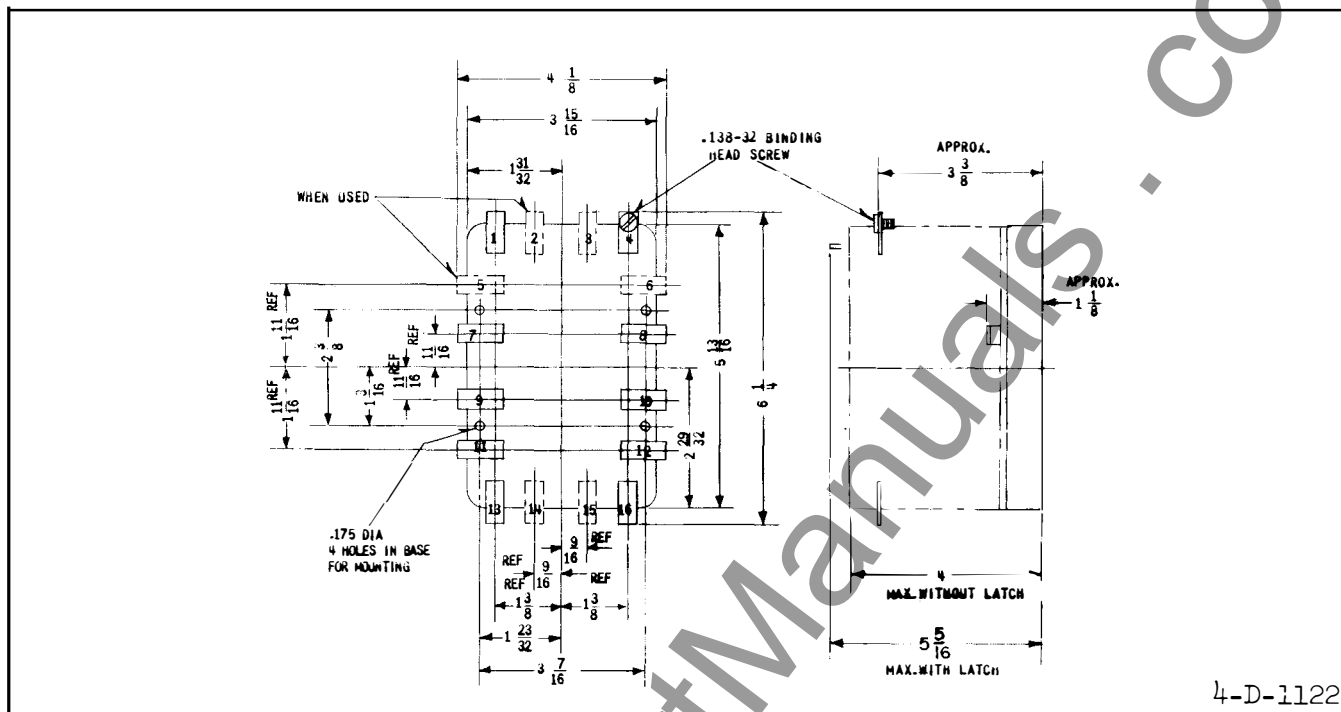


Fig. 9. Outline and Drilling Plan for the Type MG-6 Relay in the Front Connected Molded Case. See Internal Schematic for Terminals Supplied. For Reference Only.

when the armature is in contact with it, the lower edge of the armature is $7/16''$ above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

The follow of the moving contact fingers should be $3/32''$ for the make contacts and $1/16''$ for the break contacts, measured at the contacts. This can be checked more conveniently by measuring the travel of the lower edge of the armature after the contacts touch. This should be approximately $1/8''$ for the make contacts and $3/32''$ for the break contacts. In case moving contact fingers have been removed from their guide pins, it is important that the coil springs

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately $1/16''$ follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about $1\frac{1}{2}$ turns and the follow of the stationary make contacts must be reduced (by bending) to about $1/16''$. With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

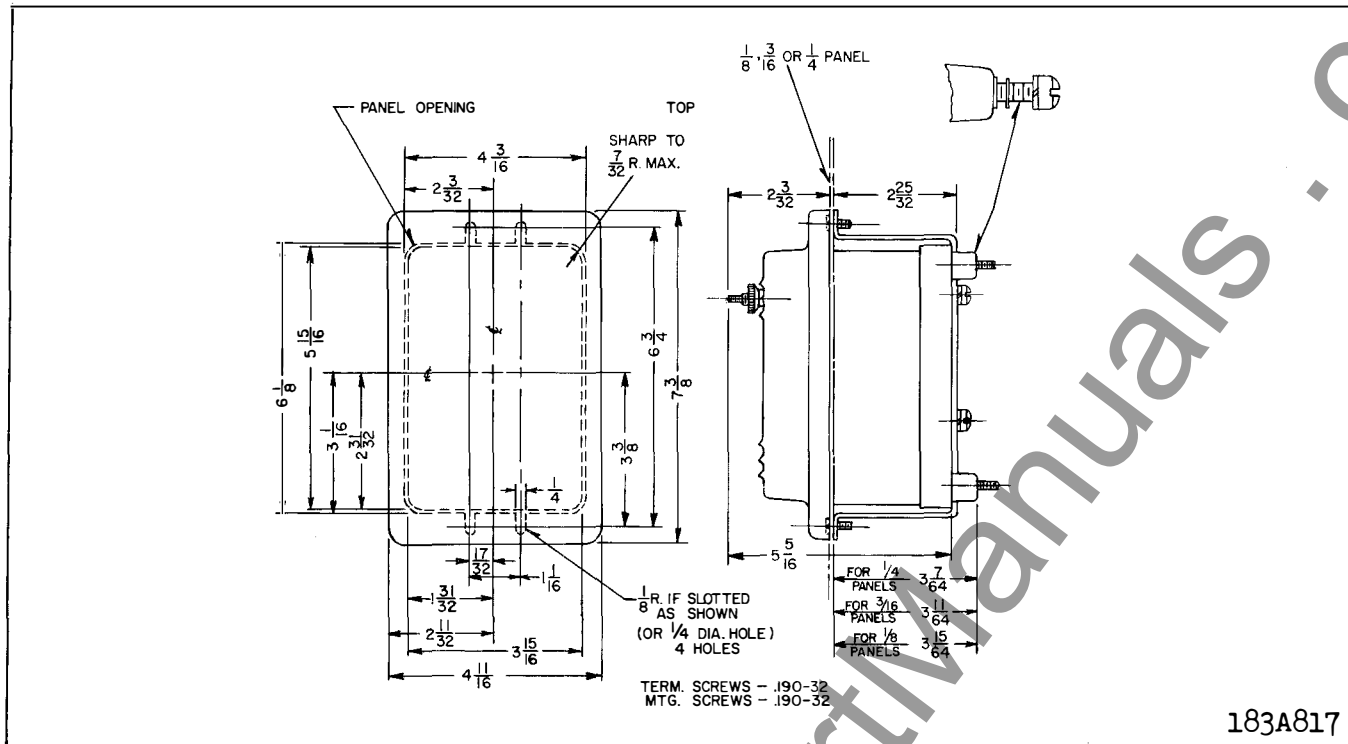


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearing carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw

