

Eaton Corporation
Operations & Technical Center
4201 North 27th Street
Milwaukee, Wisconsin 53216
Telephone (414) 449-6000

July 8, 1983

Nuclear Regulatory Commission
Office of Inspection and Enforcement
799 Roosevelt Road
Glen Ellyn, IL 60137

Attention: Mr. James E. Keppler,
Director Region III

Dear Mr. Keppler,

This letter serves to confirm our phone conversation with your office of July 5, 1983.

During the qualification testing of aged electrical equipment for the Perry Nuclear Project certain anomalies occurred. These anomalies were in apparatus which had been artificially aged using Arrhenius methodology with elevated temperature aging.

The equipment involved was A-C and D-C low voltage motor starters in motor control centers.

We have searched our records and notified the licensees whom our records indicate have purchased this apparatus for safety related Class 1E application.

We would like to further amplify the point that these conditions were obtained from artificially aged apparatus for qualification for IEEE 323-1974 and not based on any field experience. There is great probability that the conditions described are induced by molding shrinkage caused by the very high temperatures of artificial aging.

We would like to further point out that we have notified all plants known to contain this apparatus even though the plant was not licensed under the requirements of IEEE 323-1974.

There are several anomalies listed below followed by a list of those notified as known purchasers of that type of equipment for Class 1E use.

8307180194 830708
PDR ADOCK 05000249
S PDR

ATTACHMENTS SENT TO DPRP
Cutler-Hammer Products

JUL 8 1983

IE19
11

Page Two
J. E. Keppler
7/8/83

Typical letters of notification are attached for each of the conditions.

#1 Overload relays mounted 90° CCW from vertical.

Philadelphia Electric - Limerick Units 1 & 2

Pennsylvania Power & Light - Susquehanna. Units 1 & 2

#2 Reduction of stroke Electrical Interlocks & Loose Fasteners.

Indiana Mich. Electric - D.C. Cooke Units 1 & 2

Pacific Gas & Electric - Diablo Canyon

Commonwealth Edison - Dresden Unit 3

Philadelphia Electric - Limerick Units 1 & 2 &
Peachbottom Units 2 & 3

Pennsylvania Power & Light - Susquehanna Units 1 & 2

Consumers Power - Palisades

Virginia Electric Power - Surry Units 1 & 2

#3 D-C Motor Starters Acceleration Timing Circuit

Georgia Power - Hatch Unit 1

Philadelphia Electric - Peachbottom Units 2 & 3

A point to be noted is that Cleveland Electric Illuminating
Perry Units 1 & 2 has all of this information included in their
qualification testing report and the Hope Creek and Vogtle
projects will have it in their qualification reports when this
work is completed. Therefore, no separate notification was made
to these projects.

EAT•N

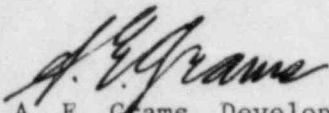
Page Three
J. E. Keppler
7/8/83

If there are any questions or clarifications which we can provide,
please contact me at (414) 449-7307.

Sincerely,

EATON CORPORATION

EAT•N



A. E. Grams, Development Manager
Custom Distribution & Control Division

djw

cc: J. W. Becker
J. W. Cooke
A. M. Cutler
R. J. Fritsch
W. F. Hogsett
B. M. Horter
W. A. Kuhar
R. J. Peterson

United States Nuclear Regulatory Commission
Director, Office of Inspection & Enforcement
Washington, D.C. 20555

Eaton Corporation
Operations & Technical Center
4201 North 27th Street
Milwaukee, Wisconsin 53216
Telephone (414) 449-6000

May 16, 1983

(Name of Power Company)

Attention:

SUBJECT: EATON/CUTLER-HAMMER PRODUCTS MOTOR CONTROL CENTERS 480V A-C
NOTICE OF ANOMALY
OVERLOAD RELAYS USED WITH NEMA SIZE 1 AND 2
MOTOR STARTERS MOUNTED 90° CCW FROM VERTICAL

Gentlemen:

During recent qualification testing for plants being reviewed under IEEE323-1974, certain anomalies have occurred which we feel should be brought to your attention for evaluation under 10CFR21.

Our records show that you have motor control centers containing NEMA size 1 and 2 motor starters with thermal overload relays mounted 90° counterclockwise from vertical on a vertical panel. Our records further indicate that some of these overload relays are in safety-related (Class IE) apparatus.

The discovered anomaly in these sizes and mounting configuration is that after a period of time in elevated ambient temperatures, in some cases, the relay may fail to trip on overload conditions.

Our company is not in a position to evaluate whether the anomaly found in these relays would cause a substantial safety hazard within the meaning of 10CFR21 regulations, and will rely on the licensee's judgement concerning the need for reporting the matter to the NRC.

Exact timing or temperatures, when this could be expected to occur, are difficult to determine since percent loading, percent on-time and ambient temperature all effect this heat related anomaly.

If it is desired to insure future operability and to check function, we would recommend periodic exercising of the trip function of these devices. Such exercising should prevent future occurrence and may correct this anomaly if it has already occurred.

We would recommend this check be done at fuel replacement time or at 18 month intervals, whichever occurs first using a minimum of three trip-outs per check.

Either mechanical or thermal trip may be used to exercise the mechanism. The recommended procedures are attached.

Page Two
(Name of Power Company)
May 16, 1983

Replacement overload relays, if required, should be ordered through Eaton Corporation/Cutler-Hammer Products, 2225 Avenue A, Lehigh Valley Industrial Park, Bethlehem, PA 18001, Mr. J. G. Rundle (Telephone No. (215) 866-0751).

If there are any questions, please call or write Eaton Corporation/Cutler-Hammer Products, 2225 Avenue A, Lehigh Valley Industrial Park, Bethlehem, PA 18001, Mr. E. P. Sherwood, (Telephone No. (215) 866-0751).

Sincerely,
Eaton Corporation



A. E. Grams
Development Manager
Custom Distribution & Control Division

cc: (Name of Power Company)

THERMAL EXERCISE OF SIZE 1 AND 2 OVERLOAD RELAYS

Periodic exercising of the size 1 and 2 overload trip mechanism when mounted 90° CCW position on a vertical panel is required to insure operability. Checking this function at least every 18 months using a minimum of three trip-outs per check is recommended.

Trip-out can be accomplished as follows:

1. Disconnect power from motor control center starter unit. Open unit door.
2. Disconnect B phase motor lead from the center terminal of the overload relay.
3. Use a portable power supply* to provide 300% of motor full load current and apply this current to two adjacent heater elements in series. Series heaters in center and either outside phase (B and A or B and C) DO NOT SERIES THE TWO OUTSIDE PHASES (A and C) because this will pass current through the motor as well as the heater coils. Use portable clip leads.
4. Overload relay should trip in 2 minutes maximum (audible and trip flag indicator on relay or measure contact change of state).
5. Remove portable supply and leads and proceed to next starter unit repeating steps 1-4.
6. After a minimum of three minutes or after all overload relays in a center have been tripped, return to first one; reset by depressing reset button and repeat tripping procedures.
7. Do this until all overload relays have been tripped three times.
8. Replace the center motor lead connection on all overload relays.
9. Replace the overload relay if it fails to trip or reset.

* NOTE: Portable power supplies for overload relay or circuit breaker tripping can be obtained from MULTI-AMP CORP., 4271 BRONZE WAY, DALLAS, TX 75237.

MECHANICAL EXERCISE OF SIZE 1 AND 2 OVERLOAD RELAYS

Periodic exercising of the size 1 and 2 overload trip mechanism when mounted 90° CCW position on a vertical panel, is required to insure operability. Checking this function at least every 18 months using a minimum of three trip-outs per check is recommended.

Mechanical exercise of the overload relay at the job site can be accomplished as follows:
(Reference Figure 1)

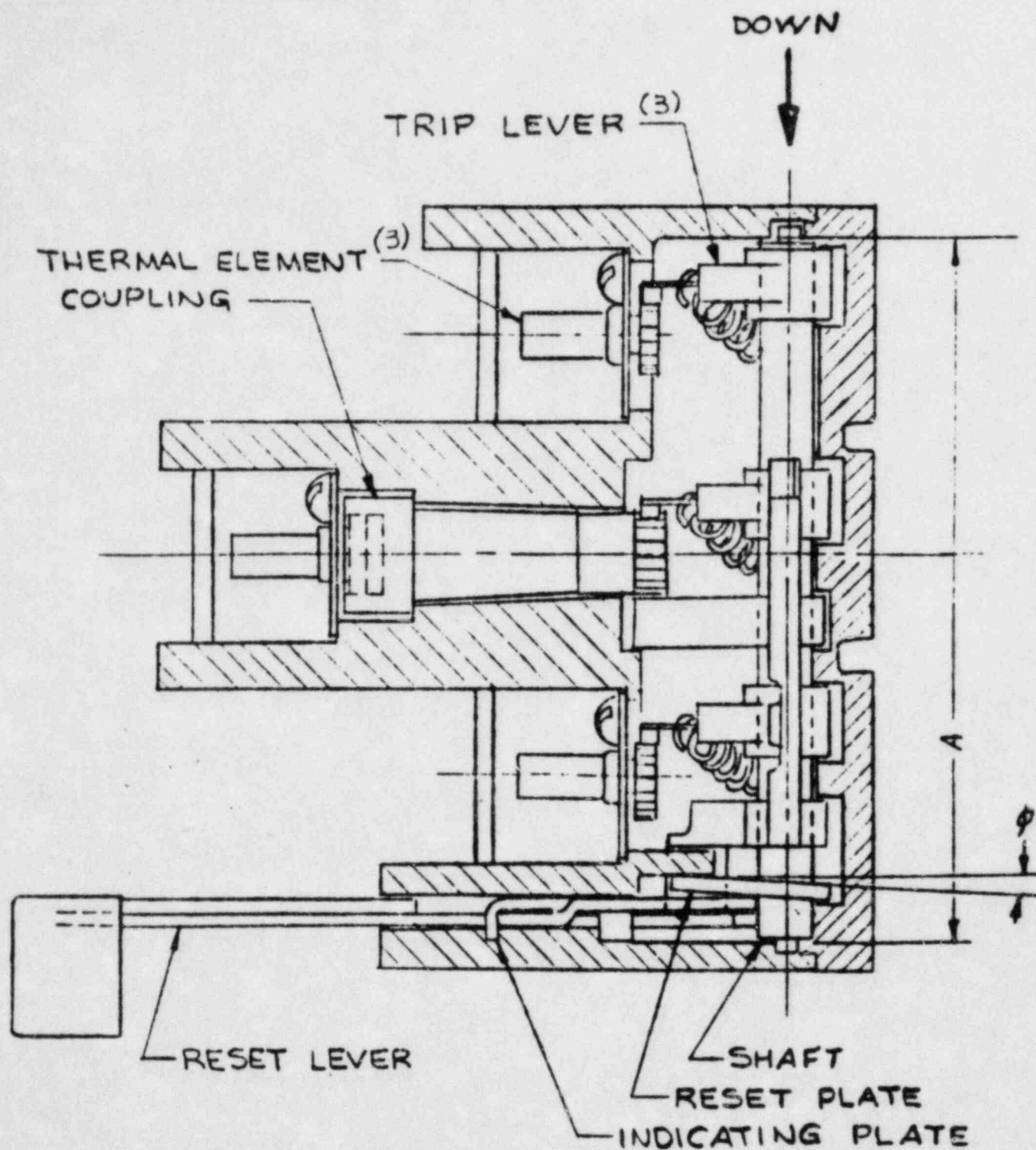
1. Disconnect power from the motor control center unit. Open unit door.
2. Remove the two outer heater coils (poles 1 and 3).
3. Loosen the two outer thermal element mounting screws 1 to 1-1/2 revolutions.
4. Using the thermal element screws as pivots, tip the thermal elements in pole 1 and 3 toward the contactor (or toward the line side terminals for the case of component overloads). This disengages the trip levers from the thermal elements thus effecting a trip-out.

Monitoring the overload relay contacts during this procedure should indicate a change of state as the overload relay trips.

NOTE: This mechanical trip method is not recommended for the center pole because fine teeth of a molded coupling underneath this pole may be damaged on reassembly when proper care is not exercised.

5. Hold pole 1 and 3 thermal elements in place by hand and fully depress the reset button. Upon release of the button, the overload contacts should return to the reset state.
6. Replace the overload relay if it fails to trip or reset.
7. Repeat step 4 and 5 for three operations.

CAUTION: USE CARE WHEN RE-TIGHTENING THE THERMAL ELEMENTS.
These are held in by self-threading screws and can be stripped if excessive torque is applied.



SIZE 1 EUTECTIC OVERLOAD
3- ELEMENT

FIGURE 1

Eaton Corporation
Operations & Technical Center
4201 North 27th Street
Milwaukee, Wisconsin 53216
Telephone (414) 449-6000

May 16, 1983

(Name of Power Company)

Attention:

SUBJECT: EATON CORPORATION/CUTLER-HAMMER PRODUCTS 125V OR 250V D-C
MOTOR CONTROL CENTERS REDUCED VOLTAGE MOTOR STARTERS
NEMA SIZE 1 AND 2
NOTICE OF ANOMALIES ACCELERATION TIMING CIRCUIT

Gentlemen:

During recent qualification testing for plants being reviewed under IEEE323-1974, certain anomalies have occurred which we feel should be brought to your attention for evaluation under 10CFR21.

RELAY TIMING

Our records show that you have D-C motor control centers containing NEMA size 1 and 2 reduced voltage motor starters. These starters contain accelerating relays, part number 10-3486 (#538) for the size 1 and part number 10-3487 (#673) for the size 2. Our records further indicate that some of these accelerating timing relays are in safety-related (Class IE) apparatus.

The first anomaly discovered was that the first step timing was reduced after the seismic event to 35% of the preseismic event setting. The overall timing is relatively unaffected by seismic events.

Our company is not in a position to evaluate whether the anomaly found in these relays would cause a substantial safety hazard within the meaning of 10CFR21 regulations, and will rely on the licensee's judgement concerning the need for reporting the matter to the NRC.

The recommended maintenance procedure after a seismic event is attached.

CAPACITOR MOUNTING

A second anomaly was discovered in the mounting of the capacitor for the RC network. The capacitor part numbers are: 42-143 (25MFD-300V), 42-143-2 (75MFD-150V), 42-143-5 (50MFD-300V) and 42-143-6 (150MFD-150V).



Page Two
(Name of Power Company)
May 16, 1983

It is highly unlikely that your plant contains this condition since the cause was a reduction in length of the capacitor which most likely did not occur until after the centers in your plant were shipped.

The nature of the anomaly was that due to improper mounting, the capacitor was damaged causing failure of the dielectric test to ground. This began to occur when the capacitor length was shortened and an improper stop bracket was used.

Most likely your plant has capacitors mounted per Figure 1 on the attached with the 8" capacitor. There is no problem with this arrangement.

If you have the Figure 2 bracket with the shorter capacitor, it should be replaced with bracket part number 55-496 per Figure 3. The capacitor should also be replaced. The capacitor part number depending on the capacitance and voltage rating are: 42-143 (25MFD-300V), 42-143-2 (75MFD-150V), 42-143-5 (50MFD-300V) and 42-143-6 (150MFD-150V).

