Instructions for A201, A251 Size 9 2 and 3 Pole Contactors, Non-reversing and Reversing

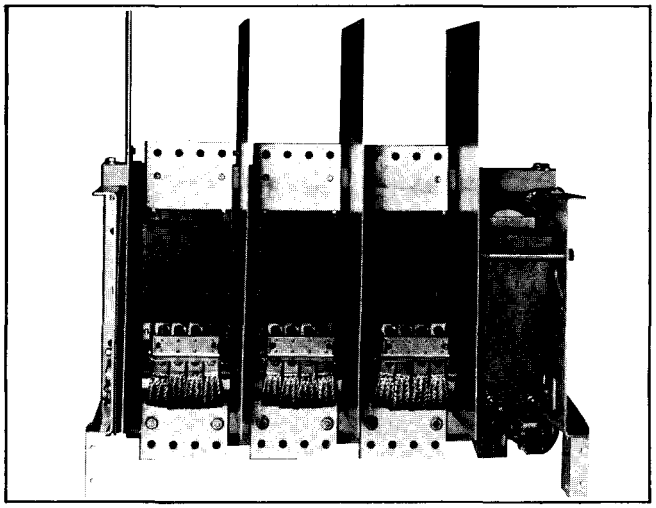

Fig. 1 Front Connected 3 Pole Contactor

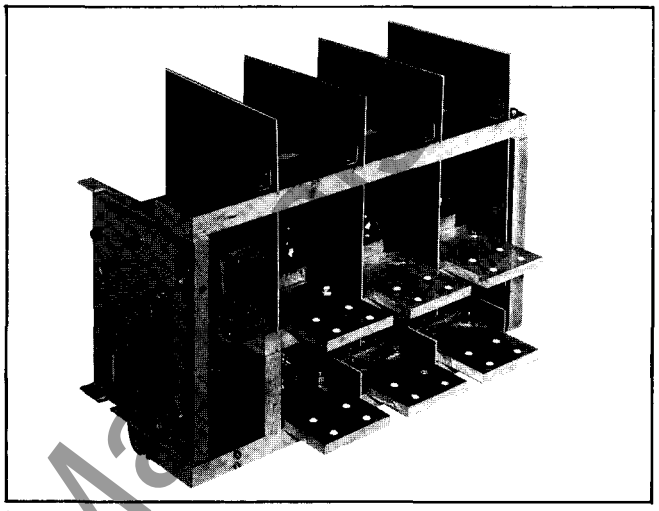

Fig. 2 Rear Connected 3 Pole Contactor

Size 9 Contactors are designed for the control of inductive or non-inductive loads at voltages between 24 and 600, AC. The units are suitable for mounting on either steel or insulated panels. All parts are front removable. Contactors should be protected against short circuits by branch circuit protective devices selected in accordance with the National Electrical Code (NEC).

CONTACTOR RATINGS - 3 POLE CONTACTORS			
Continuous Current		**Three Phase Horsepower at:**	
Open	Enclosed	230 Volts	460 Volts
2500A	2250A	800	1600
Three Phase Switching at:		**Transformers**	**Capacitors**
208 Volts		337 KVA	575 KVAR
240 Volts		392 KVA	665 KVAR
480 Volts		783 KVA	1325 KVAR
600 Volts		975 KVA	1670 KVAR

CONTACTOR RATINGS - 2 POLE CONTACTORS	
Single Phase Switching at:	**Transformer Rating**
120 Volts	112 KVA
240 Volts	225 KVA
480 Volts	450 KVA
600 Volts	562 KVA

Two pole contactors have the same current ratings as 3 pole devices but are not suitable controlling 3 phase motors.

This industrial type control is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

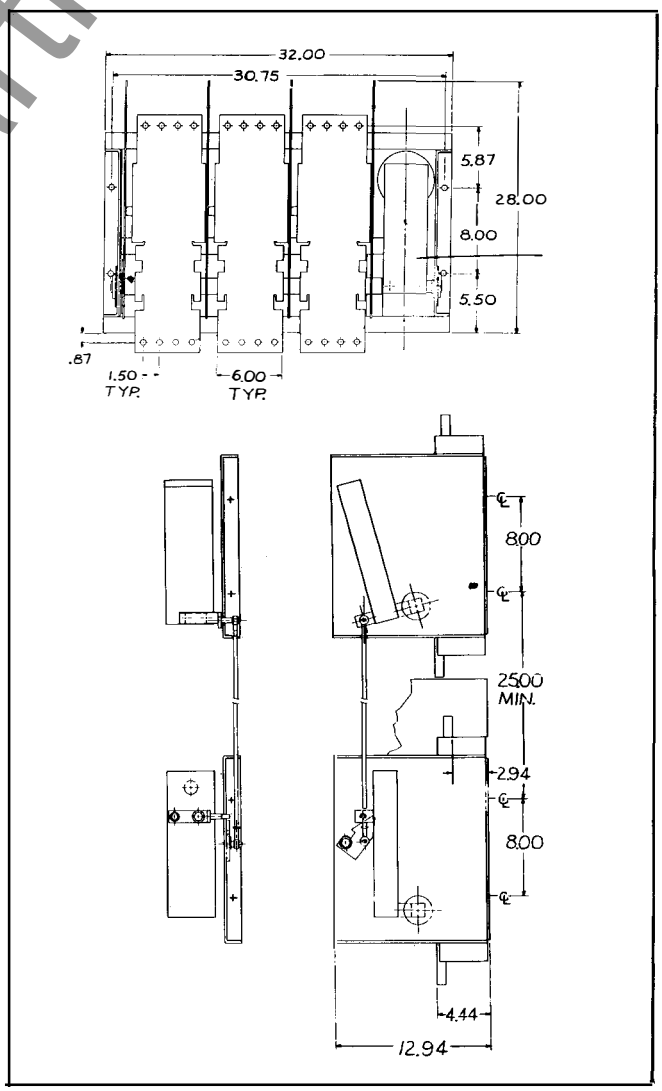

Fig. 3 Dimension Drawings (Dim. in inches)