* should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A small amount of silicone oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be re-applied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

* ENERGY REQUIREMENTS

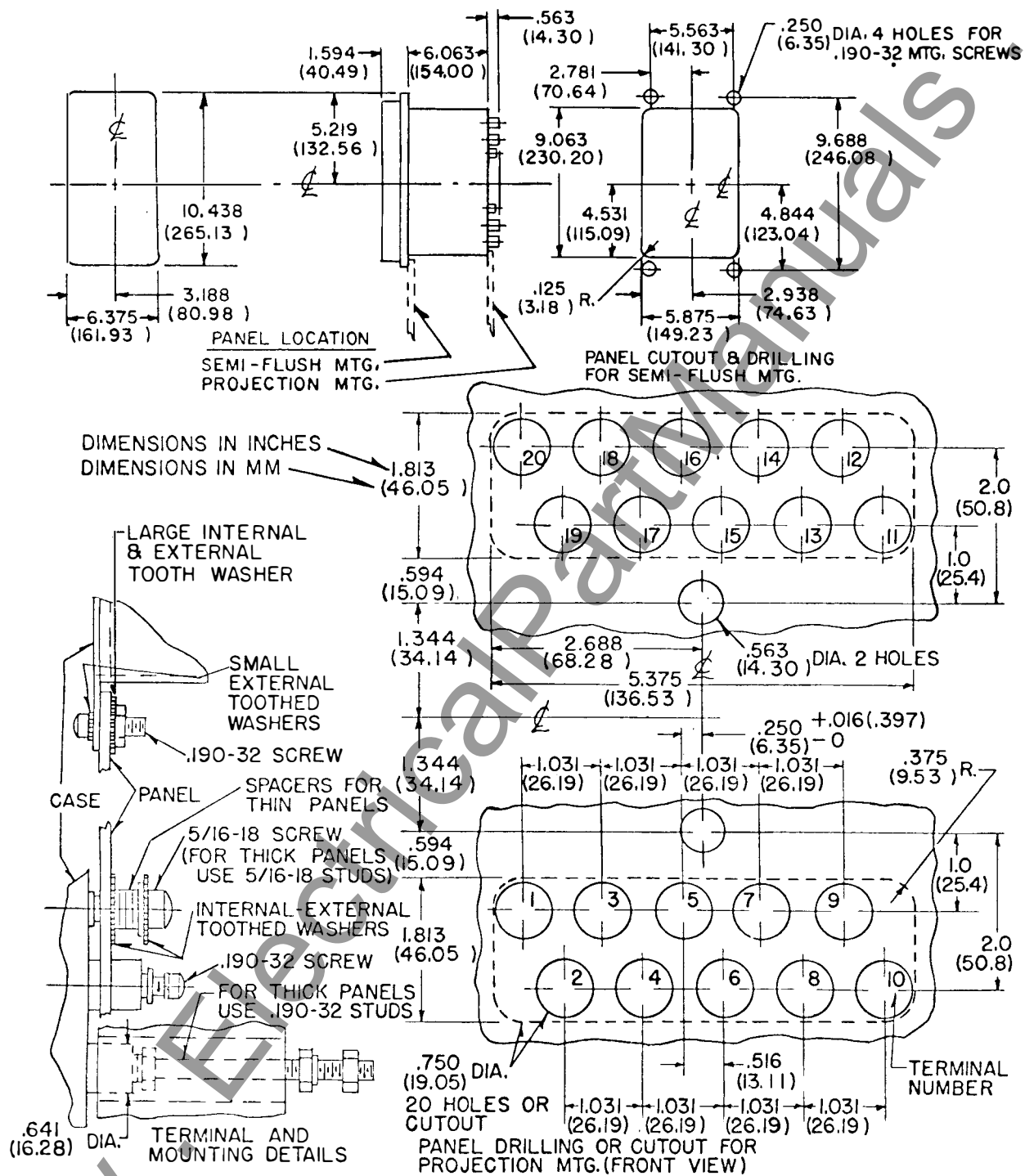
Operating Coil Burdens at rated Voltage

Frequency (Hertz)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	12	37	17.6	92
dc	7.8 cold--		7.8 cold--	
ac	6.5 hot--		6.5 hot--	

△ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (Hertz)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
dc	66 cold--		68 cold--	



183A158

Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION

CORAL SPRINGS, FL.

Printed in U.S.A.



INSTALLATION • OPERATION • MAINTENANCE INSTRUCTIONS

TYPE MG-6 MULTI-CONTACT AUXILIARY RELAY

CAUTION Before putting 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 close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type MG-6 relay is designed for applications where several independent circuits must be energized or de-energized upon the operation of a single primary relay contact, or where the capacity of the primary relay contact is inadequate for the energy required in a control circuit. In certain applications these relays may be used directly as primary relays. Since the stationary contacts can readily be reversed so as to be suitable for either circuit opening or circuit closing service (although a slight increase in spring tension may be required on the dc MG-6 relay — see “ADJUSTMENTS AND MAINTENANCE”) it is unnecessary to predetermine the arrangements of the circuits for which the relay is to be used.

In the usual application of the relay, the armature resets when the operating coil is de-energized. However, the relays may be supplied with a latching mechanism which holds the armature in the operated position until the latch is tripped, either by hand or electrically.

An operating coil cutoff contact can be supplied with the electric-reset type, where an intermittent duty coil is required for faster than normal operation, but where the operating coil circuit must be energized continuously. An operating coil, rated at 19% of supply rating may be applied, with a maximum duty of 10,000 operations, (e.g. 24 volt coil on 125 volt dc circuit).

CONSTRUCTION AND OPERATION

The operating electromagnet is at the lower end

of the relay, as shown in Fig. 1. The stationary iron circuit is built up of U-shaped punchings. These are slotted at the outer end of the lower leg to receive the copper lag loops used to obtain quiet operation on ac. The operating coil is mounted on this leg of the punchings. In order to improve the performance of the relay on dc, the pole face area is increased by means of an iron plate. This plate is assembled at the end of the coil and the corners of the lamination side plates are bent outward, serving to hold the plate in place. The inner end of the upper leg of the punching assembly is shaped so that the lower end of the armature restraining spring can be hooked over it.