Our company is not in a position to evaluate whether the anomaly found in the capacitor mounting would cause a substantial safety hazard within the meaning of the 10CFR21 regulations, and will rely on the licensee's judgement concerning the need for reporting the matter to the NRC.

REPLACEMENT PARTS

Order parts from Eaton Corporation/Cutler-Hammer Products, 2225 Avenue A, Lehigh Valley Industrial Park, Bethlehem, PA 18001, Mr. J. G. Rundle, (Telephone No. (215) 866-0751).

If there are any questions, please call or write Eaton Corporation/Cutler-Hammer Products, 2225 Avenue A, Lehigh Valley Industrial Park, Bethlehem, PA 18001, Mr. E. P. Sherwood, (Telephone No. (215) 866-0751).

Sincerely,
Eaton Corporation

A. E. Grams
Development Manager
Custom Distribution & Control Division

EAT•N

TIMING ADJUSTMENT ON THE #538 OR #673
DEFINITE TIME ARMATURE ACCELERATING CONTACTOR

After all seismic disturbances (earthquakes) check, and readjust as necessary, the timing steps of the #538 and #673 definite time armature accelerating contactor.

Follow the adjustment procedures as shown on the Cutler-Hammer renewal parts and instruction publication number:

Contactors No.

#538

#673

Publication No.

12394

12396

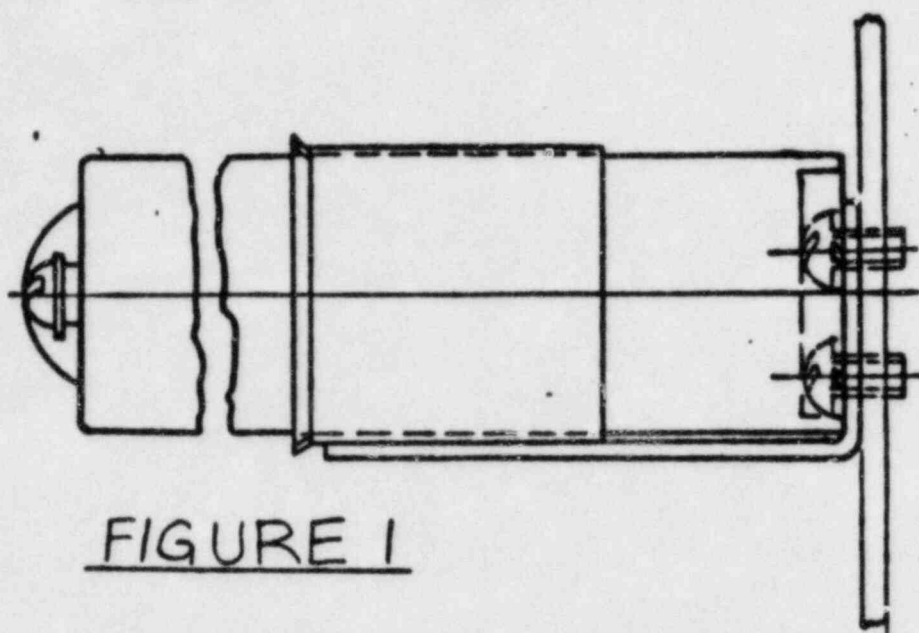


FIGURE 1

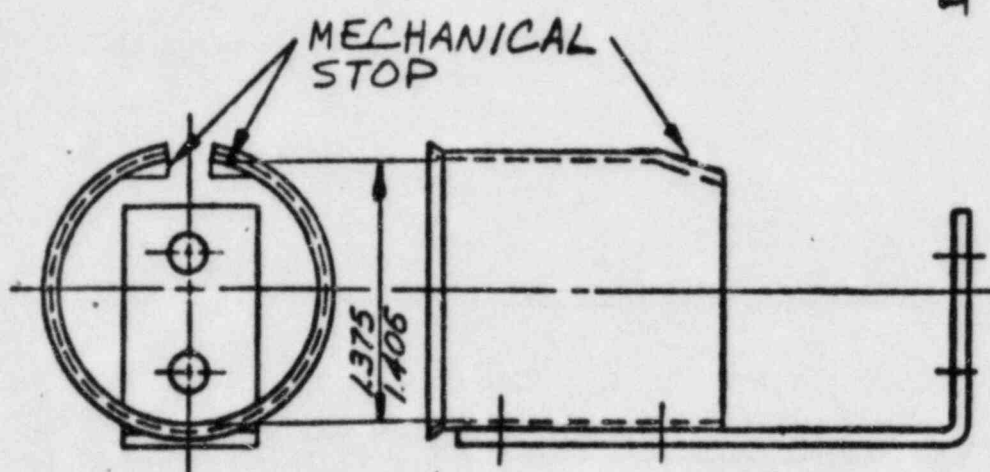


FIGURE 2

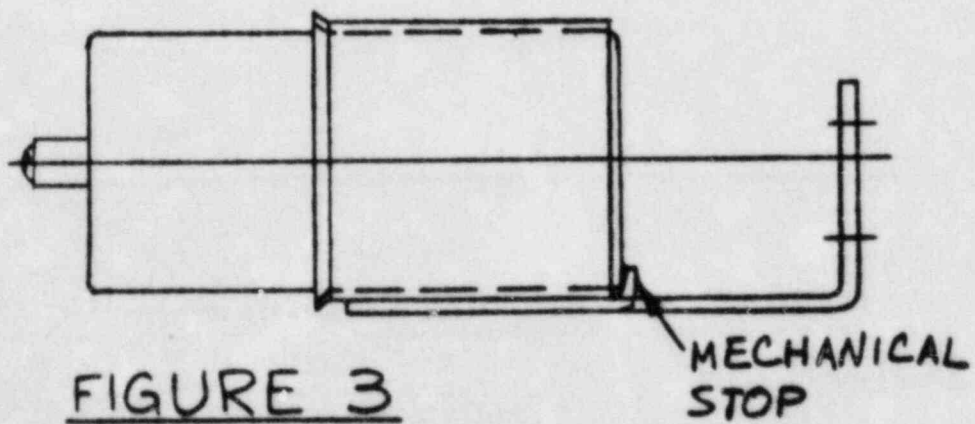


FIGURE 3

Eaton Corporation
Operations & Technical Center
4201 North 27th Street
Milwaukee, Wisconsin 53218
Telephone (414) 449-6000

May 16, 1983

(Name of Power Company)

Attention:

SUBJECT: EATON CORPORATION/CUTLER-HAMMER PRODUCTS MOTOR CONTROL CENTERS
NOTICE OF ANOMALIES; ELECTRICAL INTERLOCKS REDUCTION OF STROKE,
CITATION SIZE 1-4 AND TYPE M RELAY - LOOSE FASTENERS

Gentlemen:

During recent qualification testing for plants being reviewed under IEEE323-1974, certain anomalies have occurred which we feel should be brought to your attention for evaluation under 10CFR21.

ELECTRICAL INTERLOCKS - REDUCTION OF STROKE

GENERAL

The interlock contact bar of the Citation NEMA size 1-4 electrical interlocks will experience a reduction of operating stroke with age due to molding shrinkage, wear, and creep bending. This stroke reduction increases in severity with the interlock stack height (See Figure 1). Worst case conditions appear in the outermost auxiliary interlock. The symptom at the worst case location will be failure to close a N.O. contact or failure to open a N.C. contact.

Our company is not in a position to evaluate whether the anomaly found in these interlocks would cause a substantial safety hazard within the meaning of 10CFR21 regulations, and will rely on the licensee's judgement concerning the need for reporting the matter to the NRC.

MAINTENANCE INSTRUCTIONS

Replace the entire interlock stack (base plus auxiliaries) when the hook height becomes equal to or greater than 0.166 in. with the contactor/ starter's magnet coil energized (See Figure 1).

This condition develops gradually. Its rate of development is dependent on many factors making it impossible to predict replacement time with good accuracy. A record of periodic measurements is the best guide in this case. We recommend that the periodic measurements occur at every fuel reloading or 18 months, whichever is less, until a trend can be established. The record of measurement may allow an increase in the time between measurements after a trend is established.



Page Two
(Name of Power Company)
May 16, 1983

REPAIR PARTS INVENTORY INFORMATION

It has been estimated that electrical interlocks may need replacing once per qualified lifetime of a contactor or starter. (There is an equal chance that no replacement will be needed.)

CITATION SIZE 1-4 AND TYPE M RELAY - LOOSE FASTENERS

GENERAL



A number of fasteners on the Citation NEMA size 1 thru 4 devices and on the type M relay will loosen with age due to molding shrinkage.

Our company is not in a position to evaluate whether the anomaly found in these devices would cause a substantial safety hazard within the meaning of the 10CFR21 regulations, and will rely on the licensee's judgement concerning the need for reporting the matter to the NRC.

MAINTENANCE INSTRUCTIONS

We recommend that the potentially loose fasteners be tightened during every fuel reloading or every 18 months, whichever is less.

The specific fasteners and their tightening torques are identified for each device on the following:

Figure 2	Citation NEMA 1 & 2 Devices
Figure 3	Citation NEMA 3 & 4 Devices
Figure 4	Type M Relay

Order parts from Eaton Corporation/Cutler-Hammer Products, 2225 Avenue A, Lehigh Valley Industrial Park, Bethlehem, PA 18001, Mr. J. G. Rundle, (Telephone No. (215) 866-0751).

Page Three
(Name of Power Company)
May 16, 1983

If there are any questions, please call or write Eaton Corporation/
Cutler-Hammer Products, 2225 Avenue A, Lehigh Valley Industrial
Park, Bethlehem, PA 18001, Mr. E. P. Sherwood, (Telephone No. (215)
866-0751).

Sincerely,
Eaton Corporation

EAT•N

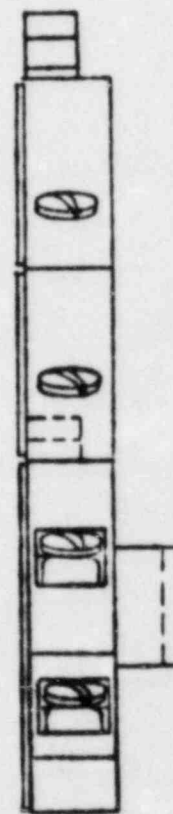
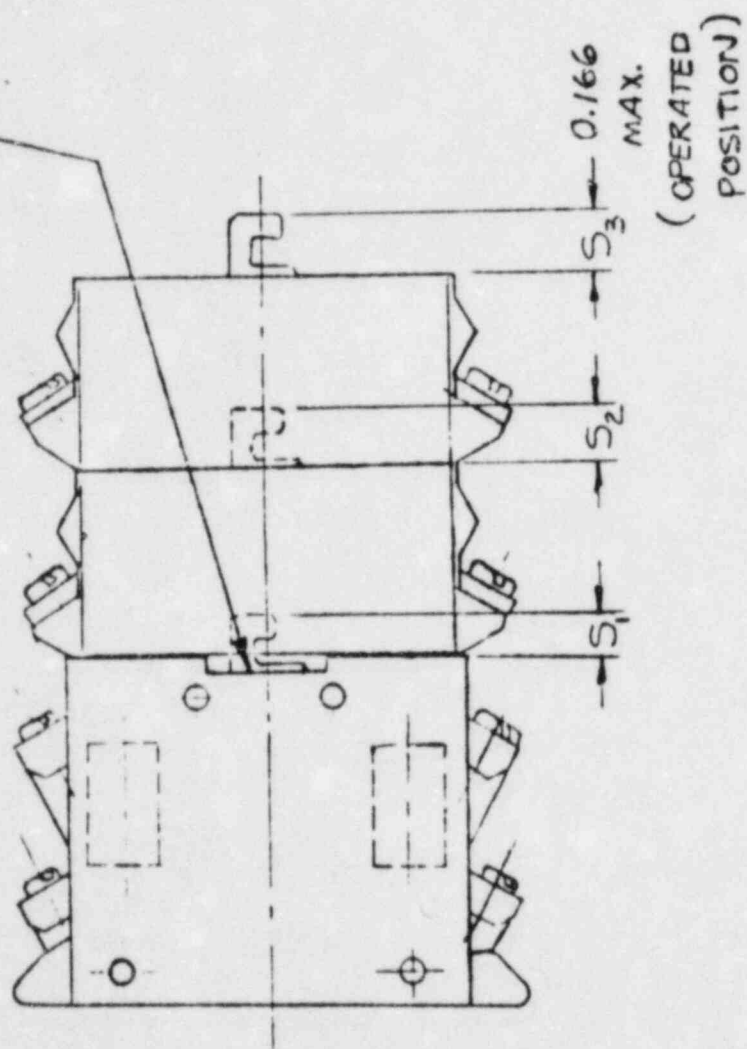
A. E. Grams
Development Manager
Custom Distribution & Control Division

cc: (Name of Power Company)

CAUTION:

DO NOT MEASURE
TO RECESSED
SURFACE

MEASURE S_1 , S_2 , OR S_3
WHICHEVER IS LAST ON STACK
(DEPENDS ON NO. OF AUX. INTERLOCKS
IN STACK.)



TYPICAL INTERLOCK STACK
(SIZE 1 SHOWN)

FIGURE 1

SCREW TIGHTENING INSTRUCTIONS - CITATION DEVICES

DUE TO MOLDING SHRINKAGE WITH AGE, TIGHTEN THE FOLLOWING SCREWS OF THE CITATION STARTERS, CONTACTORS, AND REVERSERS TO THE TORQUES (INCH-LBS) SHOWN IN THE TABLE BELOW:

NEMA DEVICE SIZE	NO. OF SCREWS	1	2
CUTLER-HAMMER RENEWAL PARTS AND INSTRUCTION PUBLICATION NO.	-- -- --	A10C-1 C10C-1 C50C-1	A10D-1 C10D-1 C50D-1
MAGNET HOUSING COVER SCREWS	2	13-15	22-24
MAGNET HOUSING MOUNTING SCREWS	2	13-15	18-19
CONTACT BAR TO PUSH BAR SCREWS	4/2	13-15(4)	20-22(2)
ARMATURE CLAMP PLATE SCREWS	4	---	12-15
BASE INTERLOCK MOUNTING SCREWS	2 EACH	8-10	9-11
MECHANICAL INTERLOCK MOUNTING SCREWS	4	8-10	9-11
AUXILIARY INTERLOCK MOUNTING SCREWS	2 EACH	8-10	10-12

NOTE: REFER TO THE RENEWAL PARTS PUBLICATIONS LISTED ABOVE AS AN AID TO IDENTIFYING THE SCREWS AND THEIR LOCATION.

FIGURE 2

SCREW TIGHTENING INSTRUCTIONS -
CITATION DEVICES (CONT'D.)

NEMA DEVICE SIZE	NO. OF SCREWS	3	4
CUTLER-HAMMER RENEWAL PARTS AND INSTRUCTION PUBLICATION NO.	-- -- --	A10E-1 C10E-1 A50E-1	A10F-1 C10F-1 A50F-1
MAGNET HOUSING COVER SCREWS	2	27-32	27-32
MAGNET HOUSING MOUNTING SCREWS	2	27-32	27-32
CONTACT BAR TO PUSH BAR SCREWS	2	27-32	27-32
ARMATURE CLAMP PLATE SCREWS	4	27-32	27-32
MAGNET FRAME CLAMP SCREWS	2	27-32	27-32
ARC CHUTE MOUNTING SCREWS	6	14-16	14-16
BASE INTERLOCK MOUNTING SCREWS	2 EACH	27-32	27-32
AUXILIARY INTERLOCK MOUNTING SCREWS	2 EACH	10-12	10-12
MECHANICAL INTERLOCK MOUNTING SCREWS	4	27-32	27-32

NOTE: REFER TO THE RENEWAL PARTS PUBLICATIONS LISTED ABOVE AS
AN AID TO IDENTIFYING THE SCREWS AND THEIR LOCATION.

