NAVY SERVICE A
D-C MAGNETIC CONTACTOR
TYPE IAR—SIZE 1

SECTION NO. 6026
I.L. 6000-IAR-1

SINGLE POLE • WITHOUT BLOW-OUT • NORMALLY OPEN

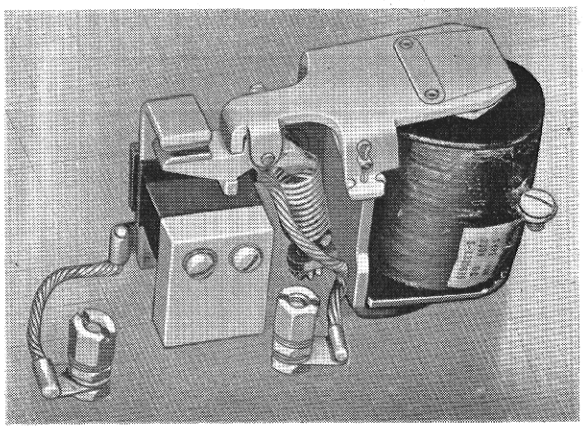


Fig. 1—Type IAR Contactor

APPLICATION

The Type IAR Contactor is a d-c magnet operated single pole contactor for d-c service. This contactor is for circuit closing application only and has been specifically designed for use in controllers and motor starters which are for Navy Service A applications. This device is primarily used as an accelerating contactor in a counter emf type of motor starter.

RATING

The single pole normally open contact has ampere and maximum hp ratings as in Fig. 2.

CONTACT				
SIZE	8-HOUR OPEN RATING IN AMPERES	SUITABLE FOR CLOSING A CIRCUIT OF AMPERES	MAXIMUM HP	
			115 VOLTS	230 VOLTS
1	25	100	3	5

Fig. 2—Contact Rating Table

This contactor does not have a blow-out coil and the contacts should be used only for circuit closing operation.

The shunt type of operating coil is suitable for continuous duty at rated voltage. The contact parts and the coil are insulated from each other and have sufficient creeping and arcing distances for 250 volt enclosed applications.

CONSTRUCTION

The Type IAR Contactor is shown in full and partial views by Fig. 6. It consists essentially of an iron frame (26), a moving armature (1), an iron core (7), an operating coil (2), a moving contact (17), and a stationary contact (18). All phenolic parts are made of a material which will not shatter or break when the contactor mounting base is subjected to a high impact shock. All parts are either made of corrosion-resisting material or are suitably protected against corrosion. The stationary and moving contact tips (20) are fine silver. The armature (3) and moving contact (19) bearing pins are corrosion-resisting steel.

The contact parts are arranged for front connection. The moving contact (17) is electrically and mechanically connected to the iron frame (26). This contactor is for mounting only on an insulation panel. Two tapped holes in the frame support (23) and three tapped holes in the frame (26) are provided for the mounting screws (14) to securely fasten the contactor to its mounting panel (9). The contactor may be mounted in any position desired. However, it is customary to mount it in the position shown by Fig. 6. This contactor has only one normally open set of contacts and does not have provision for extra or interlocking auxiliary contacts.

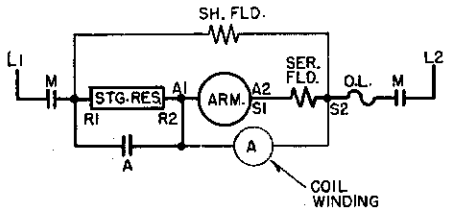
OPERATION

1. **NORMAL**—When a d-c voltage that is within the operating limits is applied to the coil (2), the armature (1) will be attracted toward and will seal against the iron core (7) pole face. The moving contact (17) will then be in electrical contact with the stationary contact (18) and will complete a circuit between the moving contact shunt (21) and the stationary contact terminal (15). The lower and middle views of Fig. 6 show the contactor armature in the open and closed positions.

The force applied to the armature and moving contact by the spring (13) can be varied by adjusting the nut (12) on the spring stud (11). For most applications, the spring is usually adjusted so that the armature will pick up and seal on approximately 65% of the rated voltage.