COILS

Each size 9 contactor has a single winding DC coil rated such that it can be supplied from a full wave rectifier operating at 120 volts AC. As the operating magnet armature approaches its sealed position a late-break, normally-closed auxiliary contact opens and introduces a resistor into the coil circuit reducing the voltage across the coil to approximately 17 volts DC. See Figures 4 and 5 for control circuits. The control relays (CR) shown in Figures 4 and 5 are not included with the contactor. The 120 volt, 60 hertz control power transformer or separate supply must be capable of supplying 2100 VA inrush and 350 VA (350 Watts) continuously while maintaining an AC voltage of not less than 115 volts to the rectifier, in addition to supplying control relays and other control circuit devices such as indicating lights. Overcurrent protection for the control circuit (#12 AWG) should be provided at the source of control voltage in accordance with the NEC.

The coils have been designed to operate at high temperatures, and are insulated to meet such service. The operator should not be alarmed to find the coils hot to the touch.

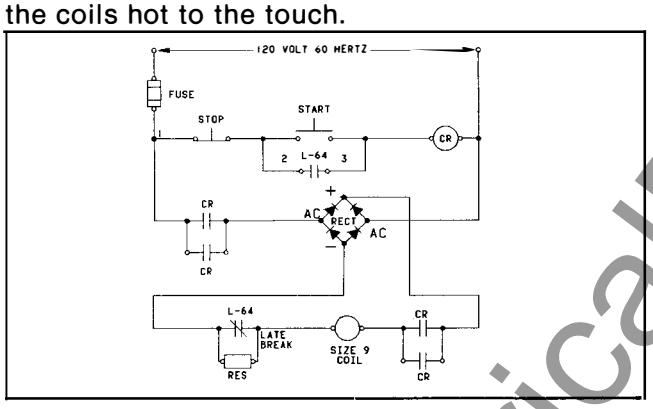

Fig. 4 Non-reversing Control Circuit

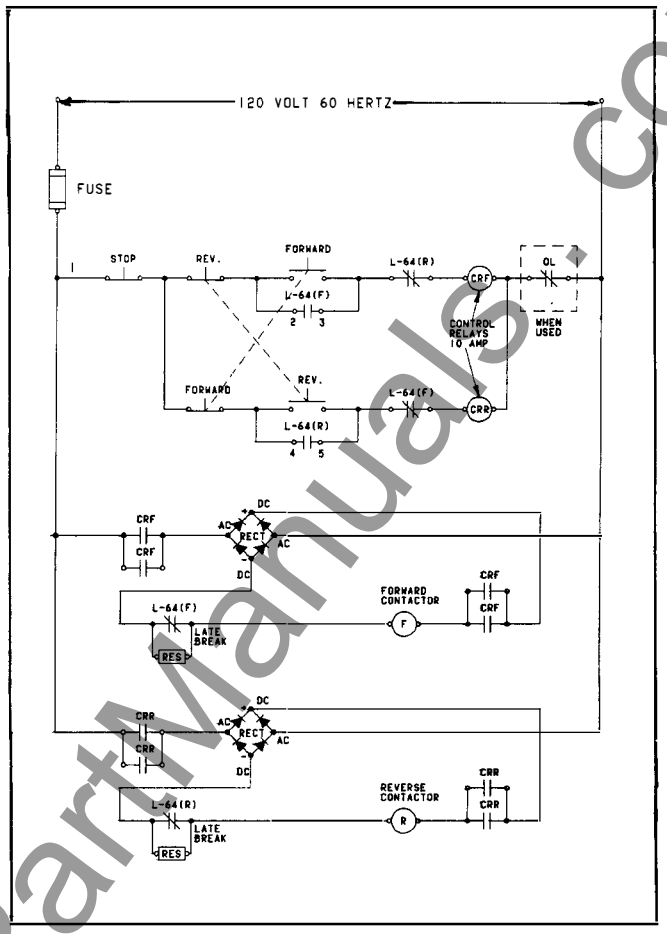

Fig. 5 Reversing Control Circuit

CHANGING COILS

To remove and replace the operating coil, proceed as shown below. Item ( ) references are to Fig. 6. Tightening torque values are shown in Table I.

1. **Turn all power OFF.**
2. Remove the arc quencher (1) adjacent to the coil.
3. Remove the coil (2) leads and adjacent phase barrier (3).
4. Remove the two screws holding the auxiliary contact support bracket (4) to the lower horizontal brace. Let the attached leads support the auxiliary contact assembly (5).
5. Remove the armature stop (6), magnet pole face (7), shim retainer (8), and stop bracket (9), by removing the five ½-13 cap screws and two spacers (10). The armature (11) can now rotate out of the way to facilitate coil removal from the magnet core.
6. Replace the coil.
7. Remount the retainer, shim and pole face, ensuring that the shim is located between the magnet core and the pole face. Tighten the cap screw holding the pole face to the core.
8. Attach the armature stop bracket and shorter spacer to the left side of the pole face. Insert the longer spacer between the pole face and end plate.
9. Rotate the armature forward and attach the armature stop.
10. Torque the five cap screws to 100 pound-feet.
11. Reattach the auxiliary contact assembly to the lower brace.
12. Attach the coil leads.
13. With the power circuit disconnect open, energize the coil circuit.
14. Check to confirm that, with the armature sealed:
    (a) The armature is centered on the pole face within 1/32 inch.
    (b) There is approximately 1/16 inch clearance between the armature and lower pole face.
    (c) The electrical interlocks' plunger can be depressed an additional 1/16 inch before bottoming out.

    Loosen and adjust parts as necessary.
15. Attach the phase barrier and arc quencher.