The armature is made of high-silicon steel. Projecting sections on the sides, near the center, act as knife-edge bearings and rest on suitably shaped supports which are a part of the moulded base. A stud attached to the lower leg of the electromagnet extends through a hole in the lower end of the armature, and a stop-nut on the outer end of this stud is used to limit and adjust the travel of the armature in the de-energized direction. The special stop nut used will remain at any position in which it is placed without additional locking means.

The upper end of the armature carries an adjusting screw to which one end of the armature restraining spring is attached. In the hand or electrically reset relays, a latch screw is mounted at the extreme end of the armature. In the self-reset relays this screw is replaced by a set screw which serves to separate the locking plate (see Fig. 1) slightly from the armature. Between the spring adjusting screw and the latch screw (or set screw), there is a third screw which when tightened applies pressure to the threads of the former screws and effectively locks them against turning.

The moving contact fingers are mounted on moulded insulation which is fastened to the armature

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

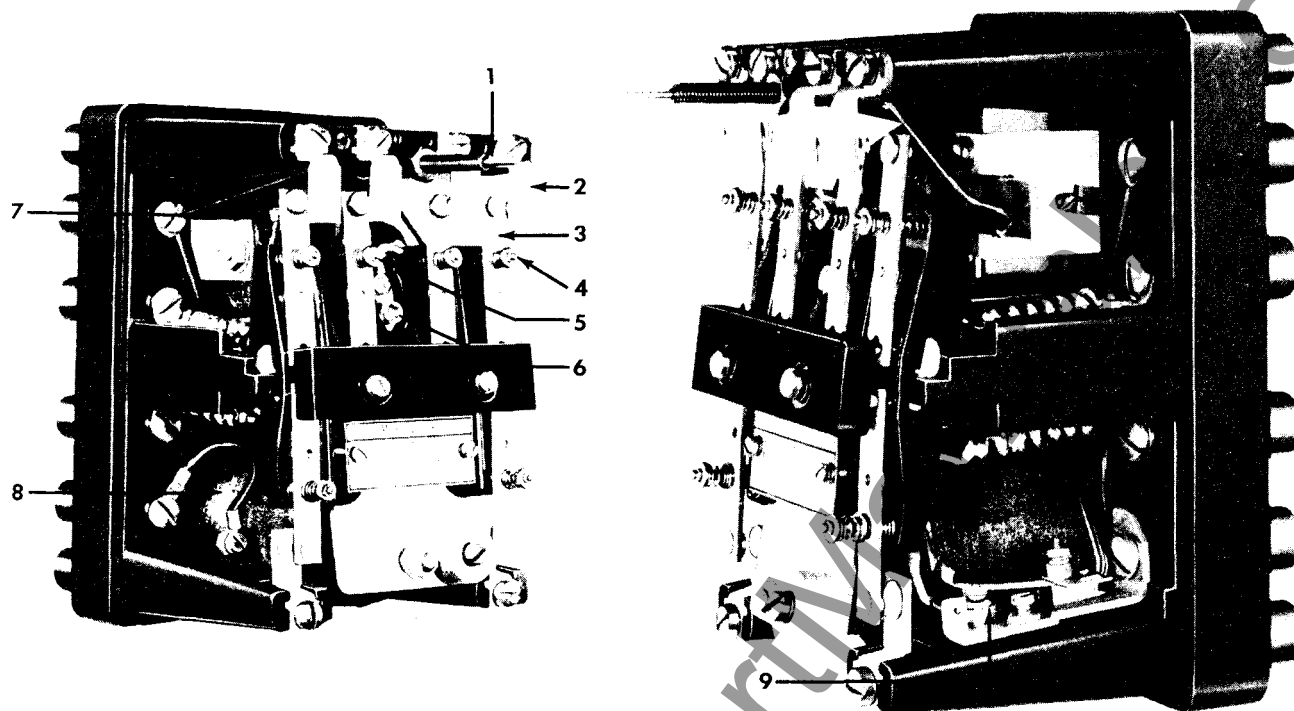


Fig. 1. Front View (Cover Omitted) and Side View of the MG-6 Electric & Hand Reset Relay in Molded Case. 1 – Reset push rod, 2 – stationary contact, 3 – moving contact, 4 – moving contact spring assembly, 5 – latch adjustment screw, 6 – adjusting screw for armature spring tension, 7 – reset coil, 8 – operating coil, 9 – optional operating coil cut-off contact.

by two screws. Silver contact buttons are on both sides of these fingers so that they can be used for either a circuit-opening or a circuit-closing contact. The fingers are assembled on guide pins, between two springs in such a way that definite spring compression and contact wipe is assured for either contact-closing or contact-opening service. Flexible leads assemblies are welded to the contact fingers. Since the armature assembly has contact fingers both above and below the bearing points, the armature weight is partially balanced about the bearings and there is less tendency for severe shocks to move the armature.

The stationary contacts consist of large silver buttons which can be assembled so that they close with the moving contacts when the armature is in either the energized or de-energized position. The stationary contact brackets are connected directly to the terminal inserts by means of long screws which pass through brass tubes. These tubes are of such length that the moulded material of the base is not under direct compression when the screws are tightened. Therefore, there is always a

tight connection from contact to terminal regardless of possible shrinkage or other variation in the moulded base material. The contact bracket is held against its seat by means of a spring ring which is compressed between shoulders in the base and on the hexagonal terminal insert.

The construction of the latch and electrical reset is shown in Fig. 2, in which the lower portion is a partial front view of the relay in the moulded case, and the upper portion a top view. In the latter view, the latch screw (in the main armature) is in the energized position, and the reset armature is free to be moved to the right by the tension spring until the hardened latch plate on the reset armature rests against the tip of the latch screw. When the operating coil is de-energized, the latch screw will move slightly so that its shoulder rests on the edge of the latch plate. When the reset coil is energized its armature moves to the left, thus permitting the main armature to return to its open position. Pressing the reset push rod, which extends through the cover stud, will also release the latch through the medium of the reset lever shown in the figure.