FIGURE 3

SCREW TIGHTENING INSTRUCTIONS - M RELAY

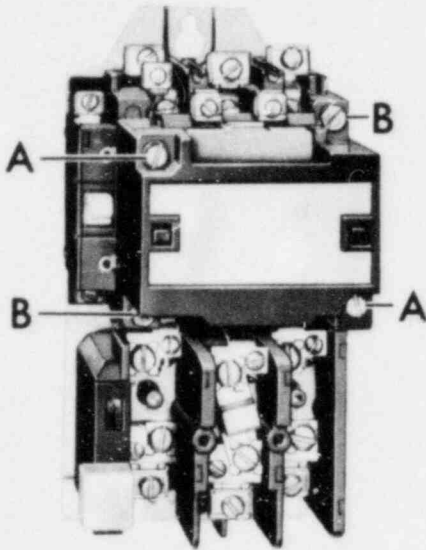
DUE TO MOLDING SHRINKAGE WITH AGE, TIGHTEN THE FOLLOWING SCREWS OF THE M RELAY TO THE TORQUES (INCH-LBS) SHOWN IN THE TABLE BELOW:

	NO. OF SCREWS	M RELAY
CUTLER-HAMMER RENEWAL PARTS AND INSTRUCTION PUBLICATION NO.	--	D26M-1
COVER PLATE MOUNTING SCREWS	2	11-14
REAR DECK MOUNTING SCREWS	4	15-18

NOTE: REFER TO THE RENEWAL PARTS PUBLICATIONS LISTED ABOVE AS AN AID TO IDENTIFYING THE SCREWS AND THEIR LOCATION.

FIGURE 4

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "1" 3 POLE STARTER WITH STANDARD TRIP EUTECTIC OVERLOAD RELAY



Typical Starter Three Pole with Two Circuit Electrical Interlock

INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are three pole, three phase, non-reversing A-c magnetic starters for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These starters require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion — refer to publication 14183 for helpful information on inspecting and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 16.
2. Tilt the top of the armature item 11 away from the coil.
3. Slide the armature up and out.
4. Remove the spring plate item 12.
5. Pull the coil straight out.
6. Install the new coil with the coil terminal blades engaging the coil terminal clips.
7. Install and seat the spring plate.
8. Slide the armature (narrow end to the right) into its seated operating position.
9. Install the cover.

RENEWAL OF POWER UNIT

NOTE — The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

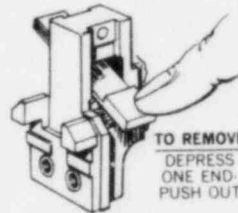
Unfasten the two gold colored Hex. Head screws "B", pull out the power unit, plug-in the new and retighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from coil table on page 4.

RENEWAL OF POWER CONTACTS

The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

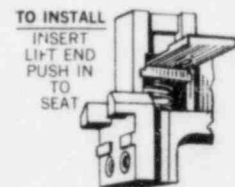
1. Remove the power unit assembly by loosening the two gold colored slotted hex. head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS

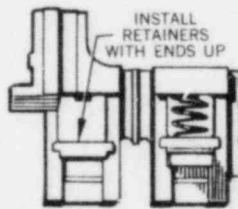


SKETCH "A"

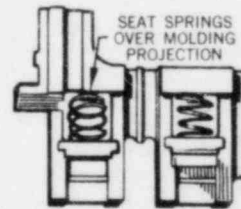
2. Depress one end of the movable contact and push the contact out (see sketch "A").
3. Remove the springs item 10.
4. Remove the retainers item 9.



SKETCH "B"



SKETCH "C"



SKETCH "D"

5. Install the new retainers item 9. (see sketch "C").
Note — the retainer must be installed so the springs will seat over the extruded hole, with the retainer ends extending away from the contacts.
6. Install the spring item 10. (see sketch "D").
7. Install the contact (see sketch "B"). Insert contact, raise end slightly and push in to seat.

STATIONARY CONTACTS

NOTE — It is not necessary to disconnect any wiring.

8. Remove the screws securing the stationary contacts.
9. Slide the contact out of the groove in the molding. A hole in the contact plate is provided for convenient removal with a screwdriver.
10. Install the new contacts.

CAUTION — The stationary contacts must be installed so they seat on **top** of the terminal plates. (See typical assembly top of page 2).

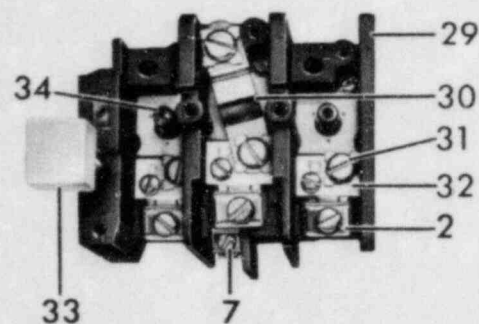
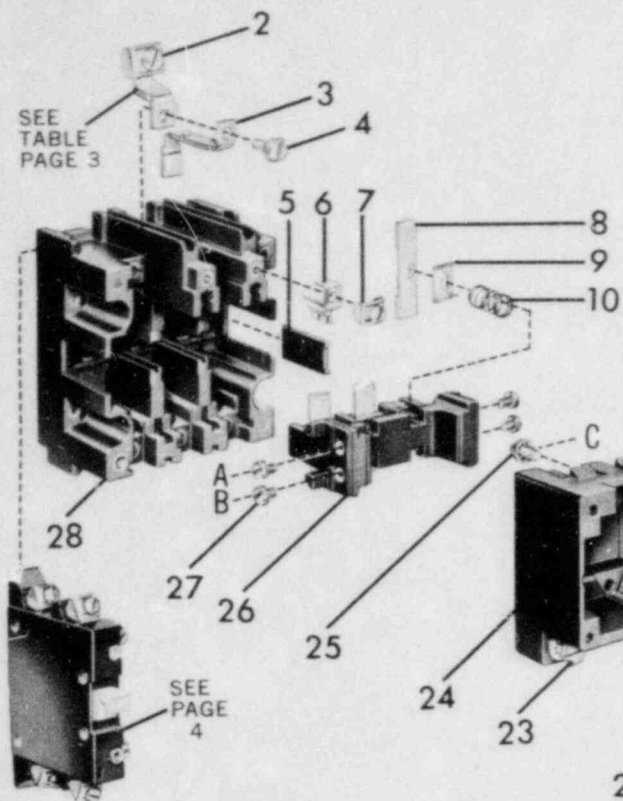
ELECTRICAL INTERLOCKS

The electrical interlocks are renewable as a complete assembly. See page 4 for the various electrical interlocks.

LUBRICATION

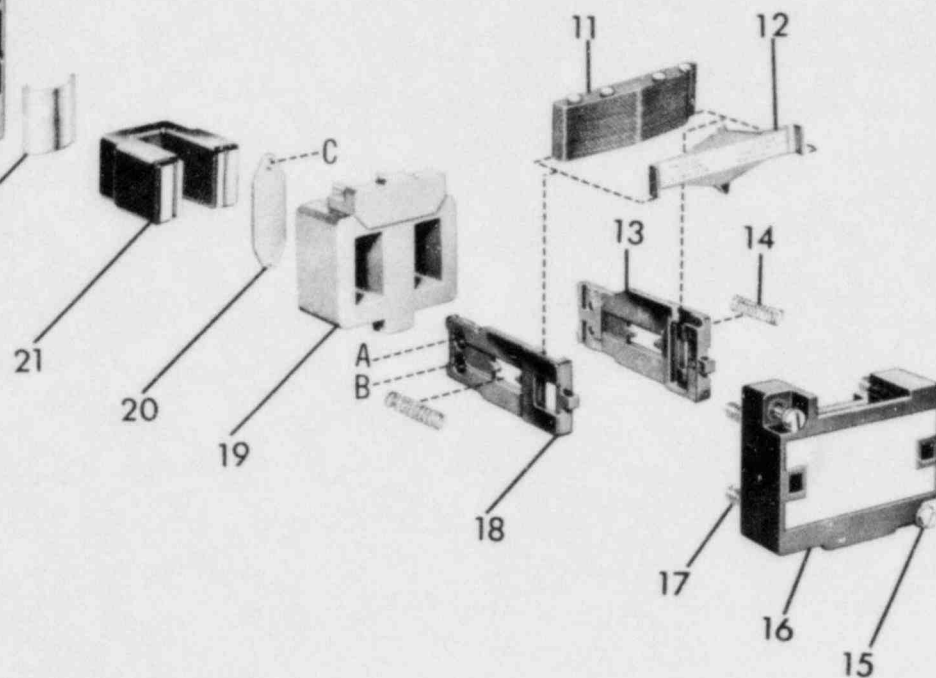
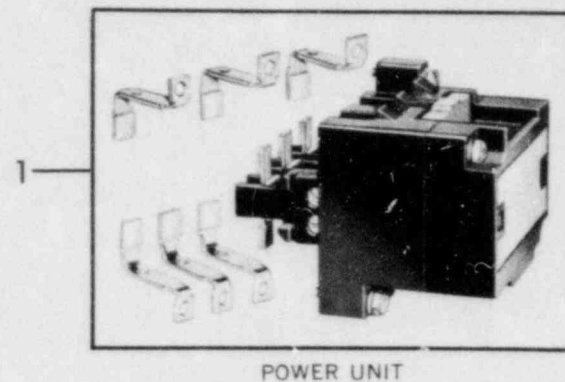
Do not lubricate any part of this equipment.

Continued on page 4



OVERLOAD RELAY

The parts listed and illustrated are available for repairs. Should other parts be required order a complete overload relay.



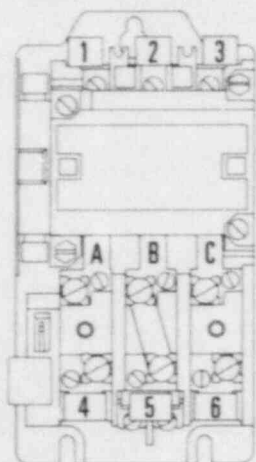
RENEWAL PARTS — Information RequiredTo insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.****PARTS LIST**

Item No.	Description of Part	No. Req.	Part No.	Item No.	Description of Part	No. Req.	Part No.
• 1	Power unit (includes items 3, 4, 8 thru 27) (see coil table, p. 4)	1	C10CX	19	Coil (see table on page 4)	1	.....
2	Power Terminal Clamp	*	55-1763	20	Strap	1	19-1723
3	Stationary Contact (included w/item 35)	6	.....	★21	Magnet Frame	1	17-8911
4	Contact Mounting Screw (included w/item 35)	6	.....	22	Spring	1	69-2766
5	Insulator	1	56-3493	23	Slotted Hex. Head Screw	2	11-2518
6	Coil Terminal Clip	2	55-1681	24	Magnet Housing	1	49-3606
7	Auxiliary Terminal Clamp	*	55-1743	25	8-32 x .50 Pan Head Screw	2	11-2515
8	Movable Contact (included w/item 35)	3	.....	26	Contact Bar Kit (includes item 13, does not include items 8, 9, 10)	1	61-2980
9	Retainer (included w/item 35)	3	.....	27	6-32 Pan Head Screw (included w/items 13 & 26)	4	.....
10	Spring (included w/item 35)	3	.....	28	Molded Base	1	17-9014
★11	Armature	1	48-1019	29	Overload Relay (includes items 2, 7, 31 thru 34) N.C. Control Circuit	1	10-3523-5
12	Spring Plate	1	69-2765		N.C.-N.O. Control Circuit	1	10-3523-9
13	Push Bars (includes items 14, 18 and 27)	1	61-1857	30	Connector	1	25-2217
14	Spring	2	69-2507	31	Screw	6	11-2582
15	Pan Head Sems Screw	2	11-2517	32	Terminal Plate	3	80-2749
16	Cover (includes items 15 and 17 w/o name- plate) (give complete nameplate data for cover with nameplate)	1	49-4114		6-20 x .438 P. H. Thd. Cutting Screw	3	11-2669
17	Spring	4	69-2508	33	Button (White)	1	53-1236
18	Push Bar (see item 13)	1	.....	34	Thermal Element	3	10-4057
					6-20 x .438 P. H. Thd. Cutting Screw	3	11-2669
				▲35	Set of Contacts (includes items 3, 4, 8, 9 & 10)	1	6-23-2

- Coil must be specified by suffix letter selected from coil table on page 4.
The power units are supplied only with 3 power poles.
▲Recommended Spare Parts.

*As Required.

★It is recommended that items 11 and 21 be replaced together.

TERMINAL POSITIONS

Selection
and
arrangement
see
adjacent
table.

TERMINALS

	POSITION			TERMINAL CLAMPS	
	1	2	3	POWER	AUXILIARY
WITH PROVISION FOR AUXILIARY TERMINAL					
PART NO.	80-3167	80-3168	.....	55-1763	55-1743
WITHOUT PROVISION FOR AUXILIARY TERMINAL				POWER 	
PART NO.	.....	80-2786	80-2788 3	55-1763	

CONNECTORS

(Contactor to Overload Relay)

POSITION	PART NO.
A	25-2212
B	25-2213
C	25-2214

TERMINALS

(On Overload Relay)

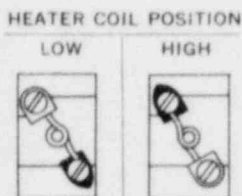
POSITION		TERM. CLAMP
4, 5, 6		
	Item 32 in Parts List	Item 2 in Parts List
PART NO.	80-2749	55-1763

Continued from page 1

EUTECTIC OVERLOAD RELAY

This overload relay has two steps of adjustment (low or high) obtained by POSITIONING THE HEATER COILS as shown in the adjacent illustrations. Note the location of the pointed terminal on the heater coil.

The heater coil selection table furnished with the starter illustrates the proper mounting position. All coils must be mounted in the same position for a given overload relay.



Reset and tripped indication —

A transparent rectangular window above the reset button provides visual indication.