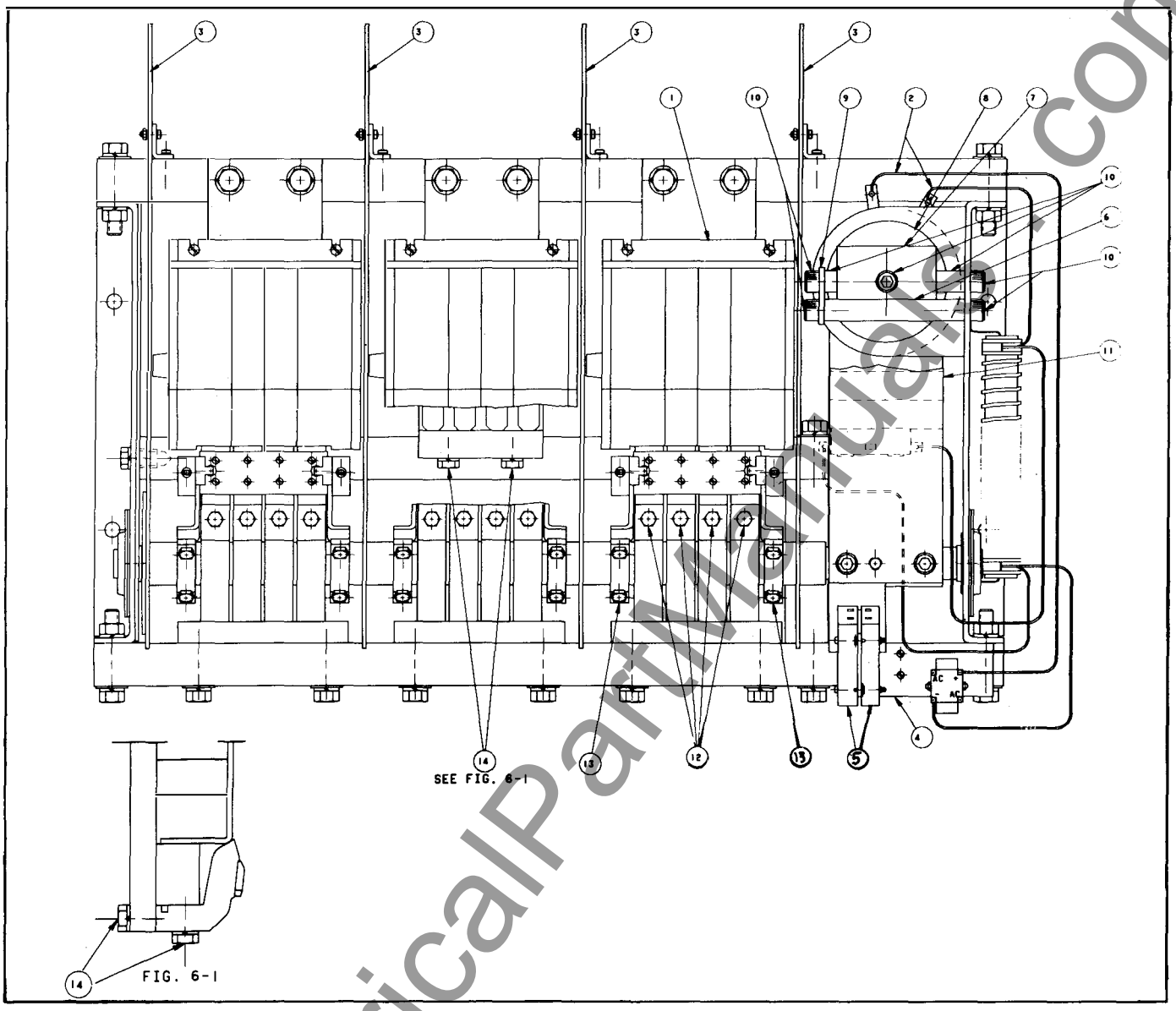

Fig. 6 Cutaway View

CONTACT INSPECTION AND REPLACEMENT

To inspect contacts and replace them proceed as shown below. Item references are to Figure 6. Contact replacement is necessary when the contact overtravel, measured at point X, Figure 7, has been reduced to 3/32 inch.

1. **Turn all power OFF.**
2. Remove arc quenchers (1) and phase barriers. (3)
3. Remove moving contact shunt bolts (12).
4. Remove clamps (13) holding moving contact assembly to the shaft and remove assembly from shaft.
5. Remove stationary contact bolts (14).
6. Install new stationary contacts and bolts. Refer to Table I for bolt driving torques.
7. Install new moving contact assembly on the shaft and bolt shunt ends to contacts.
8. See page 4 for contact adjustment.
9. Replace arc quenchers and phase barriers.

OPERATION AND MAINTENANCE

The arc quenchers must be in place when the contactor interrupts a circuit.

Each arc quencher is held in place by two screws located at the top. Two pins projecting from the stationary contact support engage notches in the lower rear sides of the arc quencher and serve to position it. A notch molded in the arc quencher cap engages the support plate to hold the arc box in position while the two screws are being assembled. The legs of the arc quencher grid plates are protected from the arc by ceramic barriers, which must be in place when the contactor is operated.

REVERSING CONTACTORS

Reversing contactors consist of two contactors with power poles interconnected by buswork, normally-closed electrical interlocks, and a Type M-52 mechanical interlock.

A201 AND A251 SIZE 9 CONTACTORS

MECHANICAL INTERLOCK

The Type M-52 mechanical interlock is used when a pair of contactors must be mechanically protected against the closing of one when the other is already closed. The two contactors may be exactly alike or may be mixed as to size or number of poles. They must be mounted one below the other, as shown in Figure 3.

The Type M-52 mechanical interlock consists of a lower operating lever, a tie rod, and an operating pin secured to the top of the armature of the lower contactor and to the bottom of the armature of the upper contactor.

With the upper contactor open and the lower contactor closed, adjust the tie rod so that the lower operating lever clears the operating pin by ¼ inch. Tighten the tie rod lock nuts. Then make sure, by alternate manual closing of first one contactor, then the other, that interlocking action is correct.