The non-magnetic armature (4) and core (5) shims insure that the armature will be released and will not be held by residual magnetism when the coil is de-energized. When the contact and armature kickout spring (13) is adjusted for the armature to pick up on approximately 65% of rated voltage, the armature will be released on approximately 20 to 25% of rated voltage.

The application of this contactor to a manually operated starter with one step counter emf acceleration is illustrated by Fig. 3.



TYPE IAR CONTACTOR COIL AND CONTACT INDICATED BY "A"

Fig. 3—Non-reversing 1 Step Manual Starter with Counter Electromotive Force Acceleration (Dwg.13-D-6165)

When the operating handle of the manual starter is moved to the "On" position, the line contacts "M" will close and apply power to the motor armature and starting resistor, and to the shunt field. As a motor cannot generate a counter emf at standstill and as its armature resistance is very small compared to that of the starting resistor, approximately full line voltage will be applied across the starting resistor. The voltage applied to the accelerating Type IAR Contactor coil "A" will be very low and will be equal to the motor armature and series field voltage drop. However, as the motor armature accelerates, a counter emf will be generated and the portion of the line voltage distributed on the starting resistor will decrease and that applied to the motor will increase. When the counter emf plus the motor armature and series field voltage drops become equal to the pickup voltage of the contactor, the contactor will close its contacts "A" and short out the starting resistor. When this occurs, full line voltage will be applied to the motor.

The motor will continue to run until the contacts "M" are opened by an overload or by moving the handle of the manual starter to the "Off" position.

The pickup of the accelerating contactor "A" can be adjusted slightly by turning the nut (12) on the spring stud (11). However, for one step starters of this type, it is usually most satisfactory to adjust the contactor to pick up at approximately 65% of rated voltage.

It is usually not advisable to adjust the accelerating contactor for a pickup higher than 65% of rated voltage as the motor counter emf may be too low to operate the contactor when the line voltage is low, the motor is overloaded, or when the accelerating contactor coil is hot. Also, too low a pickup setting of the accelerating contactor may be undesirable as excessive motor current peaks may occur if the starting resistor is shorted out when the motor has been accelerated to only a relatively low speed.

The coil used on this contactor has a very low temperature rise and the contactor pickup voltage when the coil is at its operating temperature is only slightly higher than when the coil is at room or ambient temperature.

It should be noted that the contactor "A" shown in Fig. 3 is connected in the circuit in such a manner that it operates to close a circuit only and does not interrupt any current.

2. UNDER SHOCK—All parts of this contactor have been designed to withstand mechanical damage from high impact shock. The contacts may close or open momentarily when the contactor mounting panel is subjected to a shock. However, this is usually of no consequence as the contactor is always applied for use with other fully shockproof apparatus and in a circuit in such a manner that momentary opening or closing of the contacts does not cause any trouble or affect the operation of the associated control elements.

For the starter circuit shown by Fig. 3, the manual starter "M" should be both mechanically and electrically shockproof. If a motor is operating with full voltage on the armature, a momentary opening of contact "A" is not important as the opening time is of a very short duration and the slight contact arcing will not cause any damage or false operation.

INSTALLATION—MAINTENANCE—REPLACEMENT OF PARTS

1. **GENERAL**—Reference can be made to Instruction Leaflet 6000-1 for general instructions and suggestions on installation and maintenance. A periodic inspection should be made to insure that all screws, bolts, and nuts of this contactor are tight. All current carrying connections and joints should be clean and fastened as tight as possible.

Any loose wires that might interfere with the operation of the armature or moving contact should be securely fastened down. To facilitate the repair and replacement of parts, it is suggested that the contactor be removed from its enclosure.

2. **STATIONARY CONTACT**—The stationary contact (18) may be removed for inspection or repair by taking out the two contact assembly screws (22) and removing the lead connected to the terminal (15). When the stationary contact is replaced, the two insulation plates (24) and insulation bushings (25) must be re-assembled in exactly the same manner that they were when the contactor was built at the factory. These two plates and two bushings insulate the stationary contact (18) from the frame (26). Before the screws (22) are tightened, the stationary contact should be positioned so that it lines up with the moving contact.