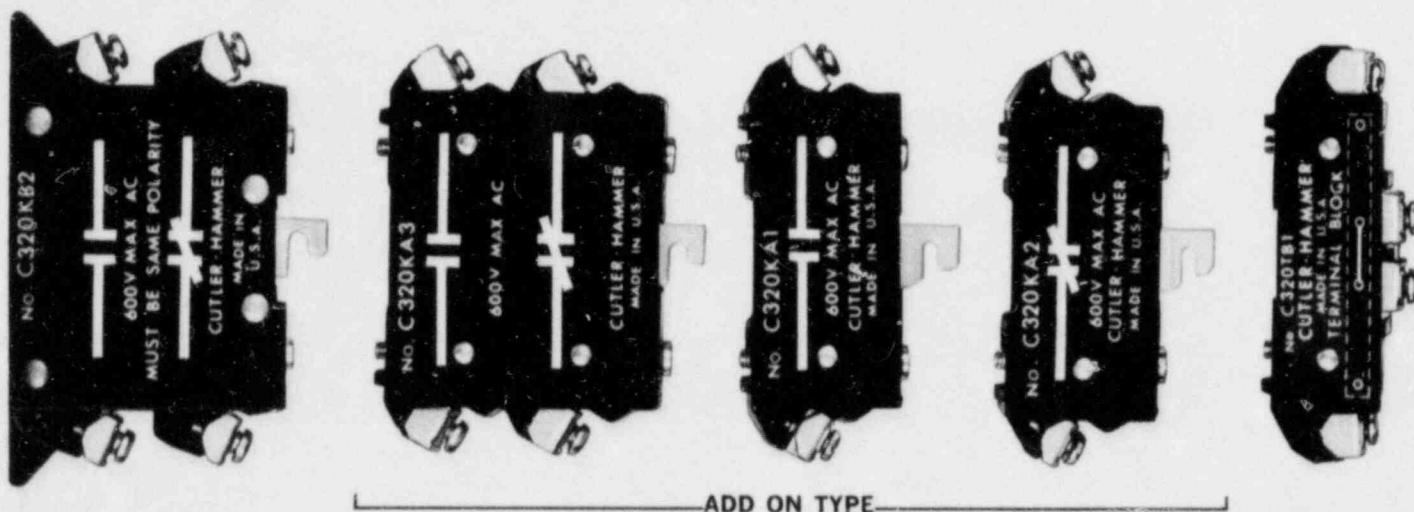
Relay Reset — Dark Window.

Relay Tripped — Light (silver) Window.

Do not disassemble this relay.

The parts called out on page 2 and listed on page 3 are available for repairs. If parts are required other than those listed replace the complete relay.

ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE



BASE MOUNTED

Circuit	Catalog No.
None (Dummy)	10-3640-3
1 N.O.	C320KB1
1 N.O.-1 N.C.	C320KB2

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

TERMINAL BLOCK

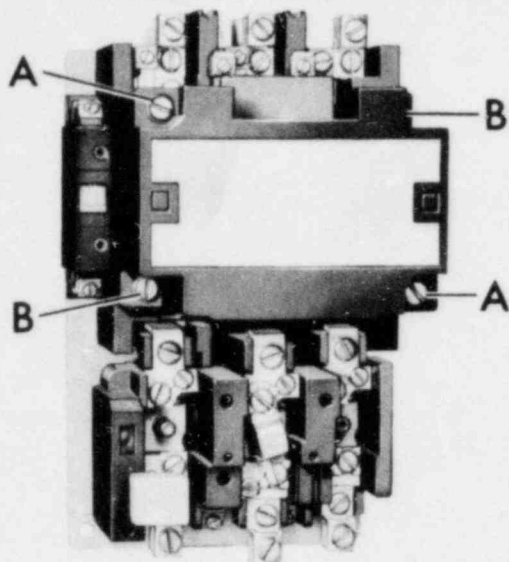
Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120	60	9-1887-1	A	600	60	9-1887-4	D
110	50			550	50		
240	60	9-1887-2	B	208	60	9-1887-5	E
220	50						
480	60	9-1887-3	C	380	50	9-1887-8	L
440	50						

*Suffix letter required only when power unit is ordered.

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "2" 3 POLE STARTER WITH STANDARD TRIP EUTECTIC OVERLOAD RELAY



Typical Starter Three Pole with Two Circuit Electrical Interlock

INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are three pole, three phase, non-reversing A-c magnetic starters for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These starters require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion — refer to publication 14183 for helpful information on inspecting and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 26 page 2.
2. Unfasten the four pan head screws item 25 securing the clamp item 24 and the armature item 22. Remove the clamp and the armature.
3. Pull the coil straight out.
4. Install the new coil with the coil terminal blades engaging the coil terminal clips.
5. Install the armature (narrow end to the right) into its seated operating position.

6. Install the clamp and secure the screws.
7. Install the cover.

RENEWAL OF POWER UNIT

NOTE • The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

Unfasten the two gold colored Hex. Head screws "B", pull out the power unit, plug-in the new and retighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from the coil table on page 4.

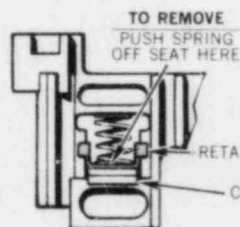
RENEWAL OF POWER CONTACTS

The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

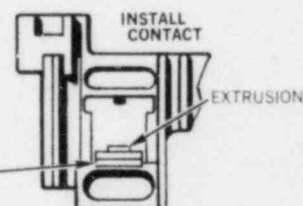
1. Remove the power unit assembly by loosening the two gold colored slotted hex. head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS

2. Remove the contact bar item 30 by removing the two screws item 31.
3. Push the springs item 10 off their seat on the retainer item 9 and push out. (See sketch "A".)
4. Remove the retainers thru the wide opening in the molding. The contacts item 8 will be free to come out.

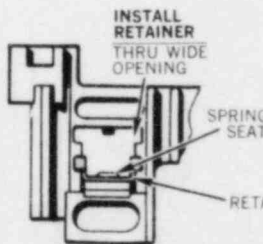


SKETCH "A"

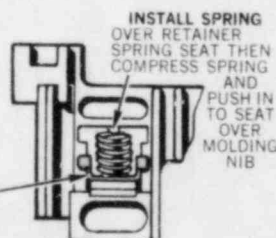


SKETCH "B"

5. Install the new contacts. (See sketch "B".)
6. Install the new retainers. (See sketch "C".) The square openings must be keyed with the extrusions on the contacts.
7. Install the springs, insert one end over the seat on the retainer, compress springs and push in to seat over the molding nib. (See sketch "D".)



SKETCH "C"



SKETCH "D"

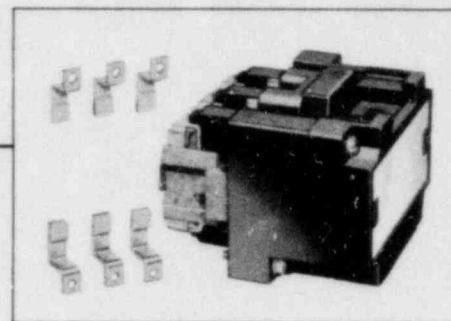
8. Install the contact bar to the push bars items 19 and 20 with screws item 31.

NOTE: The contact bar is keyed with projections on the push bars. Match the keys to insure correct fit and assembly.

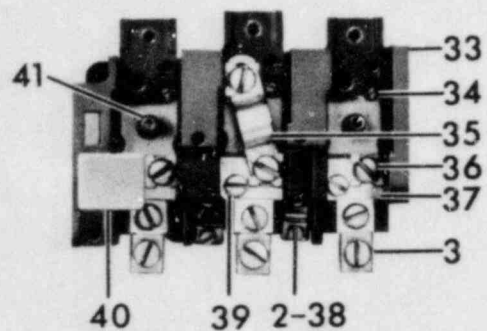
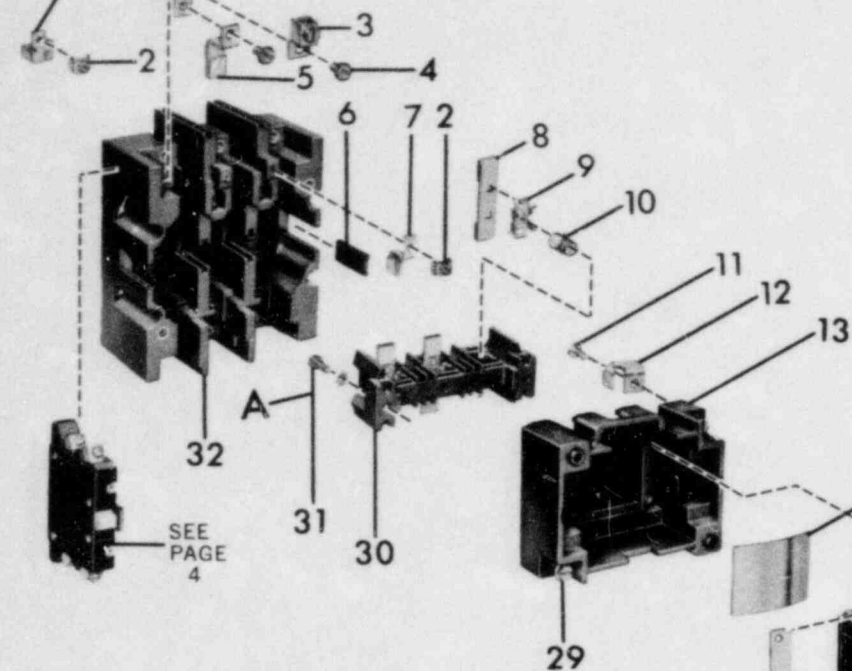
(Continued on Page 4)

CONTROL
TERMINAL
SEE TABLE
PAGE 3

TERMINAL PLATE
SEE TABLE PAGE 3

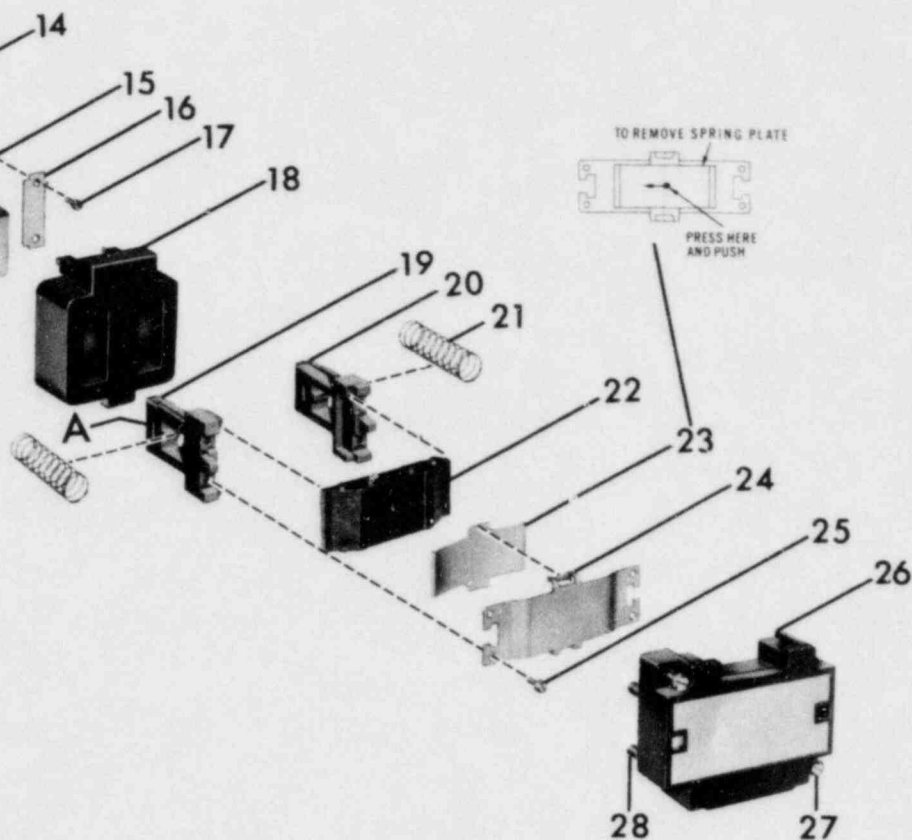


POWER UNIT



OVERLOAD RELAY

The parts listed and illustrated are available for repairs. Should other parts be required order a complete overload relay.



RENEWAL PARTS — Information Required

To insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.**

PARTS LIST

Item No.	Description of Part	3 Pole Starter		Item No.	Description of Part	3 Pole Starter	
		No. Req.	Part No.			No. Req.	Part No.
• 1	Power unit (includes items 4, 5, 8 thru 32) (see coil table page 4)	1	C10DX	25	6-32 x .50 Pan Head Sems Screw	4	11-2668
2	Auxiliary Terminal Clamp	*	55-1743	26	Cover (includes items 27 and 28) (without nameplate) (give complete nameplate data for cover with nameplate)	1	49-4151
3	Lug	*		27	10-32 x 1.25 Pan Head Sems Screw	2	11-2310
	Copper		80-2819	28	Spring	4	69-2599
	Aluminum		80-2798	29	10-32 x 1.148 Slotted Hex. Head Sems Screw	2	11-2525
4	10-32 x .437 Pan Head Sems Screw (incl. w/item 42)	*		30	Contact Bar	1	23-3619-3
5	Stationary Contacts (included w/item 42)	6		31	8-32 x .688 Round Head Sems Screw with Washers	2	11-2524
6	Insulator	1	56-3494	32	Molded Base	1	17-9255
7	Coil Terminal Clip	2	80-2871	33	Overload Relay (includes items 2, 3, 34, 36 thru 41)		
8	Movable Contact (included w/item 42)	3			With Copper Lugs	1	10-3535-5
9	Retainer (included w/item 42)	3			N.C. Control Circuit	1	10-3535-7
10	Spring (included w/item 42)	3			N.C.-N.O. Control Circuit		
11	8-18 x .50 Flat Head Thread Cutting Screw	6	11-2463		With Aluminum Lugs	1	10-3535-9
12	Blowout	6	62-529		N.C. Control Circuit	1	10-3535-11
13	Magnet Housing (see item 29)	1	49-3664		N.C.-N.O. Control Circuit		
14	Spring	1	69-2604	34	6-32 x .312 Round Head	3	11-1525
★15	Magnet Frame	1	17-8955-2	35	Connector	1	25-2217-2
16	Clamp	2	55-1877	36	Screw	*	11-2582
17	6-32 x .312 Pan Head Sems Screw	4	11-2538-4	37	Terminal Plate	3	80-2771
18	Coil (see coil table on page 4)	1		38	Auxiliary Terminal Clamp (Gold)	*	55-1743-2
19	Push Bar (Left Hand)	1	61-1629	39	8-32 x .50 Pan Head Sems Screw	6	11-2280
20	Push Bar (Right Hand)	1	61-1628	40	Button (White)	1	53-1236
21	Spring	2	69-2692	41	Thermal Element	3	10-4057
★22	Armature	1	48-1020	▲42	Set of Contacts (incl. items 4, 5, 8, 9 & 10)	1	6-24-2
23	Spring Plate	1	69-2515				
24	Clamp Plate	1	55-1878				

• Coil must be specified by suffix letter selected from coil table on page 4.
The power units are supplied only with 3 power poles.

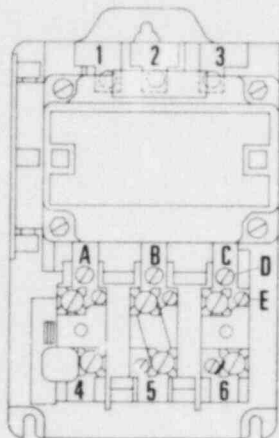
▲ Recommended Spare Parts.






* As required.

★ It is recommended that items 15 and 22 be replaced together.


TERMINAL PLATE POSITIONS

Selection and arrangement see adjacent table.