AUXILIARY CONTACTS — L64

Two double-circuit L64 auxiliary contacts (electrical interlocks) are supplied with each contactor in addition to the normally-closed, late-break contact that introduces resistance into the coil circuit. One normally-open circuit can be used in the coil holding circuit of the control relay that supplies voltage to the contactor coil and one normally-closed circuit can be used for electrical interlocking. The second double-circuit auxiliary is available for circuit monitoring.

L64 CONTACT RATINGS			
(1 normally-open, 1 normally-closed) — A600			
Part Number	**Volts**	**Make**	**Break**
843D943G04	24-120 AC	60 A	6 A
	120-600 AC	7200 VA	720 VA
	24-600 DC	200 VA	200 VA

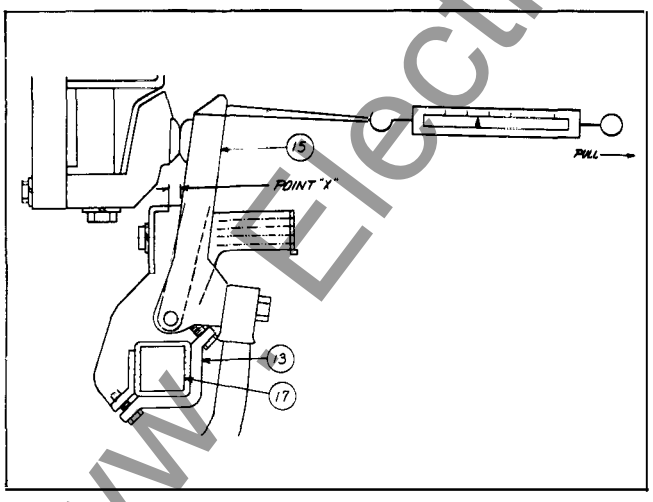

Fig. 7 Contact Overtravel and Force Measurement

CONTACT ADJUSTMENT

Make sure that all contact pairs touch simultaneously within 1/32 inch. Sufficient adjustment can generally be obtained by a selective tightening of the two bolts securing the shaft clamp (13) to the moving contact bracket (Figure 7), tightening one more than the other to produce a slight rotation of the assembly on the shaft (17). When adjusted, the contact air gap should be 3/4 inch with the armature in the fully open position. A gap of 3/16 to 7/32 inch, measured at Point X, Figure 7, is typical with newly installed contacts when the armature is in the fully closed position.

CONTACT SPRING FORCES

Measure the contact force at the top of the moving contact inlay and in line perpendicular to the moving contact (15). The contactor employs multiple contacts in parallel for each pole. The forces given below are for each contact. See Figures 6 and 7.

To measure the initial force, exert a measured pull with the contactor open until the shank of the moving contact just leaves its stop.

To measure the final force, keep the armature (11) fully seated against the magnet pole face (7) and exert a measured pull until the contacts just start to separate. Contact forces with new contacts should be as follows:

	INITIAL	**FINAL**
Contact Spring Force	10-18 LBS.	24-30 LBS.

TABLE I	RECOMMENDED DRIVING TORQUE		
Location (Qty.)		**Driving Torque (LB/IN)**	**Fig. 6 Item Number**
Wire Lugs	(8/pole)	400	(19)
Lug Mtg. Screws	(8/pole)	550	(20)
Arc Quencher Scr.	(2/pole)	40	(21)
Shaft Clamp	(2/pole)	80	(22)
Cap Screws	(5)	1200	—
Sta. Contact bolt	(2/pole)	250	—
Shunt bolt	(8/pole)	125	—
Control Circuit Electrical Connections		15	—

TABLE II	RENEWAL PARTS
ITEM	**PART NUMBER**
Coil, 100VDC for use with 120VAC Rectifier	5264C34G01
Rectifier, 120 VAC	2018A40G01
Series Resistor	443A327H31
Set of Contacts for one pole, complete	5264C42G01
Wire Lug (4/0 - 500MCM)	7865A40H05

Effective 8/83

Westinghouse Electric Corporation
Control Division
Asheville, N.C., U.S.A. 28813

Printed in USA

Instructions for A201, 3 Pole, 150 Ampere Definite Purpose Magnetic Contactor

I.L. 16993
Model B

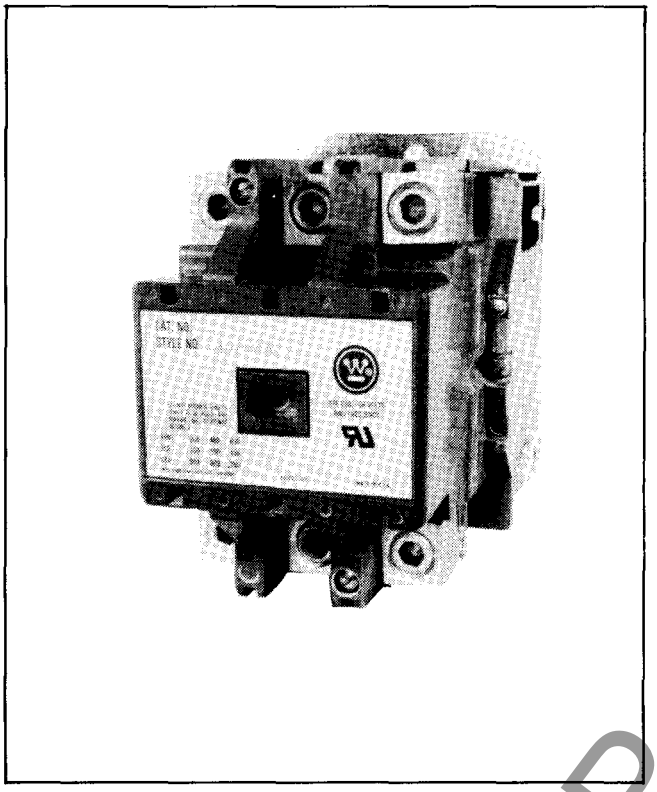

Fig. 1 150 Ampere D.P. Contactor

THE CONTACTOR

Definite purpose (D.P.) contactors are designed for the control of specific inductive or non-inductive loads at voltages between 120 and 600, AC. The units are suitable for mounting on either steel or insulated panels. All parts are front removable. Contactors should be protected against short circuits by branch circuit protective devices selected in accordance with the National Electrical Code (NEC).