3. **ARMATURE AND MOVING CONTACT ASSEMBLY**—The complete moving armature (1) and contact assembly (17) can be disengaged from the frame (26) by (a) disconnecting the moving contact shunt (21) from its connection stud, (b) unhooking the spring (13) from the clevis in the back end of the moving contact (17), (c) taking out the cotter pin which holds the armature bearing pin (3) in place, and (d) pulling the bearing pin (3) out of the frame bearing holes. It is usually best to mark the position of the adjusting nut (12) before the spring is unhooked so that the calibration will not be changed.

4. **MOVING CONTACT**—After the armature assembly has been taken off, the moving contact (17) can be removed by taking out the bearing pin (19).

5. **OPERATING COIL**—The operating coil (2) is held to the frame by the core (7). The core (7) is held to the frame by two lock nuts (10). In order to remove the nuts (10), it is usually necessary to take the contactor off the panel by removing the mounting screws (14). The armature assembly should also be removed before any attempt is made to take off the coil.

6. **OVERTRAVEL—CONTACT GAP—PRESSURE**—The overtravel is the additional distance that the moving contact would travel if it were not stopped by the stationary contact. As shown by Fig. 6, the overtravel should be 3/64 inch at the location indicated. The proper overtravel can usually be obtained by holding the armature (1) in the fully closed or sealed position and then adjusting the stationary contact position until there is a 3/64 inch gap between the contact and the contact stop. Contact overtravel is necessary to provide good contact as the contact tips wear and to permit the contact spring to exert its full force.

The contact gap is the distance between the moving and stationary contacts when the moving contact is in the fully open position. The contact gap can be adjusted to the value shown on Fig. 6 by bending the moving contact stop (16). The overtravel adjustment should always be made before any attempt is made to adjust the contact gap.

The contact pressure is the force with which the stationary and moving contacts are held together. The initial and final pressures may be measured by one of the methods illustrated in Instruction Leaflet 6000-1. When the contact and armature spring (13) is adjusted so that the contactor will pick up on approximately 65% of rated voltage, the pressures should be approximately 8 oz. initial and 10 oz. final.

7. **CONTACT MAINTENANCE**—Both the stationary and moving contacts should be replaced when the overtravel decreases to 1/64 inch. If either the stationary or moving contact tip (20) wears or burns down to 1/32 inch from the copper support, the contact should be immediately replaced. In general, moderately burned and blackened silver contacts do not require replacement or dressing as the discolored surface is usually still a good conductor.

The moving contact should always move freely on its bearing pin. Any friction between the parts may reduce the contact pressure and cause overheating. If excessive burning and pitting takes place, the contact overtravel and pressure should be checked.

8. MOVING CONTACT AND ARMATURE BEARING PINS The armature (3) and moving contact (19) bearing pins are corrosion-resisting steel and do not require lubrication. The use of oil or grease is very undesirable as it helps to collect dirt and dust.

9. ARMATURE AND CORE SEALING SURFACES — The sealing surfaces of the armature and core should be kept as clean as possible so that the armature will fully seal. Any foreign matter in the air gap will decrease the contact overtravel and pressure.

10. FAILURE TO OPERATE—Failure of the contactor to operate may be caused by the coil circuit being open, power failure or low voltage, or mechanical interference. Failure of the armature to be released can result from the coil circuit being energized, mechanical interference, or a broken armature kickout spring.

WEIGHT OF CONTACTOR AND SPARE PARTS

DESCRIPTION	NO. PER SET	WEIGHT	
Complete Contactor—Fig. 6			
Without Coil	..	11½ oz.	
With Coil	..	1 lb.-2 oz.	
Spare Parts—Fig. 6			
Coil (2)	1	6½ oz.	8½ oz.
Moving Contact (17)	1	1 oz.	
Stationary Contact (18)	1	1 oz.	
Spring (13)	1	.....	