**TERMINAL PLATES**

POSITION	1	2	3	1	2 or 3
PICTURE					
PART NO.	80-2879	80-2740	80-3433	80-3392	80-2805
MOUNTING SCREW	10-32 ITEM 4 IN PARTS LIST			TERMINAL CLAMP	6-32 ITEM 2 IN PARTS LIST
PART NO.	11-2425			PART NO.	55-1743

CONTROL TERMINALS

TERMINAL PLATE OVERLOAD RELAY		CONNECTORS CONTACTOR TO OVERLOAD RELAY	
POSITION		POSITION	PART NO.
4, 5, 6		A	25-2545
	ITEM 37 IN PARTS LIST	B	25-2544
		C	25-2543
PART NO.	80-2771	MOUNTING SCREWS	
		D ITEM 4 IN PARTS LIST	11-2425
		E ITEM 39 IN PARTS LIST	11-2280

STATIONARY CONTACTS

Note: It is not necessary to disconnect any wiring.

9. Remove the screws securing the stationary contacts.
10. Install the new contacts and screws.

Caution: The stationary contacts must be installed so they seat on top of the terminal plates.

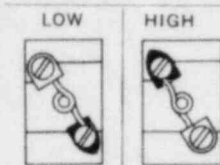
A control terminal, when used, (see table page 3) must be mounted on top of the stationary contacts.

EUTECTIC OVERLOAD RELAY

This overload relay has two steps of adjustment (low or high) obtained by POSITIONING THE HEATER COILS as shown in the adjacent illustrations. Note the location of the pointed terminal on the heater coil.

The heater coil selection table furnished with the starter illustrates the proper mounting position. All coils must be mounted in the same position for a given overload relay.

HEATER COIL POSITION



ELECTRICAL INTERLOCKS

The electrical interlocks are renewable as a complete assembly. See illustrations and tables below for the various electrical interlocks.

LUBRICATION

Do not lubricate any part of this equipment.

Reset and tripped indication —

A transparent rectangular window above the reset button provides visual indication.

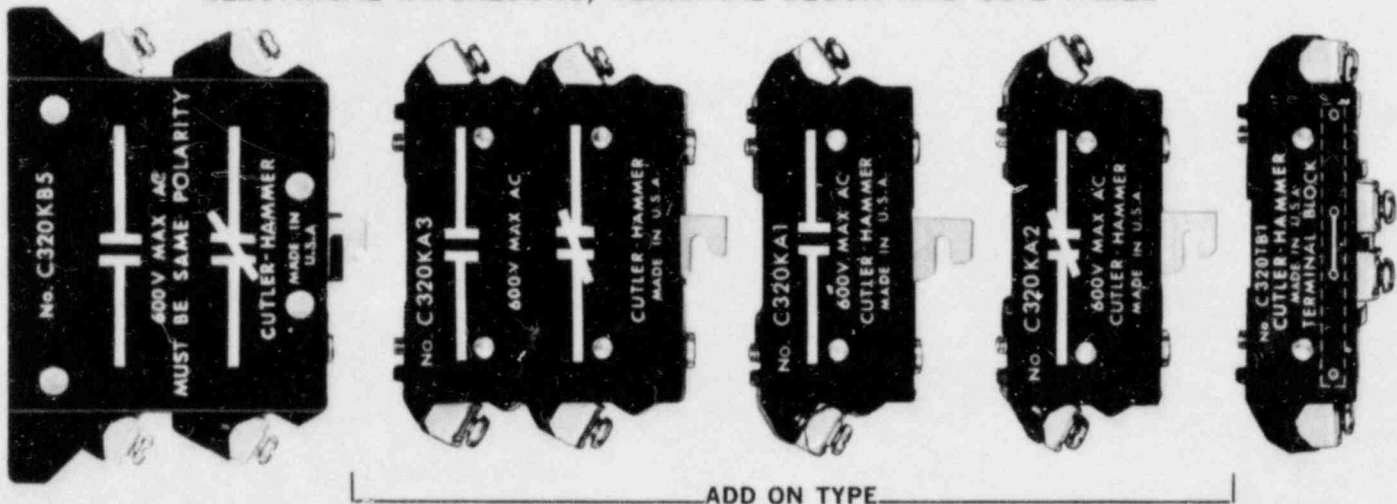
Relay Reset — Dark Window.

Relay Tripped — Light (silver) Window.

Do not disassemble this relay.

The parts called out on page 2 and listed on page 3 are available for repairs. If parts are required other than those listed replace the complete relay.

ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE



BASE MOUNTED

Circuit	Catalog No.
1 N.O.	C320KB4
1 N.O.-1 N.C.	C320KB5

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

TERMINAL BLOCK

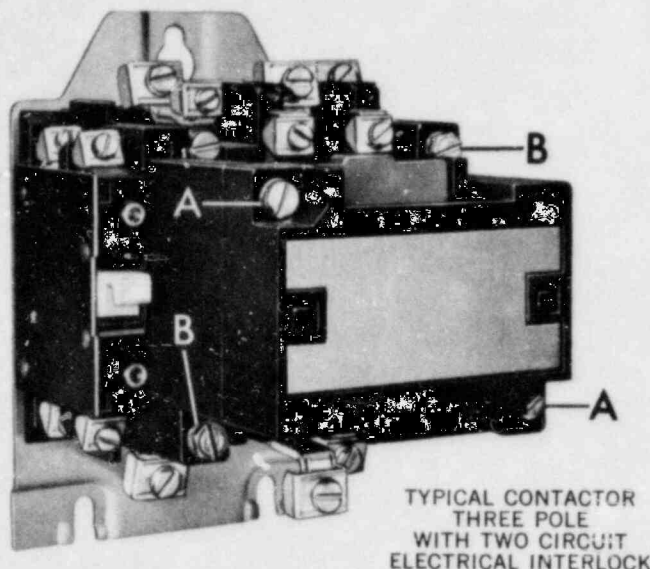
Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120	60	9-1889-1	A	600	60	9-1889-4	D
110	50			550	50		
240	60	9-1889-2	B	208	60	9-1889-13	E
220	50						
480	60	9-1889-3	C	380	50	9-1889-14	L
440	50						

*Suffix letter required only when power unit is ordered.

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "1" 2 AND 3 POLE AC CONTACTORS



INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are 2 and 3 pole A-c contactors for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These A-c contactors require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion — refer to publication 14183 for helpful information on inspecting and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 16.
2. Tilt the top of the armature item 11 away from the coil.
3. Slide the armature up and out.
4. Remove the spring plate item 12.
5. Pull the coil straight out.
6. Install the new coil with the coil terminal blades engaging the coil terminal clips.
7. Install and seat the spring plate.
8. Slide the armature (narrow end to the right) into its seated operating position.
9. Install the cover.

RENEWAL OF POWER UNIT

NOTE — The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

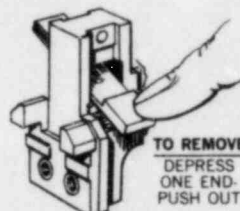
Unfasten the two gold colored Hex. Head screws "B", pull out the power unit, plug-in the new and retighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from coil table on page 4.

RENEWAL OF POWER CONTACTS

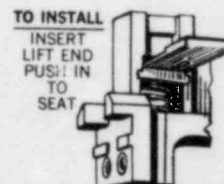
The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

1. Remove the power unit assembly by loosening the two gold colored slotted hex. head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS

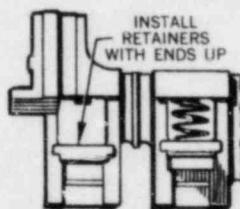


SKETCH "A"

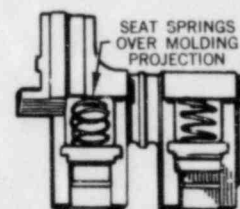


SKETCH "B"

2. Depress one end of the movable contact and push the contact out (see sketch "A").
3. Remove the springs item 10.
4. Remove the retainers item 9.



SKETCH "C"



SKETCH "D"

5. Install the new retainers item 9. (See sketch "C". Note — the retainer must be installed so the spring will seat over the extruded hole, with the retainer ends extending away from the contacts.)
6. Install the spring item 10. (see sketch "D").
7. Install the contact (see sketch "B"). Insert contact, raise end slightly and push in to seat.

STATIONARY CONTACTS

NOTE — It is not necessary to disconnect any wiring.

8. Remove the screws securing the stationary contacts.
9. Slide the contact out of the groove in the molding. A hole in the contact plate is provided for convenient removal with a screwdriver.
10. Install the new contacts.

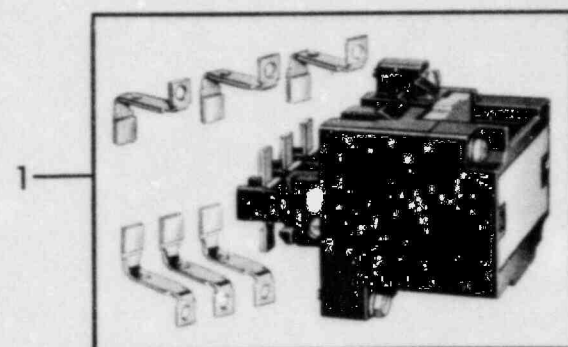
CAUTION — The stationary contacts must be installed so they seat on top of the terminal plates. (See typical assembly top of page 2).

ELECTRICAL INTERLOCKS

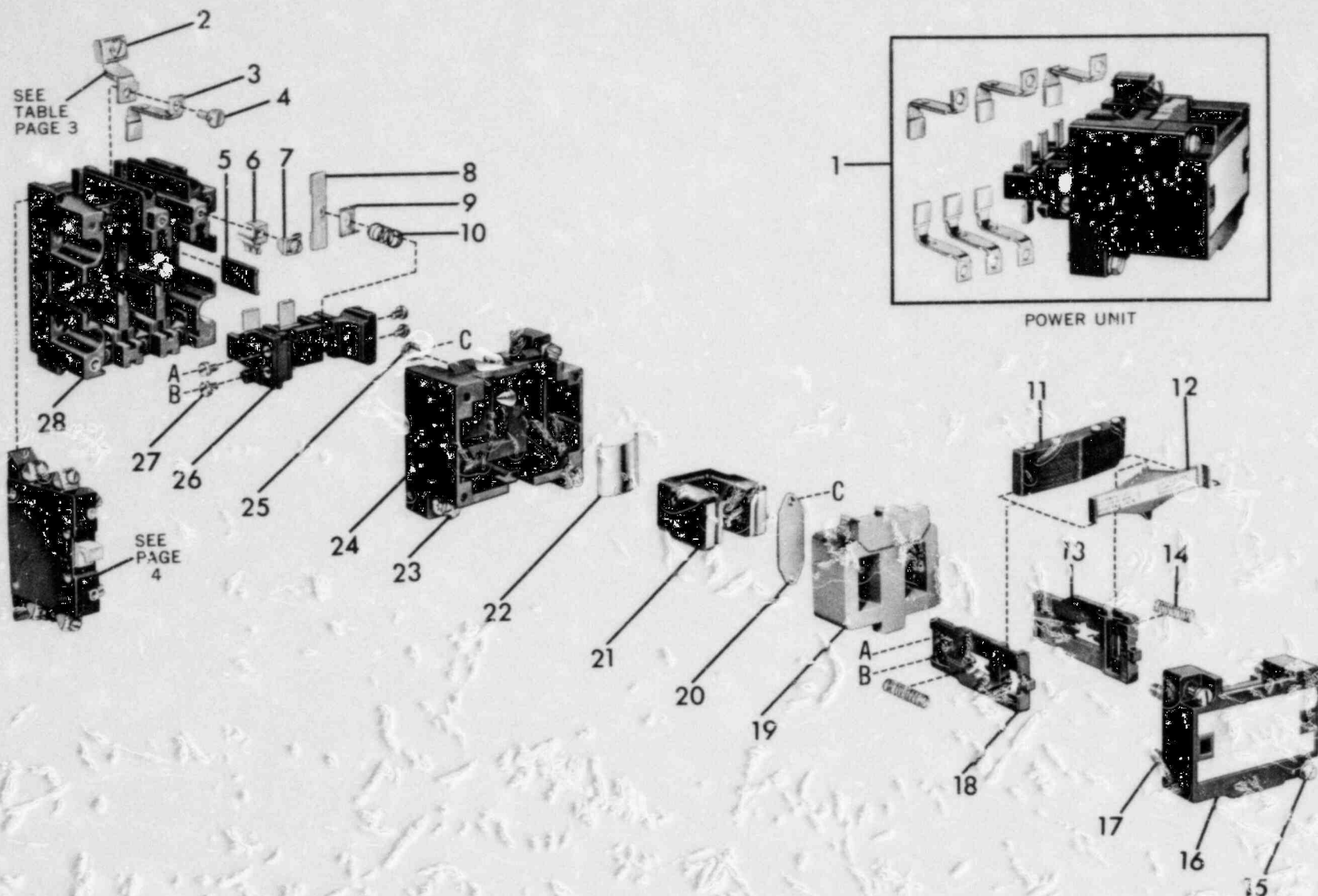
The electrical interlocks are renewable as a complete assembly. See page 4 for the various electrical interlocks.

LUBRICATION

Do not lubricate any part of this equipment.



POWER UNIT



RENEWAL PARTS — Information Required

To insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.**

PARTS LIST

Item No.	Description of Part	2 Pole Contactor		3 Pole Contactor		Item No.	Description of Part	2 Pole Contactor		3 Pole Contactor	
		No. Req.	Part No.	No. Req.	Part No.			No. Req.	Part No.	No. Req.	Part No.
• 1	Power unit (includes items 3, 4, 8, thru 27) (see coil table p. 4)	1	C10CX	1	C10CX	16	Cover (includes items 15 and 17 w/o nameplate) (give complete nameplate data for cover with nameplate)	1	49-4114	1	49-4114
2	Power Terminal Clamp	*	55-1763	*	55-1763	17	Spring	4	69-2508	4	69-2508
3	Stationary Contact (included w/item 29)	4		6		18	Push Bar (see item 13)	1		1	
4	Contact Mounting Screw (included w/item 29)	4		6		19	Coil (see coil table on page 4)	1		1	
5	Insulator	1	56-3493	1	56-3493	20	Strap	1	19-1723	1	19-1723
6	Coil Terminal Clip	2	55-1681	2	55-1681	★21	Magnet Frame	1	17-8911	1	17-8911
7	Auxiliary Terminal Clamp	*	55-1743	*	55-1743	22	Spring	1	69-2766	1	69-2766
8	Movable Contact (included w/item 29)	2		3		23	Slotted Hex. Head Screw	2	11-2518	2	11-2518
9	Retainer (included w/item 29)	2		3		24	Magnet Housing	1	49-3606	1	49-3606
10	Spring (included w/item 29)	2		3		25	8-32 x .50 Pan Head Screw	2	11-2515	2	11-2515
★11	Armature	1	48-1019	1	48-1019	26	Contact Bar Kit (includes item 13, does not include items 8, 9, 10)	1	61-2980	1	61-2980
12	Spring Plate	1	69-2765	1	69-2765	27	6-32 Pan Head Screw (included w/items 13 & 26)	4		4	
13	Push Bars (includes items 14, 18 and 27)	1	61-1857	1	61-1857	28	Molded Base	1	17-9014	1	17-9014
14	Spring	2	69-2507	2	69-2507	▲29	Set of Contacts (includes items 3, 4, 8, 9 and 10)	1	6-23	1	6-23-2
15	Pan Head Sems Screw	2	11-2517	2	11-2517						

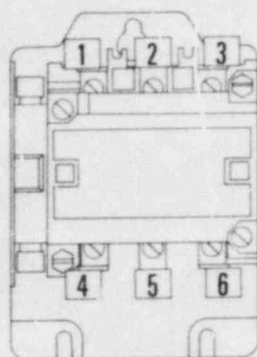
•Coil must be specified by suffix letter selected from coil table on page 4.
 The power units are supplied only with 3 power poles.
 ▲Recommended Spare Parts.