CONTACTOR RATINGS — 3 POLES		
3 Phase Volts:	**200 to 460**	**575**
Full Load Amps:	150	150
Locked Rotor Amps:	900	750

This industrial type control is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

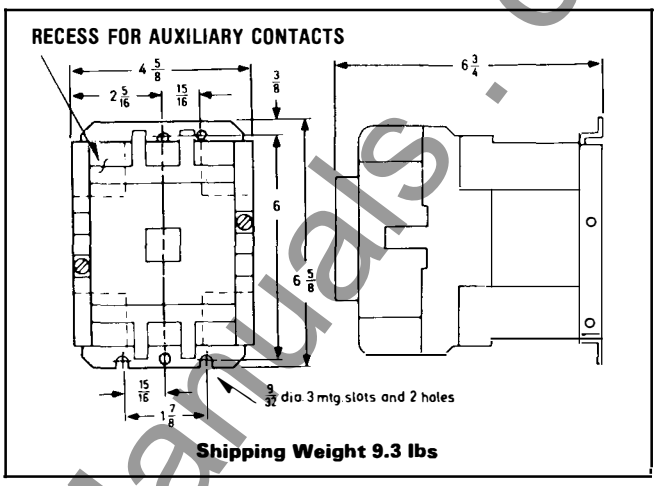

Fig. 2 Dimension Drawing (Dim. in inches)

AUXILIARY CONTACTS — L56 (RATED B600)

An L56D with one normally open pole is supplied as the holding circuit auxiliary and is mounted in the upper left hand corner recess of the contactor. A maximum of two auxiliary units can be installed in the recesses of each non-reversing contactor. These may be mounted with the terminals in line with the power poles or may be mounted with the terminals in a right angle relationship to the power poles. They mount by means of a spring clip which snaps into locations provided in the contactor. To remove the L56 disengage the top spring clip, by pressing on the extended tab, and withdraw the unit.

Although four recesses appear to be available if more than two L56's are used, the pickup characteristics of the contactor are likely to be unsatisfactory.

L56 AUXILIARY CONTACTS	
Contact Type	**Catalog No.**
1 Normally Closed	L56E
1 Normally Open	L56D
2 Normally Closed	L56C
2 Normally Open	L56B
1 Normally Open and 1 Normally Closed	L56

L56 CONTACT RATINGS (B600)			
AC Volts	**Continuous**	**Make**	**Break**
24-120	5A	30A	3A
120-600	5A	3600VA	360VA

POWER CIRCUIT TERMINALS	
Size	**Wire Size**
15 Amp D.P.	#4 - 300MCM AWG
Wire with copper conductors only.	

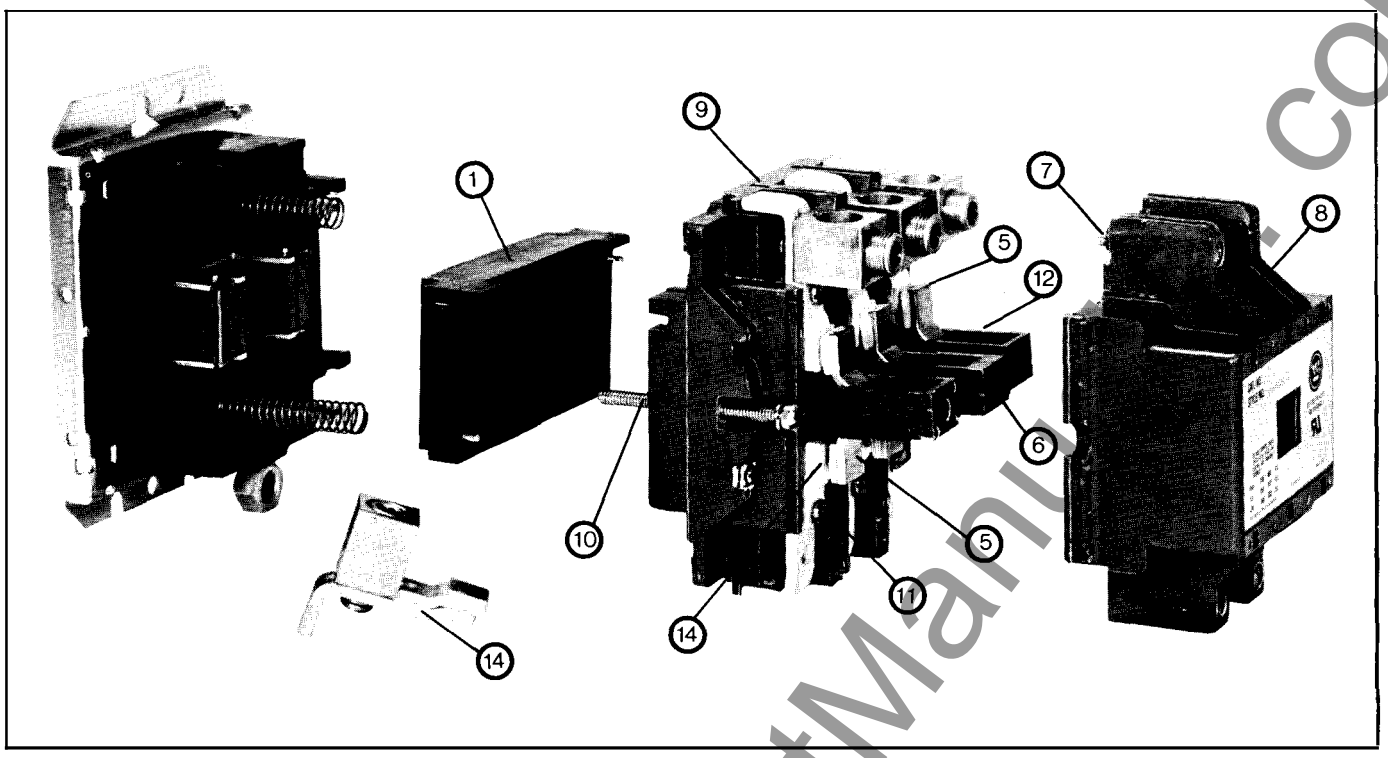

Fig. 3 Definite Purpose Magnetic Contactor (Exploded View)