Fig. 4—Weight Table

CIRCUIT DIAGRAM SYMBOL

FRONT VIEW

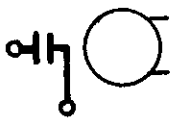


Fig. 5—Wiring Diagram Symbol (Dwg. 13-D-6165)

WESTINGHOUSE ELECTRIC CORPORATION
EAST PITTSBURGH WORKS • EAST PITTSBURGH, PA.
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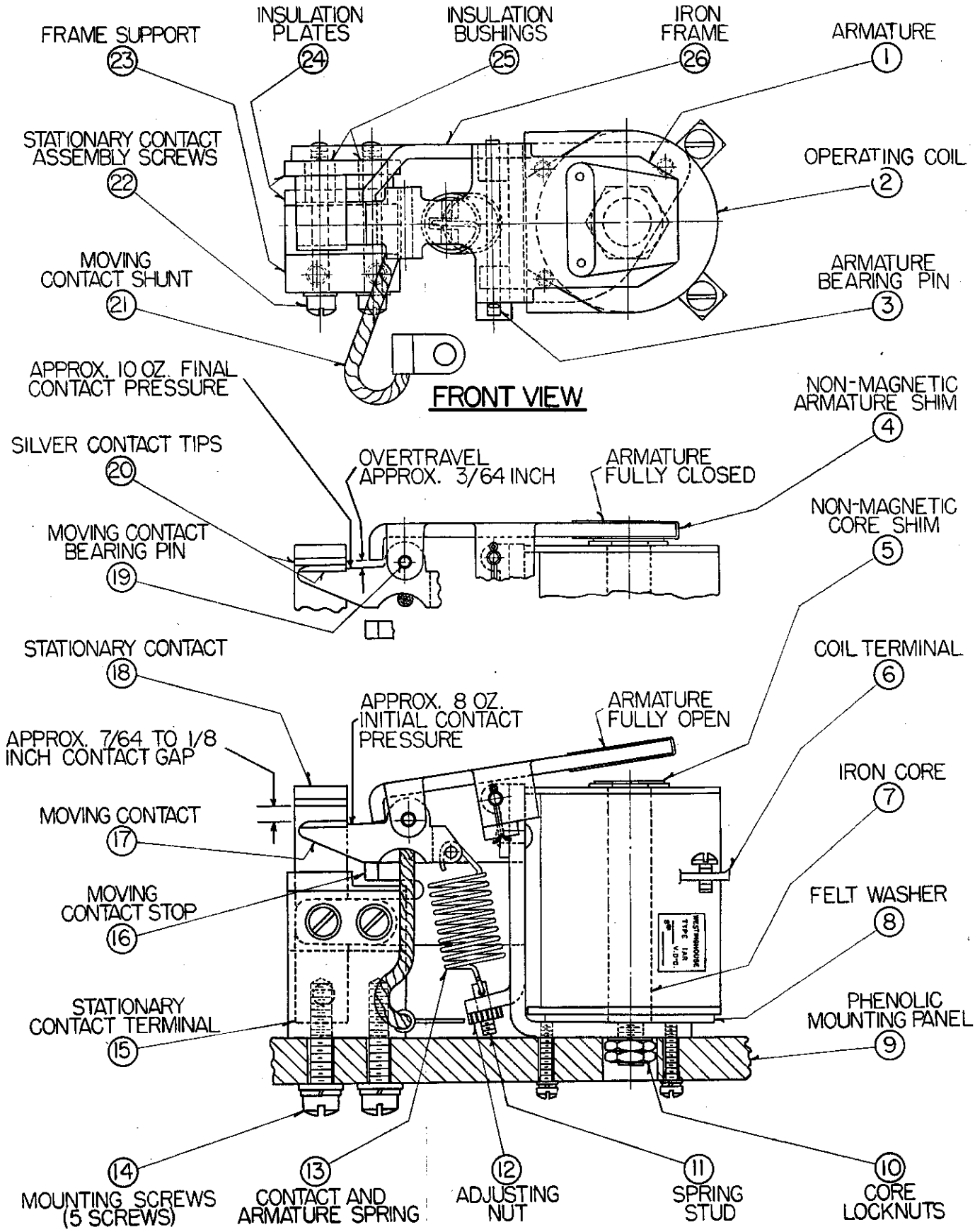

FIG.6-TYPE IAR CONTACTOR

Dwg. 18-A-7848