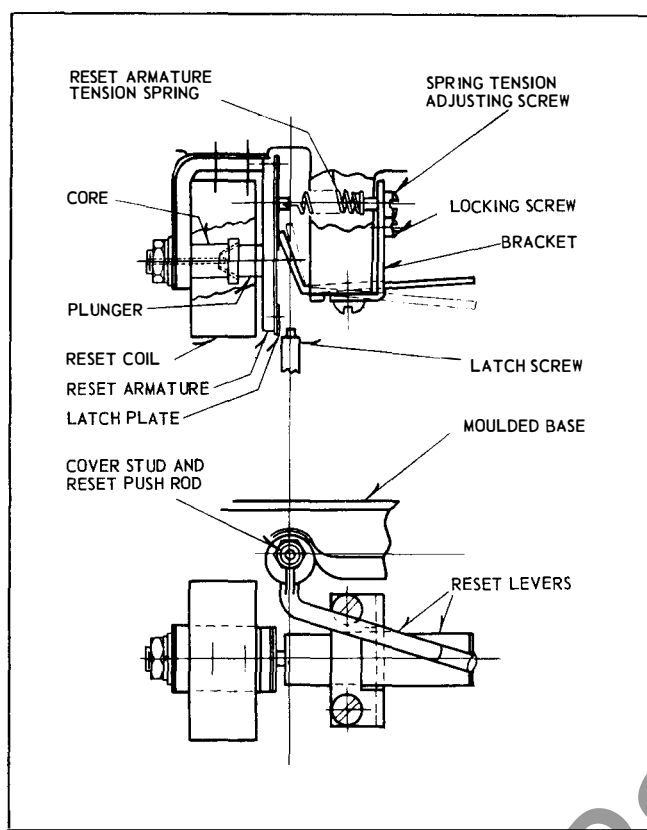


Fig. 2. Detail Views of the Latch and Electrical Reset of the Type MG-6 Relay.

In some applications of the relay with latch and electrical reset, it may be desirable to have the operating and reset coils deenergized automatically as soon as they have performed their functions. In the case of the reset coil this can be accomplished by connecting the coil through one of the relay "make" contacts. An auxiliary contact is required to open the operating coil circuit. This contact, when provided, is assembled on the lower right-hand side of the relay, and is held in position by the terminal screw to which the right-hand coil lead ordinarily connects. The coil lead is connected to the moving contact of the auxiliary contact, and the end of the stationary contact bracket is in contact with the head of the terminal screw. The auxiliary contact is closed when the main armature is open. When the armature approaches the closed position, the spring on the molded insulation block snaps off the roller and causes the contacts to open and interrupt the operating coil current. When this auxiliary contact is used, a weight is screwed to the lower end of the armature to increase its mass and stabilize contact action. This contact will interrupt the coil current

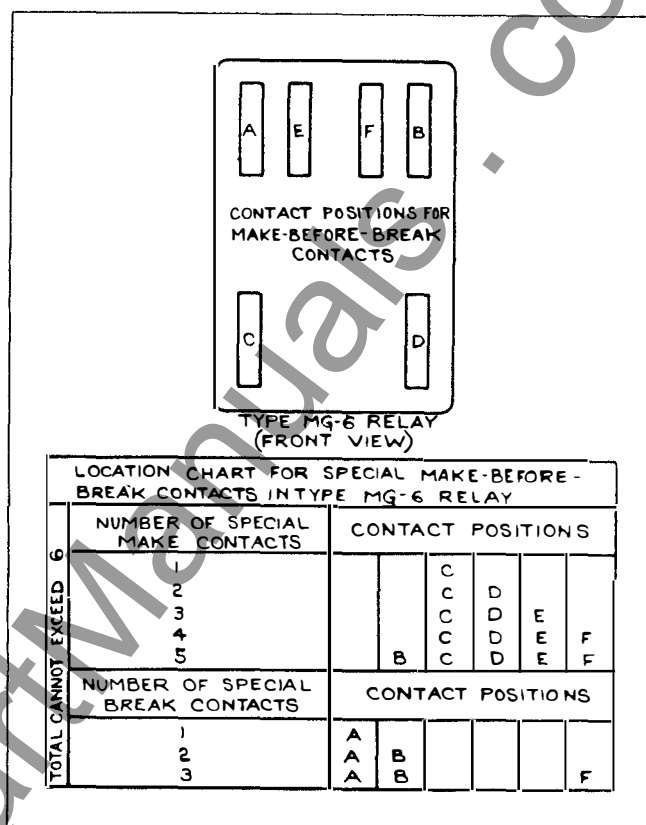


Fig. 3. Contact Positions for Combinations of Make-Before-Break Contacts.

at up to five times rated coil voltage.

In certain applications of the type MG-6 relay, it may be desirable to have one or more of the contacts close before other contacts on the same relay open. A special armature assembly is required to obtain such operation, and the number of special make and break contacts desired must be known when the relay is built. The special moving contacts have longer follow than the standard contacts and greater armature spring tension is required for full deflection of the break contacts. Consequently, it is preferable to limit the number of special break contacts to two. A maximum of three may be used, although the increased armature spring tension needed may raise the minimum pick-up voltage above the standard value. As many as five contacts may be special make contacts, with the total of special make and break contacts limited to six, of course. The locations of the make and break contacts for any combination of these special contacts are shown in Fig. 3. This figure indicates the physical location of the contacts in the relay, and can be used in conjunction with the inter-

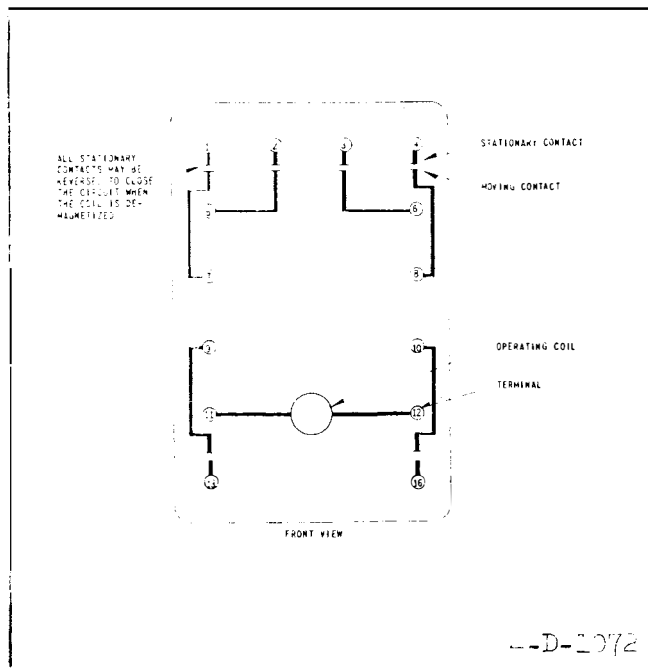


Fig. 4. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in Molded Case.

nal schematic diagram for the type of case involved to determine the corresponding terminal locations.

The type MG-6 relay may be provided without cover, for front connection, or in a variety of completely closed cases, for rear connection. The moulded base for rear connection is shown in Fig. 1. The base for front connection is similar except that there are no terminals projecting in the rear. This same base is also used as a sub-base when the relays are supplied in the FT22 case.