MAINTENANCE — First Turn Off Power

To Inspect Contacts

Refer to Figure 3. Loosen the two arc box assembly screws (7) located immediately above and below the nameplate and remove the arc box (8). Contacts (5) are visible. Retighten the screws per Table I.

Contacts should be replaced when indicated by either the visual or measurement methods outlined on pages 3 and 4.

In the case of extreme pitting or curling of the contacts, it is possible that the measurement method would indicate sufficient overtravel, but the contacts should be replaced. In this case, the application should be questioned. A larger unit may be required to meet jogging duty, inching duty, or abnormal load currents.

When the appearance of the contacts is good, the overtravel should be measured. The contact material can not be allowed to wear completely away. If too much wear is allowed, single phasing of a three phase motor or contact welding may take place.

To Replace Contacts

After removing the arc box and with replacement contacts at hand, compress the overtravel spring (12) and remove the moving contact (5) from the crossbar (6). Disconnect any power cables. Remove the retaining screw (11) and lift out the stationary contact assembly (14).

To replace contacts, reverse the above procedure, making sure that stationary contacts are secure, (see Table I) movable contacts are free to move, overtravel springs are seated and the crossbar moves freely when the arc box is in position.

The silver cadmium oxide contact buttons need **NO** dressing or lubricant throughout their life. **Important —** Replace all contacts and springs as a group to avoid misalignment.

To Replace The Coil

Refer to Figure 3. Loosen the assembly screws (10) located to the immediate top and bottom of the arc box. Pull the loosened upper base structure (9) forward. Pull the coil (1) from the upper base, plug in a new coil, replace the upper base structure and check the auxiliary contacts for secureness when repositioning the upper base. Tighten the assembly screws referring to Table I.

Magnet — Armature Assembly

Self alignment and permanent air gap features of the magnet armature make replacement unnecessary. Mating pole face surfaces should be kept clean.

Arc box must be in place when the contactor interrupts a circuit.

TABLE I — RECOMMENDED DRIVING TORQUE

Location (Qty.)	Driving Torque (lb.-in.)	Fig. 3 Item
Cover Screw (2)	18— 21	7
Coil Wire Connector (2)	9— 12	13
Stationary Contact Screw (2/pole)	25— 30	3
Main Power Connector (2/pole)	75—100	4

Contact Wear and Replacement

Contactors are subject to both mechanical and electrical wear during their operation. In most cases mechanical wear is insignificant. The erosion of the contacts is due to electrical wear. During arcing, material from each contact is vaporized and blown away from the useful contacting surface.

A critical examination of the appearance of the contact surfaces and a measurement of the remaining contact overtravel will give the user the information required to get the maximum contact life.

Overtravel Measurement

Contact life has ended when the overtravel of the contacts has been reduced to .020 inch.

Overtravel of the contact assembly is that part of the stroke which the moving contacts would travel after touching the fixed contacts, if they were not blocked from movement by the fixed contacts.

A method of measuring overtravel is as follows:

A. Place a .020 inch feeler gauge between the armature and magnet, with the armature held tightly against the magnet.

B. Check continuity in each phase, i.e., determine if circuit from terminal-to-terminal for each pole is open under these conditions.

C. If there is continuity through all phases, the remaining overtravel is sufficient. If there is not continuity through all phases, replace all stationary and moving contacts plus moving contact overtravel springs. After replacing parts, manually operate contactor to be sure binding does not occur.

Overtravel Springs

Weak contact overtravel springs can cause low contact pressures and cause contacts to bounce excessively. Low contact pressures can cause the contacts to overheat. Bouncing contacts often cause the contact surfaces to weld. Therefore, inspect the springs for signs of deterioration.

Comparison of a used spring with a new spring as to size, shape, color and force will indicate roughly whether the used spring has lost its strength. If there is any doubt about the condition of the spring, measure the spring pressures (forces) and compare them to the recommended values.

Contact pressure is measured by using a spring scale as shown in Figure 6. Turn off the power and remove the arc box from the contactor.

Tie a loop of strong string or light weight cord around each movable contact sufficiently large to extend on both sides of the crossbar (item 6 in Figure 3) and engage the hook on the spring scale

CONTACT EVALUATION

Time of Service	Contact Appearance
New	The new contact has a uniform silver color.
Start of Service	The contact surface will have a blue coloring. The geometric form of the contact is unchanged. The sharp outer corners will be rounded with small silver beads. (See Figure 4.)
Intermediate Service to End of Service Life	The coloring changes to brown or black with distributed small silvery white areas. The surface has a finely chiselled appearance. Material transfer causes small peaks and valleys in the contact button surface. (See Figure 5.)