*As required.

★It is recommended that items 11 and 21 be replaced together.

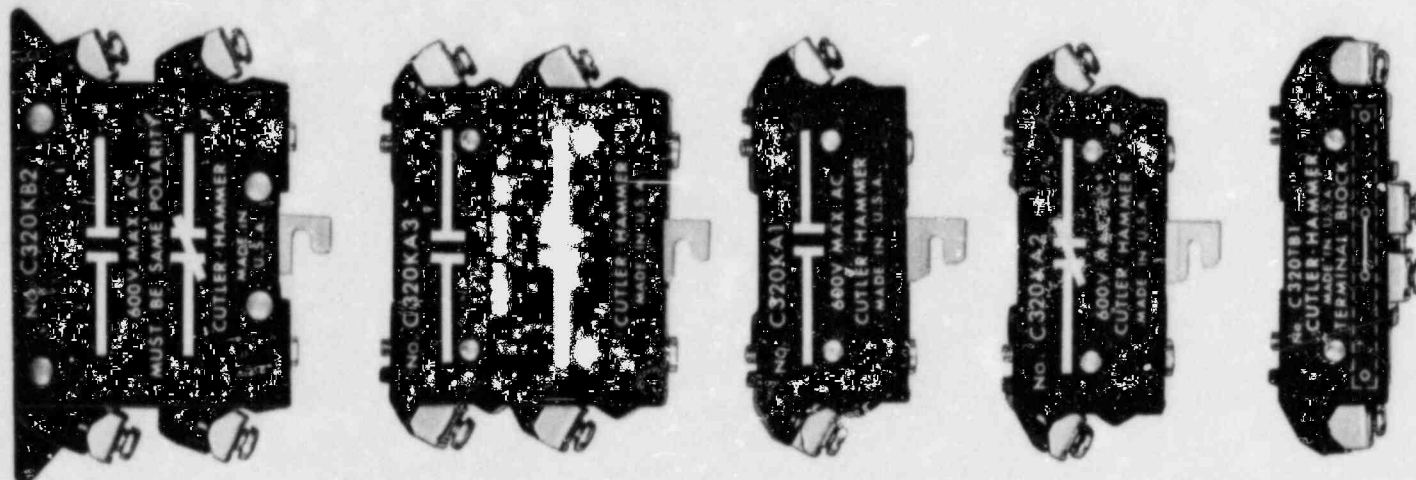
TERMINAL POSITIONS

Selection and arrangement see Adjacent table.

**TERMINALS**

	POSITION						TERMINAL CLAMPS	
	1	2	3	4	5	6	POWER	AUXILIARY
WITH PROVISION FOR AUXILIARY TERMINAL								
PART NO.	80-3167	80-3168	80-3167-2				55-1763	55-1743
WITHOUT PROVISION FOR AUXILIARY TERMINAL							POWER 	
PART NO.	80-2788-2	80-2786	80-2788-3	80-2788-3	80-2786-3	80-2788-2	55-1753	

ACCESSORIES ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE



BASE MOUNTED

Circuit	Catalog No.
None (Dummy)	10-3640-3
1 N.O.	C320KB1
1 N.O.-1 N.C.	C320KB2

ADD ON TYPE

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

TERMINAL BLOCK

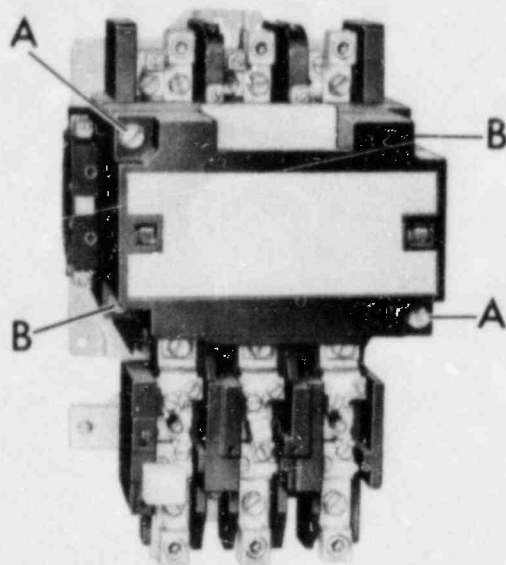
Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120	60	9-1887-1	A	600	60	9-1887-4	D
110	50			550	50		
240	60	9-1887-2	B	208	60	9-1887-5	E
220	50						
480	60	9-1887-3	C	380	50	9-1887-8	L
440	50						

*Suffix letter required only when power unit is ordered.

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "4" 3 POLE STARTER WITH STANDARD TRIP EUTECTIC OVERLOAD RELAY



Typical Starter Three Pole with Two Circuit Electrical Interlock

INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are three pole, three phase, non-reversing A-c magnetic starters for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These starters require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion — refer to publication 14183 for helpful information on inspecting and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 28 page 2.
2. Unfasten the four pan head screws item 27 securing the clamp item 25 and the armature item 22. Remove the clamp and the armature.
3. Pull the coil straight out.
4. Install the new coil with the coil terminal blades engaging the coil terminal clips.
5. Install the armature (narrow end to the left) into its seated operating position.

6. Install the clamp and secure the screws.
7. Install the cover.

RENEWAL OF POWER UNIT

NOTE • The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

Unfasten the two gold colored Hex. Head screws "B", pull out the power unit, plug-in the new and retighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from the coil table on page 4.

RENEWAL OF POWER CONTACTS

The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

1. Remove the power unit assembly by loosening the two gold colored slotted hex head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS

2. Remove the contact bar item 34 by removing the two screws and washers items 35 and 36.
3. Refer to sketch "A". Raise the retainer item 12 against the spring to free the contact so it can drop out.

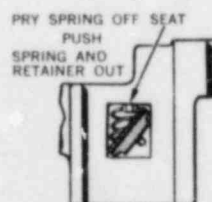


SKETCH "A"

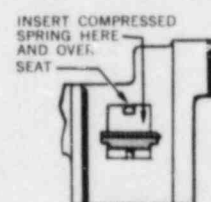


SKETCH "B"

4. Refer to sketch "B" and "C". Rotate the retainer into the position shown and push it into the window to hold it. Lift the spring off the seat with a small screwdriver. Push the spring and retainer through the window.



SKETCH "C"

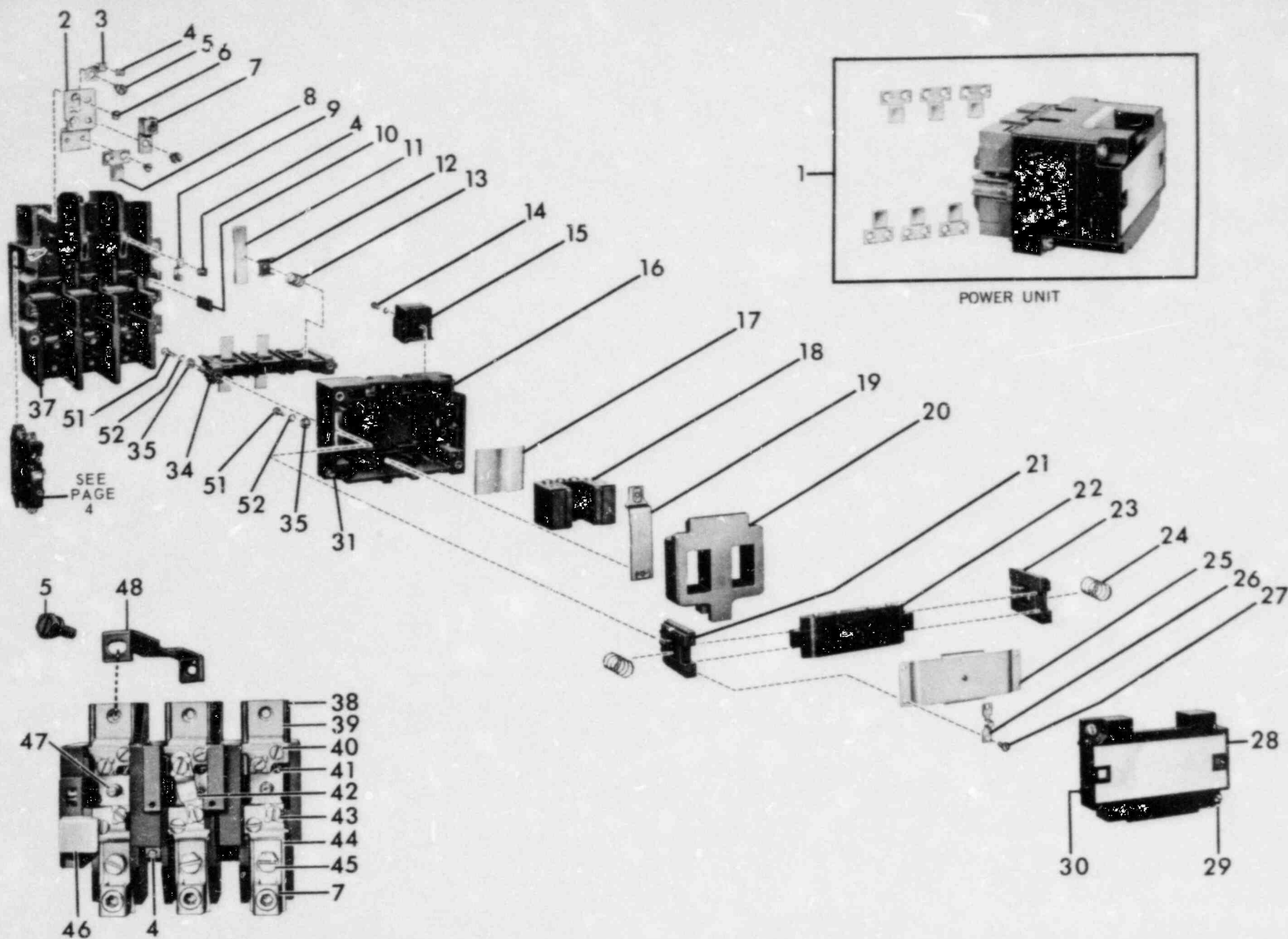


SKETCH "D"

5. Refer to sketch "D". Place and hold the retainer in the position as shown.
6. Compress the spring with the thumb and index finger and insert and seat in the cavity above the retainer.
7. Raise the retainer against the spring, insert and position the contact. Contact tips must face away from the retainer.
8. Install the contact bar to the push bars items 21 and 23 with screws and washers items 35 and 36.

Note: The contact bar is not reversible. Match the ends of the contact bar to fit inside the raised projections on the push-bars.

(Continued on Page 4)



OVERLOAD RELAY

The parts listed and illustrated are available for repairs. Should other parts be required order a complete overload relay.

RENEWAL PARTS — Information Required

To insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.**

PRICE LIST

Item No.	Description of Part	3 Pole Starter		Item No.	Description of Part	3 Pole Starter	
		No. Req.	Part No.			No. Req.	Part No.
1	Power Unit (includes items 6, 8, 11 thru 36)	1	C10FX	27	10-32 x .62 Pan Head Sems Screw	4	11-2523
2	Terminal Plate	6	80-2810	28	Cover (includes items 29 and 30) (without Nameplate) (Give Complete Nameplate Data for Cover with Nameplate)	1	49-4152
3	Control Terminal	2	80-2824	29	1/4-20 x 1.04 Pan Head Sems Screw	2	11-2313
4	Auxiliary Terminal Clamp	*	55-1743	30	Spring	4	69-2552
5	1/4-20 x .625 Slotted Hex Sems Screw	*	11-2912	31	1/4-20 x 1.45 Slotted Hex Head Sems Screw	2	11-2522
6	10-32 x .438 Flat Head Sems Screw (included w/item 53)	24		34	Contact Bar	1	23-3542-3
7	Lug			35	No. 10 Washer	4	916-166
	Copper	6	80-2812	37	Molded Base	1	17-9044
	Aluminum	6	80-3379	38	Overload Relay (includes items 4, 7, 39 thru 47)		
8	Stationary Contact (included w/item 53)	6			With Copper Lugs	1	10-3563-11
9	Coil Terminal Clip	2	80-2747		N.C. Control Circuit	1	10-3563-12
10	Insulator	1	56-3494		N.C.-N.O. Control Circuit	1	10-3563-15
11	Movable Contact (included w/item 53)	3			With Aluminum Lugs	1	10-3563-16
12	Retainer (included w/item 53)	3			N.C. Control Circuit	1	10-3563-16
13	Spring (included w/item 53)	3		39	Terminal Plate	3	80-2889
14	8-18 x .625 Pan Head Screw	6	11-3106	40	10-32 x .50 Pan Head Sems Screw	6	11-2537
	No. 8 Lockwasher	6	16-42	41	6-32 x .312 Round Head Sems Screw	3	11-1525
15	Blowout	6	62-531	42	Connector	1	25-2217-2
16	Magnet Housing (incl. 6 of it. 14) (see it. 31)	1	49-3626	43	Screw	6	11-2581
17	Spring	1	69-2770	44	Terminal Plate	3	80-2793
★18	Magnet Frame	1	48-1030	45	1/4-20 x .75 Slotted Hex Head Sems Screw	3	11-2683
19	Clamp	1	19-1570	46	Button (White)	1	53-1346-6
20	Coil (see Coil Table on Page 4)	1		47	Thermal Element	3	10-4057
21	Push Bar (Left Hand)	1	61-1612	48	Connector (Contact to Overload Relay)	3	25-2718
★22	Armature	1	48-1029	51	10-32 x .938 Pan Head Screw	4	11-3107
23	Push Bar (Right Hand)	1	61-1606	52	No. 10 Lockwasher	4	916-484Z
24	Spring	2	69-2554	★53	Set of Contacts (incl. items 6, 8, 11, 12 & 13)	1	6-26-2
25	Clamp Plate	1	79-8622				
26	Indicating Plate	2	30-4864				

•Coil must be specified by suffix letter selected from coil table on page 4.
The power units are supplied only with 3 power poles.

▲Recommended Spare Parts.

*As Required.

★It is recommended that items 18 and 22 be replaced together.

(Continued from Page 1)

STATIONARY CONTACTS

Note: It is not necessary to disconnect any wiring.

9. Remove the screws securing the stationary contacts.
10. Install the new contacts and screws.

ELECTRICAL INTERLOCKS

The electrical interlocks are renewable as a complete assembly. See illustrations and tables below for the various electrical interlocks.

EUTECTIC OVERLOAD RELAY

This overload relay has two steps of adjustment (low or high) obtained by POSITIONING THE HEATER COILS as shown in the adjacent illustrations. Note the location of the pointed terminal on the heater coil.

The heater coil selection table furnished with the starter illustrates the proper mounting position. All coils must be mounted in the same position for a given overload relay.

HEATER COIL POSITION



ARC CHUTES

These seldom require renewal. Some burning and discoloration are normal. When the contacts are renewed, brush out any loose accumulations.

MAGNET

The magnet clamp screws item 33 are accessible when the two center arc chutes are removed.

LUBRICATION

Do not lubricate any part of this equipment.

Reset and tripped indication —

A transparent rectangular window above the reset button provides visual indication.