CHARACTERISTICS

- * The type MG-6 relay has an operating time of approximately 2 cycles on ac and 5 cycles on dc (on a 60 hertz basis) when energized at the rated voltage.
- * **50 Hz relay.** The operate and reset coils for 50 Hz MG-6 relay are different than the 60 Hz coils.

- * If faster operation is desired and if the application requires only intermittent energization of the relay, the operating coils may be energized at higher than rated voltage. (1) Twice rated voltage will give an operating time of approximately 1 cycle on ac, and the coil will stand this voltage safely for over two minutes if 60 hertz or 4 minutes if 25 hertz. (2) The time of the d-c relay can be reduced to slightly

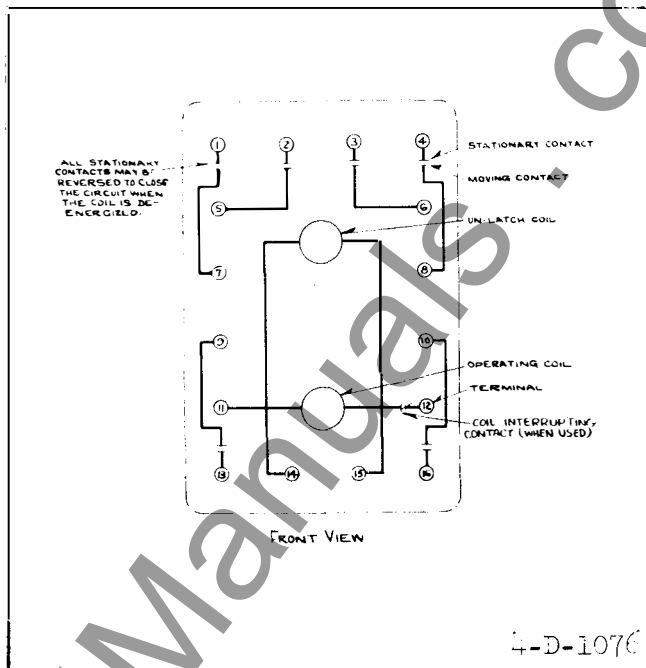


Fig. 5. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in Molded Case.

- over 1 cycle if the coil is energized at five times rated voltage. The coil will stand this voltage for one minute. If faster time is desired on a dc relay which must be energized continuously, the use of a low voltage coil with a series resistor will reduce the time. With 10% of the line voltage across the relay coil and the balance across a series resistor, the reduced inductance of the circuit results in an operating time of approximately 2 cycles. The time of operation may be reduced to approximately one cycle by applying 4 or 5 times rated dc voltage to the coils through the coil interrupting contact.

Reset coils are for intermittent duty only and should not be energized longer than one-half minute.

The relay contacts will close circuits carrying 30 amperes. They will carry this current for 1 minute, and will carry 12 amperes continuously.

The contacts will interrupt the following currents, in non-inductive circuits, at the voltages listed:

Current	* Volts ac
30	115
20	230
15	460
10	575

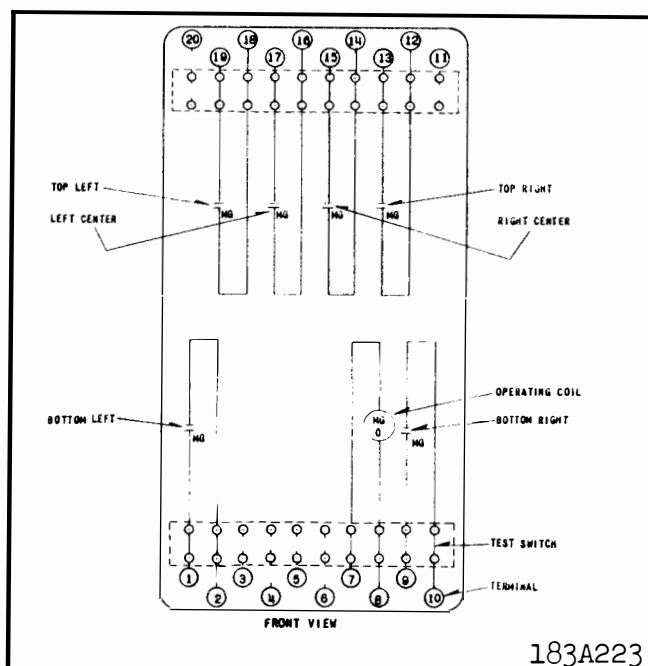


Fig. 6. Internal Schematic of the Type MG-6 Relay, Without Electrical Reset, in FT22 Case.

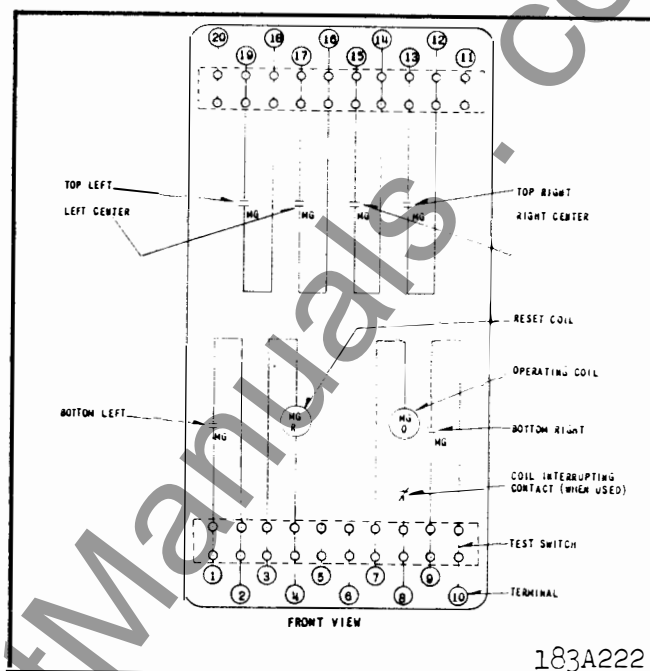


Fig. 7. Internal Schematic of the Type MG-6 Relay, With Electrical Reset, in FT22 Case.

Current	* Volts dc
30	12
15	24
10	32
8	48
3	125
1	250

* The type MG-6 relay for ac can be used with any combination of contacts, but the dc relay can have up to four circuit-opening contacts with the normal operating spring adjustment. With more than four the operating spring should be adjusted to give the correct back contact follow.

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.