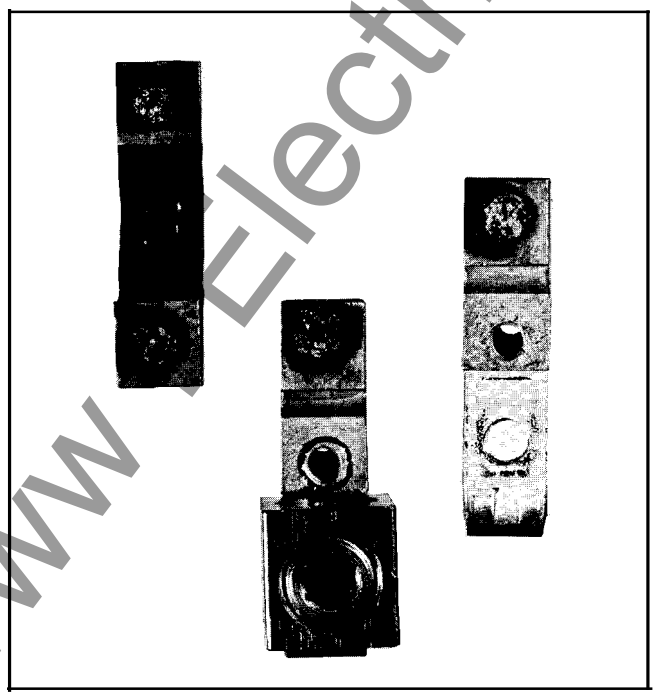

Fig. 4 Normal Service Wear

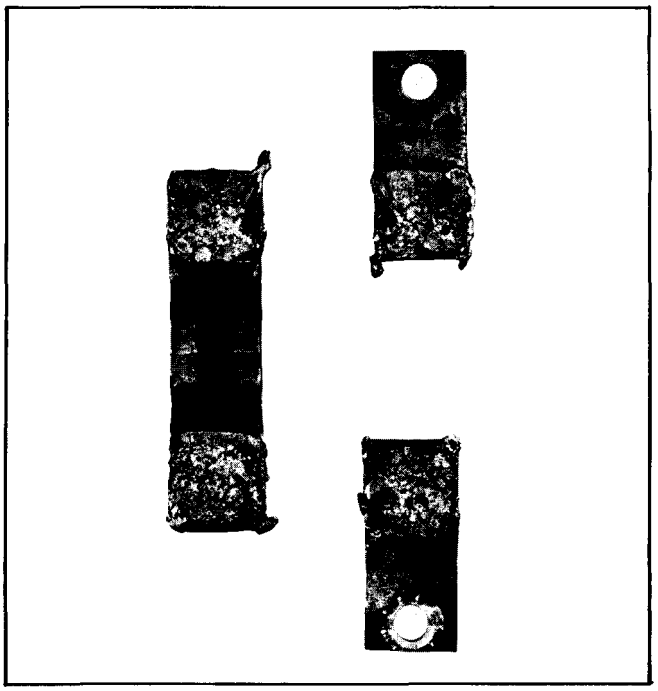

Fig. 5 End of Service Life

Effective 10/83

Westinghouse Electric Corporation
Control Division
Asheville, N.C., U.S.A. 28813

Printed in USA

with the contactor deenergized, pull on the spring scale and determine the force required to just begin to move the contact (i.e. to compress the overtravel spring). This measurement is the initial contact force. Measure each contact spring.

With the contactor energized or the armature held sealed against the magnet by some convenient means, determine the force required to just begin to move the bridging (movable) contact away from the stationary contacts. This measurement is the final contact force.

All force measurements must be taken with a smooth steady pull in a straight line perpendicular to the contactor base plate.

CONTACT OVERTRAVEL SPRING CHARACTISTICS		
Force	**Lbs.**	**Length**
Initial	3.00	1.12 in.
Final	3.87	1.00 in.

Inspection and Replacement

Check all terminals for loose connections. Operate devices manually to locate loose hardware. Tighten loose hardware, and replace worn or defective parts. If the replacement of a component requires the removal of connections, be sure to replace the connections in their original locations.

Replace all springs and contacts as a group when inspection or measurement indicates one or more component part is no longer usable.

ABNORMAL CONDITIONS

Appearance	**Cause**
Curling and Separation of Corner of Contact Button From Carrier	Curling is usually a result of service that produces very high heat, as under jogging or inching duty.
Irregular Contour or Slantwise Wear	One corner of a contact may wear more quickly than the other three corners. This wear is normally due to misalignment of the moving and stationary contacts. Contacts should be replaced if it is apparent that one contact is nearly making direct contact with the copper contact carrier.
Large Beads of Silver on Edges of Contacts	Breaking an excessive current.
Welded Spot (Core of Smooth, Shining Silver Surrounded by a Roughened Halo)	Making an excessive current. High frequency of operation, i.e., jogging.