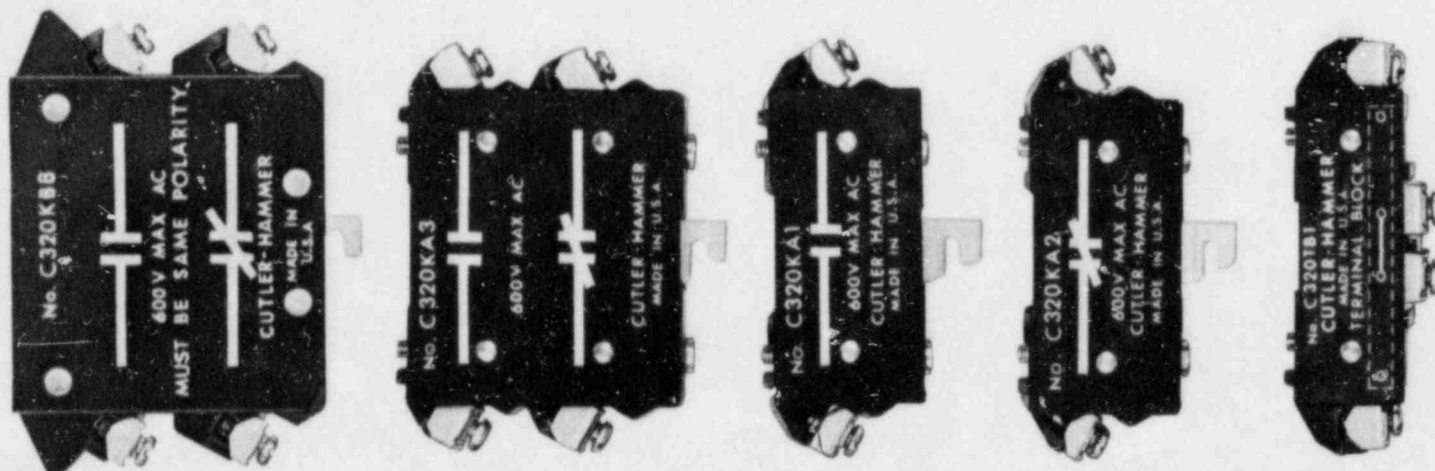
Relay Reset — Dark Window.

Relay Tripped — Light (silver) Window.

Do not disassemble this relay.

The parts called out on page 2 and listed on page 3 are available for repairs. If parts are required other than those listed replace the complete relay.

ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE



ADD ON TYPE

BASE MOUNTED

Circuit	Catalog No.
1 N.O.	C320KB7
1 N.O.-1 N.C.	C320KB8

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

TERMINAL BLOCK

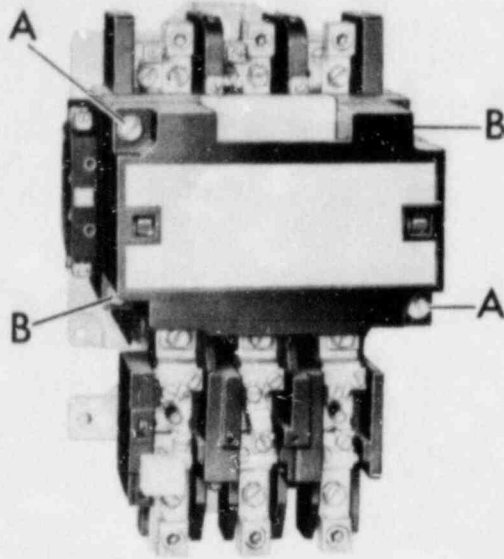
Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120	60	9-1891-1	A	600	60	9-1891-4	D
110	50			550	50		
240	60	9-1891-2	B	208	60	9-1891-13	E
220	50						
480	60	9-1891-3	C	380	50	9-1891-14	L
440	50						

*Suffix letter required only when power unit is ordered.

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "3" 3 POLE STARTER WITH STANDARD TRIP EUTECTIC OVERLOAD RELAY



Typical Starter Three Pole with Two Circuit Electrical Interlock

INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are three pole, three phase, non-reversing A-c magnetic starters for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These starters require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion — refer to publication 14183 for help. Information on inspecting and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 28 page 2.
2. Unfasten the four pan head screws item 27 securing the clamp item 25 and the armature item 22. Remove the clamp and the armature.
3. Pull the coil straight out.
4. Install the new coil with the coil terminal blades engaging the coil terminal clips.
5. Install the armature (narrow end to the left) into its seated operating position.

6. Install the clamp and secure the screws.
7. Install the cover.

RENEWAL OF POWER UNIT

NOTE • The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

Unfasten the two gold colored Hex. Head screws "B", pull out the power unit, plug-in the new and retighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from the coil table on page 4.

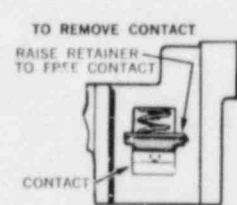
RENEWAL OF POWER CONTACTS

The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

1. Remove the power unit assembly by loosening the two gold colored slotted hex. head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS

2. Remove the contact bar item 34 by removing the two screws and washers items 35 and 36.
3. Refer to sketch "A". Raise the retainer item 12 against the spring to free the contact so it can drop out.

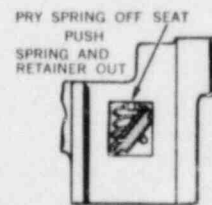


SKETCH "A"

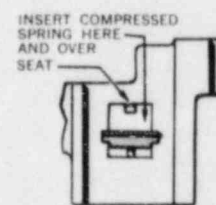


SKETCH "B"

4. Refer to sketch "B" and "C". Rotate the retainer into the position shown and push it into the window to hold it. Lift the spring off the seat with a small screwdriver. Push the spring and retainer through the window.



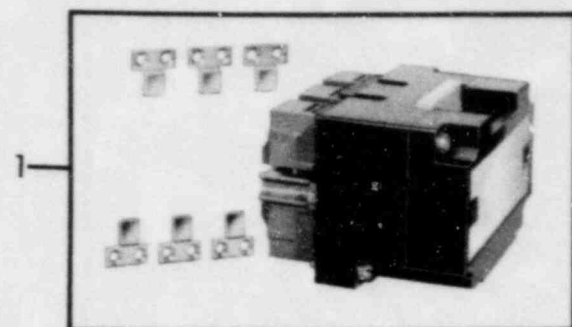
SKETCH "C"



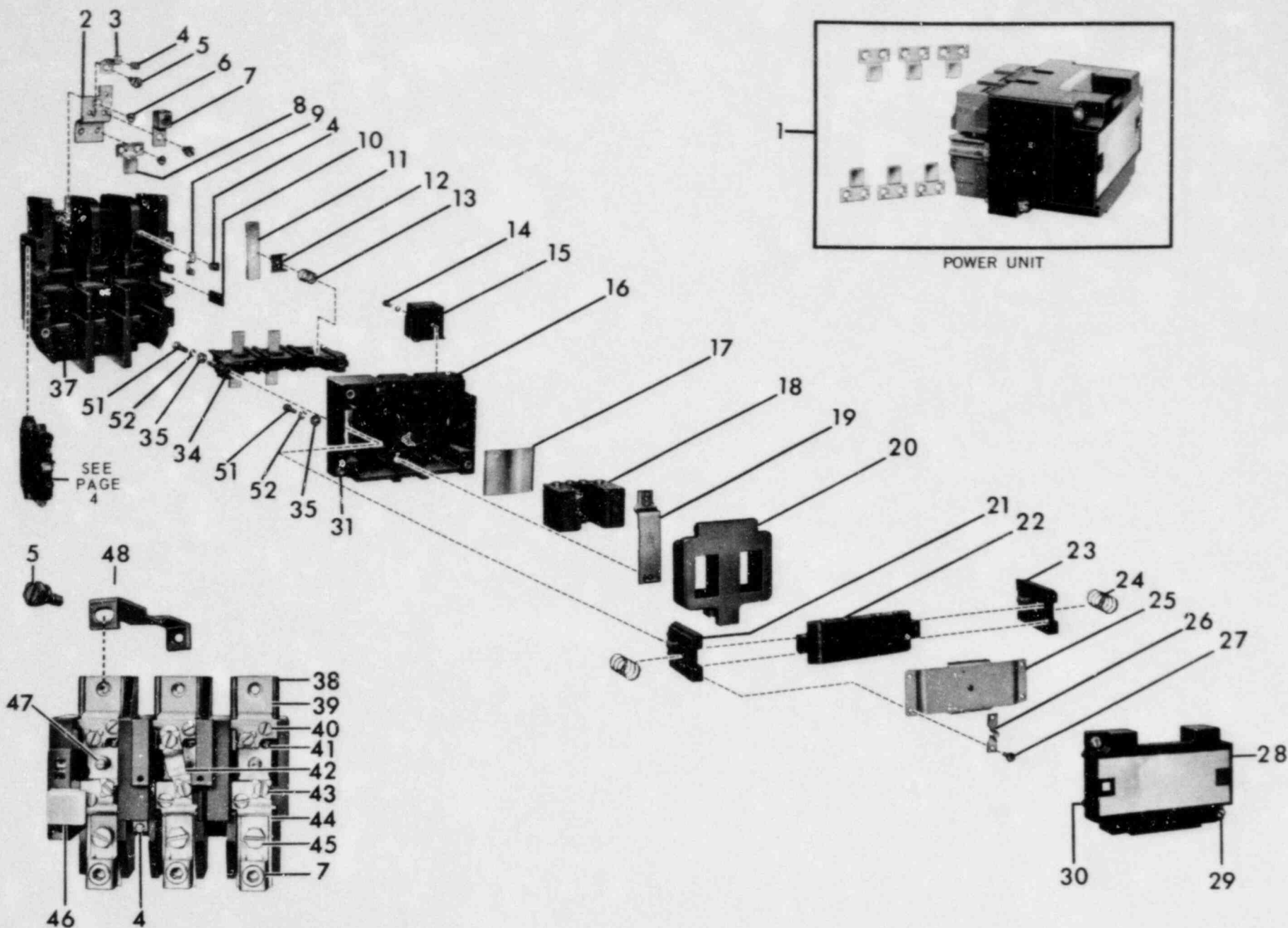
SKETCH "D"

5. Refer to sketch "D". Place and hold the retainer in the position as shown.
 6. Compress the spring with the thumb and index finger and insert and seat in the cavity above the retainer.
 7. Raise the retainer against the spring, insert and position the contact. Contact tips must face away from the retainer.
 8. Install the contact bar to the push bars items 21 and 23 with screws and washers items 35 and 36.
- Note: The contact bar is not reversible. Match the ends of the contact bar to fit inside the raised projections on the push-bars.

(Continued on Page 4)



POWER UNIT



OVERLOAD RELAY

The parts listed and illustrated are available for repairs. Should other parts be required order a complete overload relay.

RENEWAL PARTS — Information RequiredTo insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.****PARTS LIST**

Item No.	Description of Part	3 Pole Starter		Item No.	Description of Part	3 Pole Starter	
		No. Req.	Part No.			No. Req.	Part No.
• 1	Power unit (includes 6, 8, 11 thru 36)	1	C10EX	27	10-32 x .62 Pan Head Sems Screw	4	11-2523
2	Terminal Plate	6	80-2807	28	Cover (includes items 29 and 30) (without nameplate) (give complete nameplate data for cover with nameplate)	1	49-4152
3	Control Terminal	2	80-2824	29	1/4-20 x 1.04 Pan Head Sems Screw	2	11-2313
4	Auxiliary Terminal Clamp	*	55-1743	30	Spring	4	69-2552
5	1/4-20 x .625 Slotted Hex Sems Screw	*	11-2912	31	1/4-20 x 1.45 Slotted Hex Head Sems Screw	2	11-2522
6	10-32 x .438 Flathead Sems Screw (included w/item 53)	18		34	Contact Bar	1	23-4030-3
7	Lug			35	No. 10 Washer	4	916-166
	Copper	6	80-2801	37	Molded Base	1	17-9043
	Aluminum	6	80-3307				
8	Stationary Contact (included w/item 53)	6		38	Overload Relay (incl. items 4, 7, 39 thru 47)		
9	Coil Terminal Clip	2	80-2747		With Copper Lugs		
10	Insulator	1	56-3494		N.C. Control Circuit	1	10-3563-5
11	Movable Contact (included w/item 53)	3			N.C.-N.O. Control Circuit	1	10-3563-6
12	Retainer (included w/item 53)	3			With Aluminum Lugs		
13	Spring (included w/item 53)	3			N.C. Control Circuit	1	10-3563-13
14	8-18 x .625 Pan Head Screw	6	11-3106		N.C.-N.O. Control Circuit	1	10-3563-14
	No. 8 Lockwasher	6	16-42	39	Terminal Plate	3	80-2889
15	Blowout	6	62-531	40	10-32 x .50 Pan Head Sems Screw	6	11-2537
16	Magnet Housing (incl. 6 of it. 14) (see it. 31)	1	49-3626	41	6-20 x .312 Round Head Sems Screw	3	11-1525
17	Spring	1	69-2770	42	Connector	1	25-2217-2
★18	Magnet Frame	11	48-1030	43	Screw	6	11-2581
19	Clamp	1	19-1570	44	Terminal Plate	3	80-3321
20	Coil (see Coil Table on Page 4)	1		45	1/4-20 x .75 Slotted Hex Head Sems Screw	3	11-2683
21	Push Bar (Left Hand)	1	61-1612	46	Button (White)	1	53-1346-6
★22	Armature	1	48-1029	47	Thermal Element	3	10-4057
23	Push Bar (Right Hand)	1	61-1606	48	Connector (Contact to Overload Relay)	3	25-2848
24	Spring	2	69-2554	51	10-32 x .938 Pan Head Screw	4	11-3107
25	Clamp Plate	1	79-8622	52	No. 10 Lockwasher	4	916-484Z
26	Indicating Plate	2	30-4864	▲53	Set of Contacts (incl. items 6, 8, 11, 12 & 13)	1	6-25-2

●Coil must be specified by suffix letter selected from coil table on page 4.

The power units are supplied only with 3 power poles.

▲Recommended Spare Parts.

*As required.

★It is recommended that items 18 and 22 be replaced together.

(Continued from Page 1)

STATIONARY CONTACTS

Note: It is not necessary to disconnect any wiring.

9. Remove the screws securing the stationary contacts.
10. Install the new contacts and screws.

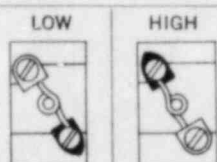
ELECTRICAL INTERLOCKS

The electrical interlocks are renewable as a complete assembly. See illustrations and tables below for the various electrical interlocks.

EUTECTIC OVERLOAD RELAY

This overload relay has two steps of adjustment (low or high) obtained by POSITIONING THE HEATER COILS as shown in the adjacent illustrations. Note the location of the pointed terminal on the heater coil.

The heater coil selection table furnished with the starter illustrates the proper mounting position. All coils must be mounted in the same position for a given overload relay.

HEATER COIL POSITION**ARC CHUTES**

These seldom require renewal. Some burning and discoloration are normal. When the contacts are renewed, brush out any loose accumulations.

MAGNET

The magnet clamp screws item 33 are accessible when the two center arc chutes are removed.

LUBRICATION

Do not lubricate any part of this equipment.