Coil Resistance (at 25° C) (± 10%)

* Rating	Operating Coil		Reset Coil
	dc Ohms	Closed Gap Impedance	dc Ohms
1 amp dc	4.8	....	...
2 amps dc	1.0	....	...
3 amps dc	.4	....	...
4 amps dc	.24	....	...
5 amps dc	.15	....	...
6 volts dc	4.8	....	.53
12 volts dc	19	....	2.12
24 volts dc	75	....	8.5
32 volts dc	132	....	13.9
48 volts dc	310	....	34
62.5 volts dc	530	....	56
125 volts dc	2000	....	222
250 volts dc	8200	....	890
115 volts, 60 Hertz	19	354	91
208 volts, 60 Hertz	67	1160	322
230 volts, 60 Hertz	75	1410	364
460 volts, 60 Hertz	305	5680	1445
575 volts, 60 Hertz	495	8860	2208
115 volts, 50 Hertz	26	....	138
230 volts, 50 Hertz	105	....	550
460 volts, 50 Hertz	465	....	2200
575 volts, 50 Hertz	660	....	3550

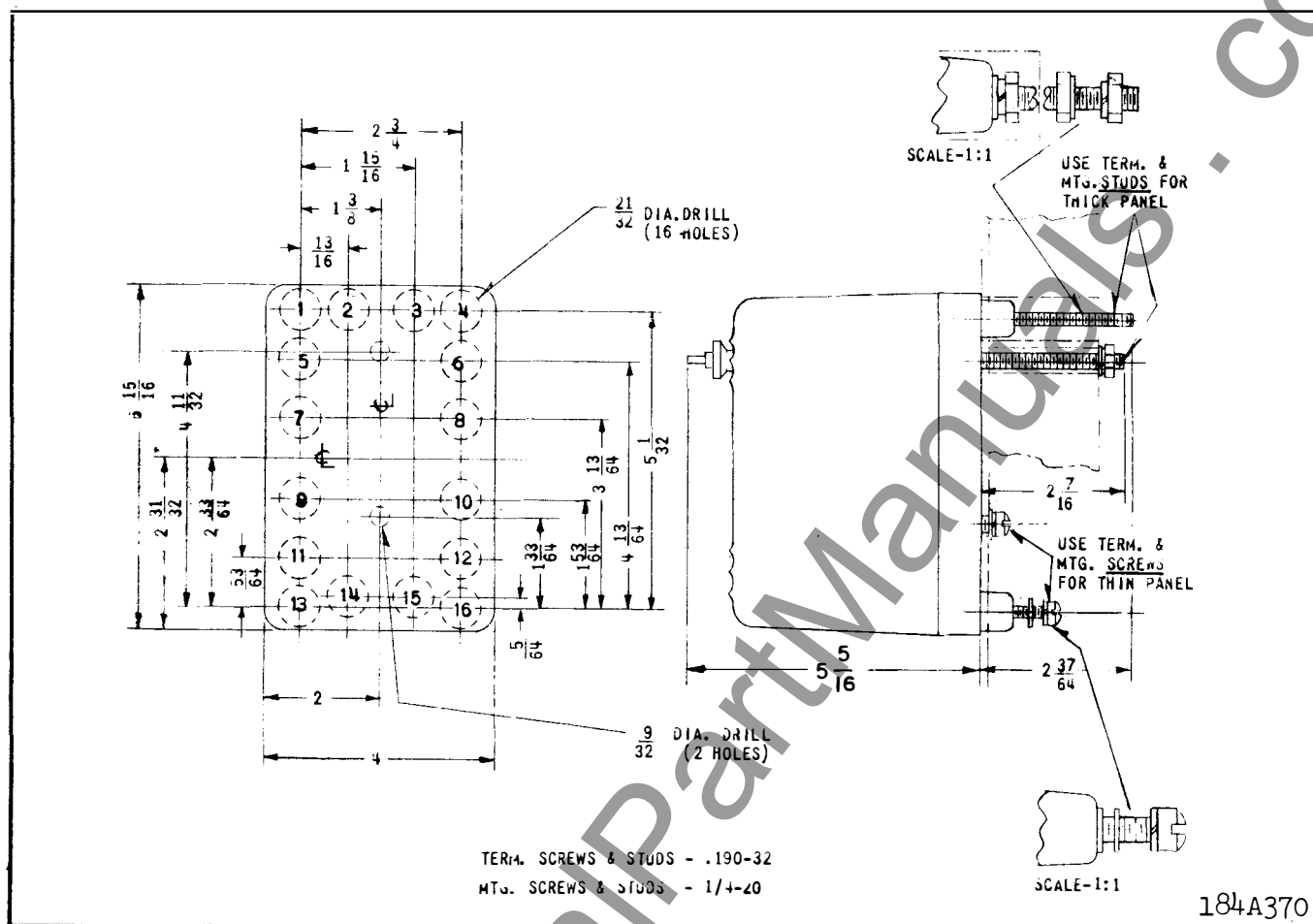


Fig. 8. Outline and Drilling Plan for the Type MG-6 Relay in the Rear Connected Molded Case. For Reference Only.

Relays in the rear-connected moulded cases should be mounted and electrically connected similar to the other projection cases. The lower mounting stud may be used to ground the electromagnet iron. The hexagon-shaped terminal inserts are slightly loose in the base but this does not affect the electrical connections. Only the two mounting studs should be used to secure the relay to the panel. Removal of terminal insert end-play (in the case of thick-panel mounting) by turning a nut on the terminal stud tightly against a large diameter washer (not supplied) at the rear of the panel should not be attempted as this may distort the relay base and affect the adjustments, or possibly damage the relay. Relays in the front-connected moulded cases should be mounted by four screws through the sides of the base as indicated in the drilling plan.

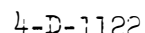
ADJUSTMENTS AND MAINTENANCE

The relays are shipped from the factory correctly adjusted for armature travel and for contact follow and pressure, and it should not be necessary to dis-

turb these adjustments. The relays normally are shipped with all contacts assembled for circuit-closing operation. To convert them for circuit-opening operation, it is necessary merely to loosen the mounting screw for the stationary contact bracket, turn this bracket over, and tighten the screw. After reversing the position of the contact brackets, it may be necessary to bend them slightly to obtain contact follow approximately as stated in the fourth paragraph of this section. On a d-c relay not more than four contacts can be assembled in the circuit-opening position if normal contact pressure and travel are maintained. With more than four the operating spring should be adjusted to give the correct back contact follow.

If a relay has been dismantled and is being re-assembled, the following adjustments should be made or checked. Reference should be made to Figs. 1 and 2 for identification of the parts mentioned in these instructions.