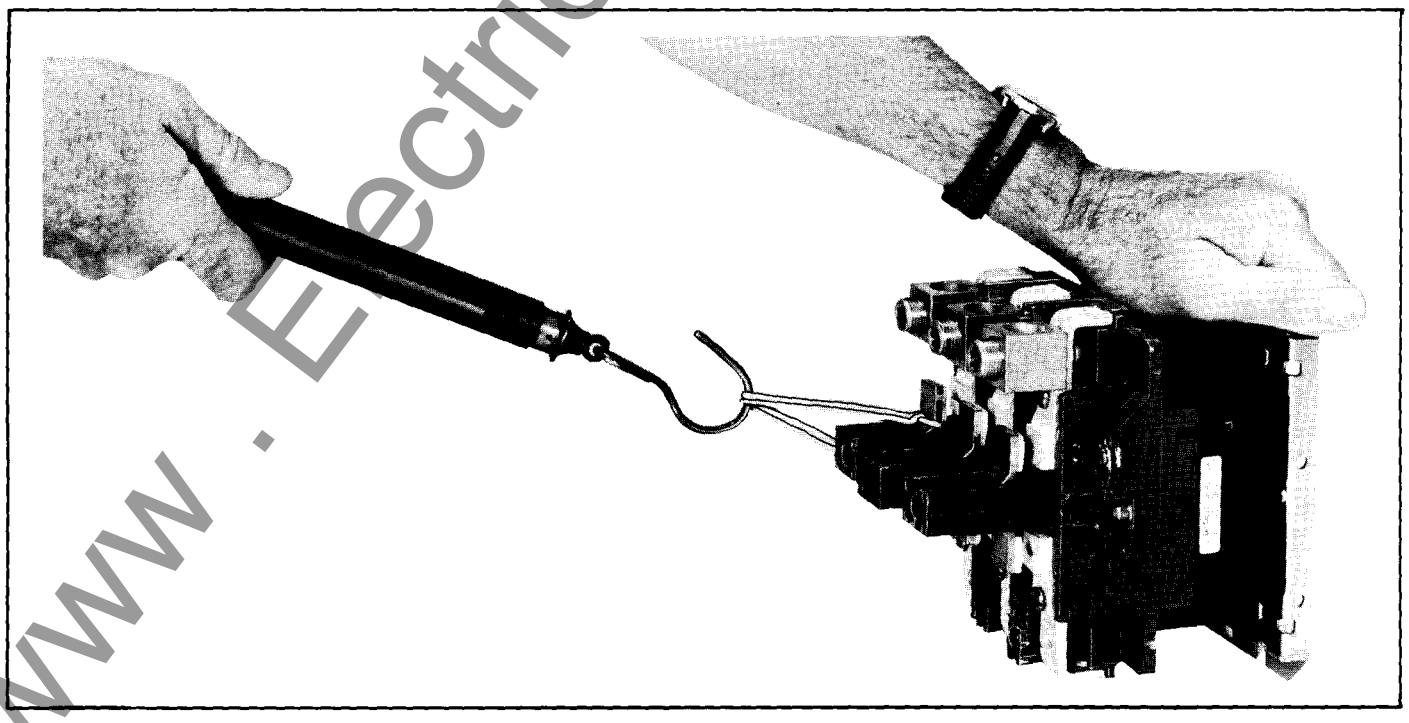

Fig. 6 Measuring Contact Overtravel Spring Forces.

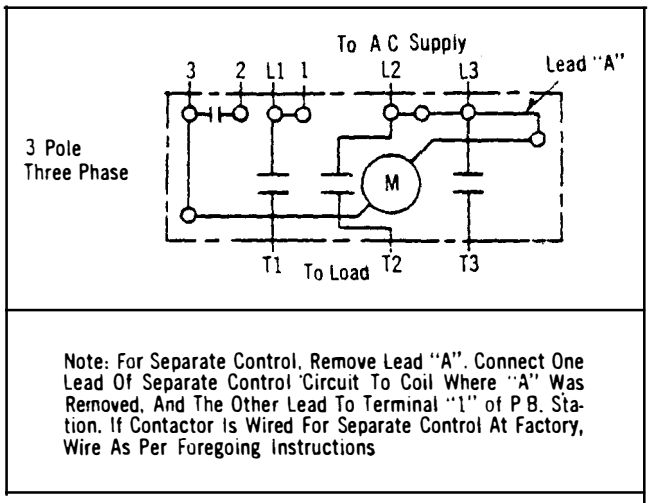

Fig. 7 Connection Diagram

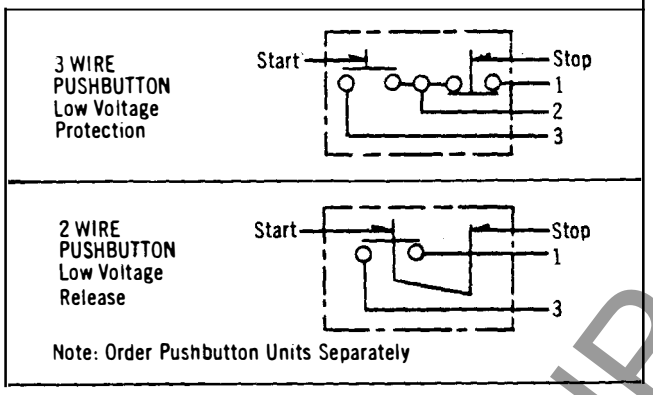

Fig. 8 Control Station

Use With Overload Relay

This contactor may be used with a Westinghouse Type A overload relay, Size 4 as described in I.L. 13299. Use the + 15% adjustment for motor currents greater than those shown in Table IV.

AC COIL DATA, (TYPICAL VALUES)

Inrush VA	Sealed VA	Sealed Watts
520	48	18

Pickup Time: 33—41 ms **Dropout Time:** 12—16 ms

Operate coil at rated voltage. Both over-voltage and under-voltage conditions are undesirable.

TABLE II — ACCESSORIES

Fuse Block Kits — Meet requirements of NEC concerning common control fusing.

Order Cat. No.	Qty.	Description
F56	2	Contactor mounted Fuse Holder for 1 600 volt Bussman KTK Fuse
FKR	1	Panel mounted Fuse Holder for 2 Class CC (Bussman KTKR) Fuses*

*Use when available fault current exceeds 10,000 amperes.

Order Fuses Separately By Ampere Rating.

Controller Size	Minimum Wire Size in Control Circuit	Suggested Fuse Size†
150 AMP D.P.	#16 AWG	10 AMP

†When using a control transformer, select fuse size per the National Electrical Code.

TABLE III — RENEWAL PARTS

Item	Part No.
Replacement Device Without Coil*	1366D46G16
Replacement Coil: 110V, 60Hz/92V, 50Hz	505C633G44
Replacement Contacts and Springs For 3 Pole Device:	Contact Kit Part No. 672B788G31

*To specify a complete contactor, order both replacement device and replacement coil part numbers.

TABLE IV — OVERLOAD RELAY SELECTION TABLE

Heater Code Marking	Range of Motor Full-Load Currents for S.F. 1.15 Motors	
	Non-Temperature Compensated Overload Relay (AN43)	Ambient Compensated Overload Relay (AA43)
FH90	92 — 99 Amperes	102 — 110 Amperes
FH91	100 — 110 Amperes	111 — 122 Amperes
FH92	111 — 122 Amperes	123 — 129 Amperes
FH93	123 — 128 Amperes	130 — 135 Amperes