The armature stop nut should be adjusted so that



when the armature is in contact with it, the lower edge of the armature is $7/16''$ above the position which it assumes when the relay is energized. When adjusting the armature spring tension, the locking screw for the spring adjusting screw is loosened, and this adjusting screw is turned (inward, to reduce the spring tension) until the spring barely holds the armature against the stop nut. The relay must be in its normal vertical position when this adjustment is made, with all contacts assembled as circuit-closing. The armature spring should then be tightened by turning the adjusting screw 4 turns counter-clockwise for a-c relays or 2 turns for d-c relays, and the locking screws should be tightened. If the relay is being used with a number of break contacts, it may be necessary to increase the spring tension to obtain full follow on the break contacts. The adjusting screw should be turned just enough farther to obtain full follow with the armature against the stop nut.

on the two sides of the fingers be replaced correctly. The springs which are compressed by circuit-closing contacts are approximately three times as strong as the ones compressed by circuit-opening contacts and thus they can be readily distinguished. The positions of the two springs are reversed at the two ends of the relay.

When special contacts are supplied for make-before-break operation, the stationary members of the special contacts are bent equally toward their respective moving contacts to obtain "make" at the point where the "break" moving contact has approximately 1/16" follow before parting from its stationary contact.

If an a-c relay is to be used with a series resistor so that the relay can be dropped out by shorting the coil, either the resistance value must be such that the watt consumption with the coil shorted will be quite high or the relay armature spring tension must be reduced to about 1-1/2 turns and the follow of the stationary make contacts must be reduced (by bending) to about 1/16". With the reduced armature spring tension, not more than two of the contacts can be used as break contacts. Because of the low relay impedance with armature open as compared to the impedance with armature closed, it is not advantageous to use a resistor in series with a coil rated at less than line voltage, as in the case of d-c applications. For the contact and spring adjustments

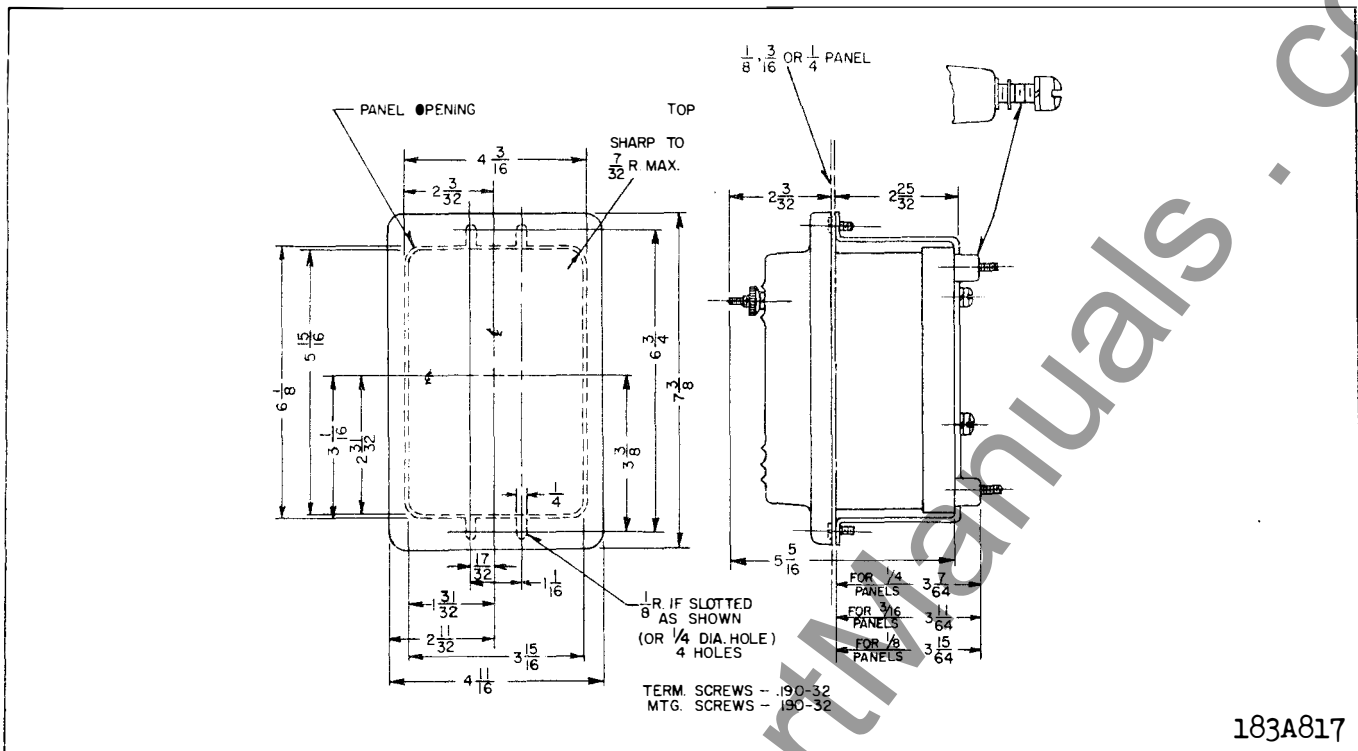


Fig. 10. Outline and Drilling Plan for the Molded Semi-Flush Case. For Reference Only.

specified above, a 60 cycle MG relay with voltage rating equal to the line voltage can be used with a series resistor which will take about 90 watts when directly across the line. Of course, if the coil will be shorted only momentarily or if a higher watt consumption is not objectionable, it may be unnecessary to reduce the spring tension or contact follow.

If the complete armature assembly is to be removed from the relay, the screws which fasten the lower ends of the moving contact leads to the terminals should be removed, the armature spring tension adjusting screw should be turned in as far as possible, and the armature stop nut should be removed. The upper end of the armature spring should then be slipped off of the grooved member at the lower end of the adjusting screw, and the armature should be lifted off of its bearings carefully so as to avoid distortion of the coiled leads. The leads to the upper center moving contacts are not coiled but the coiling of the four other moving contact leads should be such that when the relay base is horizontal and the armature is on its bearings and approximately at its mid-position, the lead terminals will just touch the base terminal inserts or be within about 1/8" of that position.

On latch-type relays the latch screw is adjusted

so that with the armature latched and the operating coil de-energized, there will be a gap of between .005 and .015 inch between the electromagnet pole face and the raised section of the armature which strikes the pole face. The locking screw should be tightened securely after making this adjustment. There is a small amount of clearance between the armature and its supporting posts, and in order to insure proper operation allowance must be made for this in the following manner. With the armature held against its left-hand support and nearly closed, the latch spring or reset armature should be moved to the left as far as it will go by means of the hand reset. To assure that the latch will always release the armature the resulting space between the latch and the latch screw

* should be at least .010 inch, and should not be more than about 1/64". This should also be checked electrically if electrical reset is provided. Some change of this gap can be made by loosening the mounting screws in the relay base and moving the latch support in the desired direction. The gap also can be changed by loosening the two screws which hold the moving contact insulation block to the armature and shifting the armature in the desired direction.

On electrical reset relays, the tension of the spring which draws the reset armature toward the

latch screw must be adjusted if these parts are being reassembled. The locking screw (Fig. 2) is screwed out until its head clears the head of the adjusting screw. The main armature is then held completely closed and against its right hand support, and the latch spring tension adjusting screw is turned until the latch barely touches the stop projecting from the center of the latch screw. Then the latch spring tension should be increased by turning the screw clockwise 9 turns, and the locking screw should be tightened.

If either the core nut of the electrical reset assembly or the screws which mount its armature have been loosened, the relative positions of the core and plunger may shift sufficiently to cause the plunger to strike on the side of the conical core opening. To assure correct alignment of these parts, .042 diameter holes are provided through the center of the core and about 1/16" deep in the center of the plunger. After tightening the core nut, a close fitting pin should be inserted through the core and into the plunger. With the pin in place, and plunger pressed firmly against the core, and the mounting end of the armature centrally located with respect to the electromagnet, the two armature mounting screws should be tightened. The pin then should be removed.

A small amount of silicone oil is supplied at the factory to the polished and hardened surfaces of the latch screw and the latch plate to minimize wear and as protection against corrosion. Oil should be re-applied after any cleaning and reassembling of these parts, and it is desirable also to renew this at the regular maintenance periods.

If the relay is provided with a coil interrupting contact, the following points must be observed to assure satisfactory operation. With the relay in its normal operating position and the armature shifted to the extreme right, align the armature "snap" spring so that it is at least 1/64 inch in from the right hand edge of the moving contact spring. With an .030 inch gap between the armature and the lower pole face of the electromagnet, adjust the bracket by

means of the adjusting screw, until the snap spring just passes the roller. The latch screw should be adjusted so that with the armature in the latched position and the operating coil deenergized, the gap between the armature and the lower pole face of the electromagnet is .010 to .015 inch. With the armature in this position the coil interrupting contact should be open at least 3/64 inch.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and this impairing the contact.

REPAIRS AND 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.

* ENERGY REQUIREMENTS

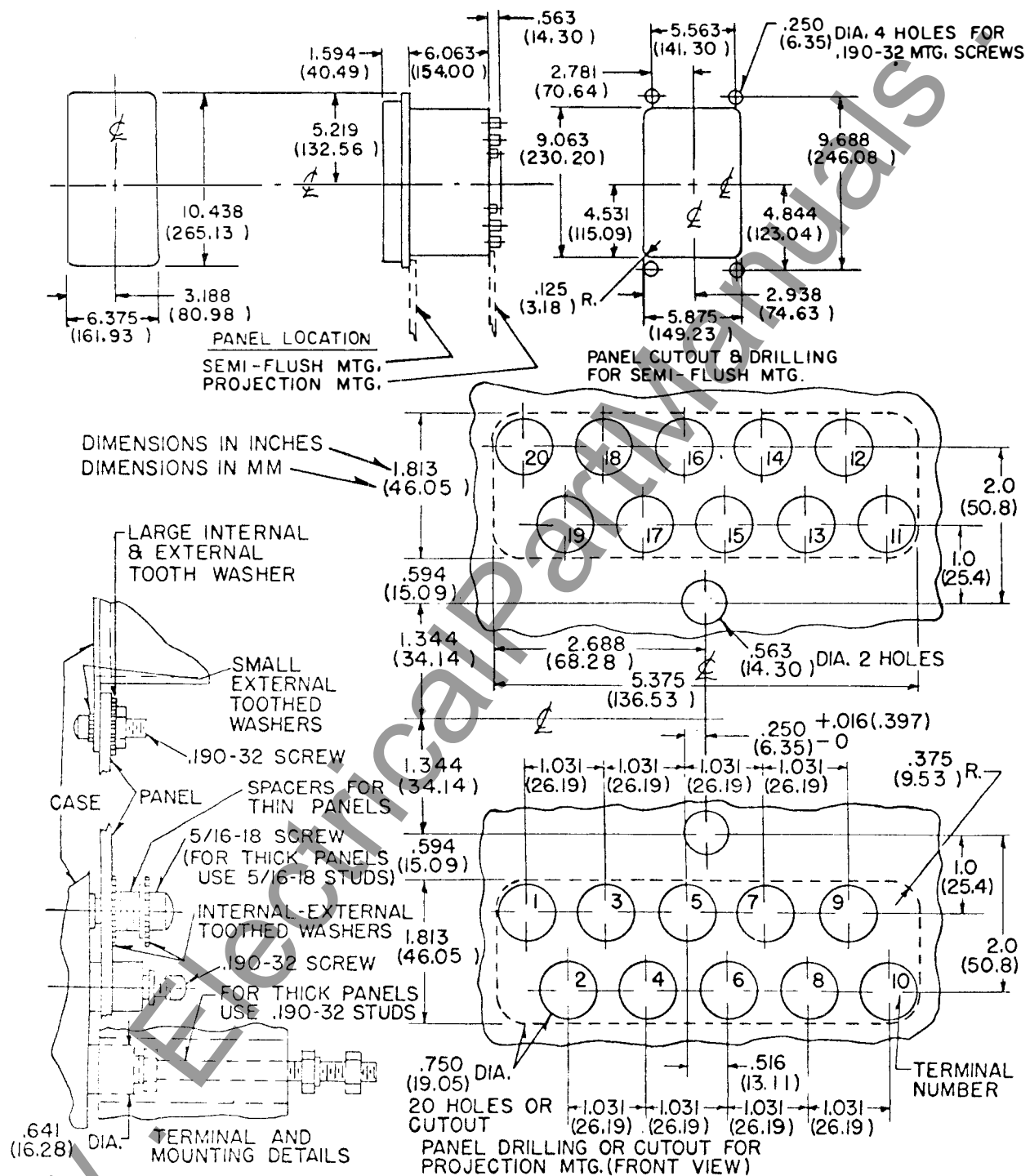
Operating Coil Burdens at rated Voltage

Frequency (Hertz)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	6.8	23	19.6	53
50	9.8	31	17.4	78
△ 60	12	37	17.6	92
dc	7.8 cold--		7.8 cold--	
dc	6.5 hot--		6.5 hot--	

△ Rated voltage is 115 volts or its multiples.

Reset Coil Burdens at Rated Voltage (Multiples)

Frequency (Hertz)	Closed Gap		Open Gap	
	Watts	Volt-Amps	Watts	Volt-Amps
25	48	51.6	52	54
50	46	58.2	57	63.8
60	84	104.5	96	112.8
dc	66 cold--		68 cold--	



183A158

Fig. 11. Outline and Drilling Plan for the Type MG-6 Relay in Type FT22 Case.

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RELAY-INSTRUMENT DIVISION

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