Reset and tripped indication —

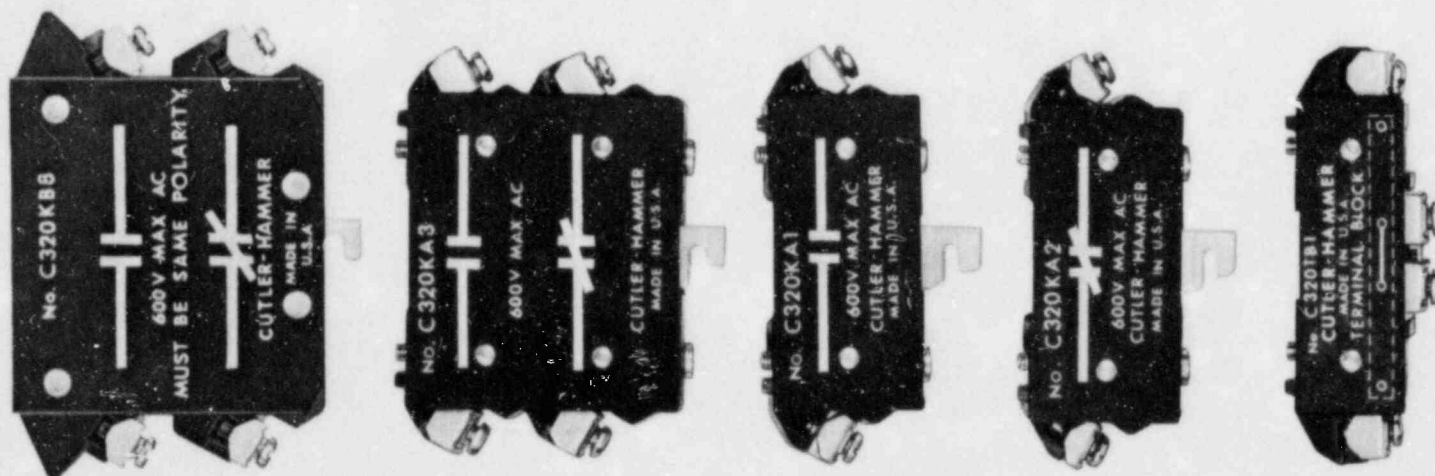
A transparent rectangular window above the reset button provides visual indication.

Relay Reset — Dark Window.

Relay Tripped — Light (silver) Window.

Do not disassemble this relay.

The parts called out on page 2 and listed on page 3 are available for repairs. If parts are required other than those listed replace the complete relay.

ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE**ADD ON TYPE****BASE MOUNTED**

Circuit	Catalog No.
1 N.O.	C320KB7
1 N.O.-1 N.C.	C320KB8

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

TERMINAL BLOCK

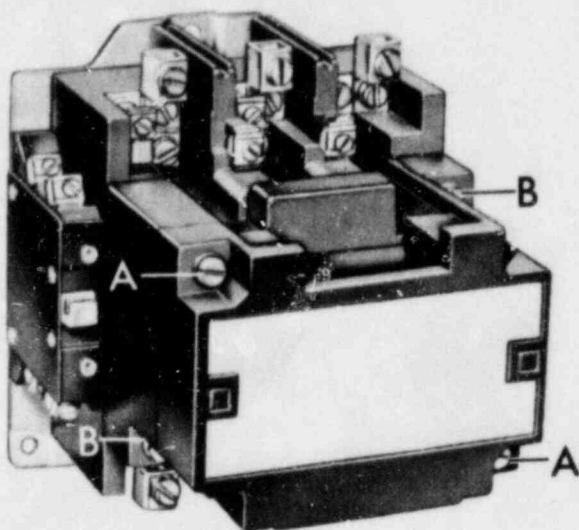
Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120	60	9-1891-1	A	600	60	9-1891-4	D
110	50			550	50		
240	60	9-1891-2	B	208	60	9-1891-13	E
220	50						
480	60	9-1891-3	C	380	50	9-1891-14	L
440	50						

*Suffix letter required only when power unit is ordered.

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "2" 2 AND 3 POLE AC CONTACTORS



TYPICAL CONTACTOR THREE POLE
WITH TWO CIRCUIT ELECTRICAL INTERLOCK

INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are 2 and 3 pole A-c contactors for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These A-c contactors require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion — refer to publication 14183 for helpful information on inspecting and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 26 page 2.
2. Unfasten the four pan head screws item 25 securing the clamp item 24 and the armature item 22. Remove the clamp and the armature.
3. Pull the coil straight out.
4. Install the new coil with the coil terminal blades engaging the coil terminal clips.
5. Install the armature (narrow end to the right) into its seated operating position.

6. Install the clamp and secure the screws.
7. Install the cover.

RENEWAL OF POWER UNIT

NOTE • The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

Unfasten the two gold colored Hex. Head screws "B", pull out the power unit, plug-in the new and re-tighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from the coil table on page 4.

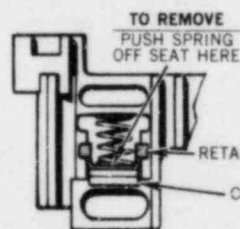
RENEWAL OF POWER CONTACTS

The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

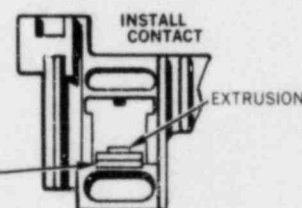
1. Remove the power unit assembly by loosening the two gold colored slotted hex. head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS

2. Remove the contact bar item 30 by removing the two screws item 31.
3. Push the springs item 10 off their seat on the retainer item 9 and push out. (See sketch "A").
4. Remove the retainers thru the wide opening in the molding. The contacts item 8 will be free to come out.

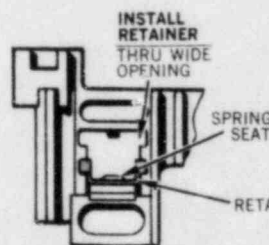


SKETCH "A"

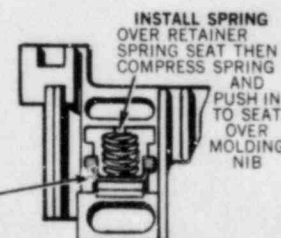


SKETCH "B"

5. Install the new contacts. (See sketch "B").
6. Install the new retainers. (See sketch "C"). The square openings must be keyed with the extrusions on the contacts.
7. Install the springs, insert one end over the seat on the retainer, compress springs and push in to seat over the molding nib. (See sketch "D").



SKETCH "C"

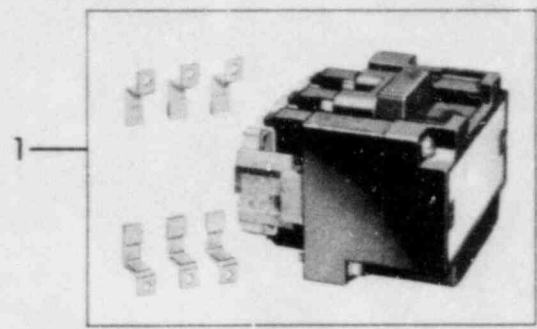


SKETCH "D"

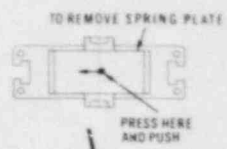
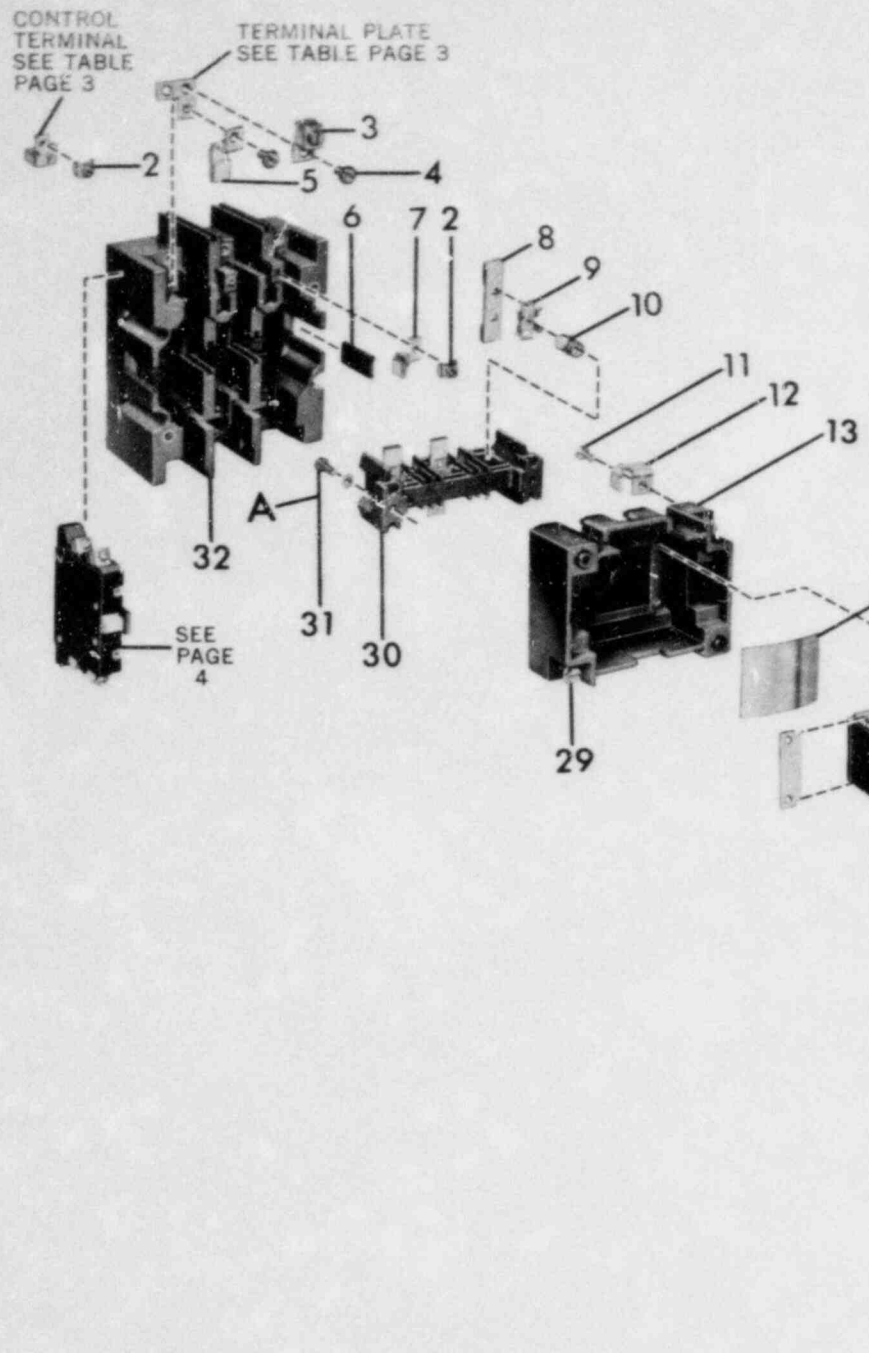
8. Install the contact bar to the push bars items 19 and 20 with screws item 31.

Note: The contact bar is keyed with projections on the push-bars. Match the keys to insure correct fit and assembly.

(Continued on Page 4)



POWER UNIT



RENEWAL PARTS — Information Required

To insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.**

PARTS LIST

Item No.	Description of Part	2 Pole Contactor		3 Pole Contactor		Item No.	Description of Part	2 Pole Contactor		3 Pole Contactor	
		No. Req.	Part No.	No. Req.	Part No.			No. Req.	Part No.	No. Req.	Part No.
• 1	Power unit (includes items 4, 5, 8 thru 32) (see coil table page 4)	1	C10DX	1	C10DX	17	6-32 x .312 Pan Head Sems Screw	4	11-2538-4	4	11-2538-4
2	Auxiliary Terminal Clamp	*	55-1743	*	55-1743	18	Coil (see coil table on page 4)	1		1	
3	Lug	*				19	Push Bar (Left Hand)	1	61-1629	1	61-1629
	Copper (furnished with open contactors)		80-2819		80-2819	20	Push Bar (Right Hand)	1	61-1628	1	61-1628
	Aluminum (furnished with enclosed contactors)		80-2798		80-2798	21	Spring	2	69-2692	2	69-2692
4	10-32 x .437 Pan Head Sems Screw (incl. w/item 33)	*		*		*22	Armature	1	48-1020	1	48-1020
5	Stationary Contact (incl. w/item 33)	4		6		23	Spring Plate	1	69-2515	1	69-2515
6	Insulator	1	56-3494	1	56-3494	24	Clamp Plate	1	55-1878	1	55-1878
7	Coil Terminal Clip	2	80-2871	2	80-2871	25	6-32 x .50 Pan Head Sems Screw	4	11-2668	4	11-2668
8	Movable Contact (incl. w/item 33)	2		3		26	Cover (includes items 27 and 28) (without nameplate) (give complete nameplate data for cover with nameplate)	1	49-4151	1	49-4151
9	Retainer (included w/item 33)	2		3		27	10-32 x 1.25 Pan Head Sems Screw	2	11-2310	2	11-2310
10	Spring (included w/item 33)	2		3		28	Spring	4	69-2599	4	69-2599
11	8-32 x .50 Flat Head Thread Cutting Screw	4	11-2251	6	11-2251	29	10-32 x 1.148 Slotted Hex. Head Sems Screw	2	11-2525	2	11-2525
12	Blowout	4	62-529	6	62-529	30	Contact Bar	1	23-3619-3	1	23-3619-3
13	Magnet Housing (see item 29)	1	49-3664	1	49-3664	31	8-32 x .688 Round Head Sems Screw with Washers	2	11-2524	2	11-2524
14	Spring	1	69-2604	1	69-2604	32	Molded Base	1	17-9255	1	17-9255
*15	Magnet Frame	1	17-8955	1	17-8955	▲33	Set of contacts (includes items 4, 5, 8, 9 and 10)	1	6-24	1	6-24-2
16	Clamp	2	55-1877	2	55-1877						

*Coil must be specified by suffix letter selected from coil table on page 4. The power units are supplied only with 3 power poles.

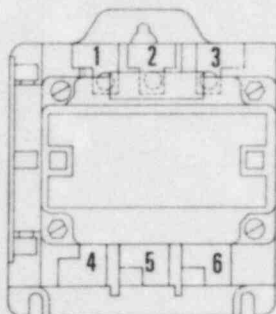
▲Recommended Spare Parts

*As required.

*It is recommended that items 15 and 22 be replaced together.

TERMINAL PLATE POSITIONS

Selection and arrangement see Adjacent table.



TERMINAL PLATES

Position	1, 4, 5, 6	2	3
PICTURE			
Part No.	80-2879	80-2740	80-3433
Mounting Screws	10-32 Item 4 in Parts List		
Part No.	11-2425		

CONTROL TERMINALS

Position	1	2 or 3
PICTURE		
Part No.	80-3392	80-2805
Terminal Clamp	 6-32 Item 2 in Parts List	
Part No.	55-1743	

(Continued from Page 1)

STATIONARY CONTACTS

Note: It is not necessary to disconnect any wiring.

9. Remove the screws securing the stationary contacts.
10. Install the new contacts and screws.

Caution: The stationary contacts must be installed so they seat on top of the terminal plates.

A control terminal, when used, (see table page 3) must be mounted on top of the stationary contacts.

ELECTRICAL INTERLOCKS

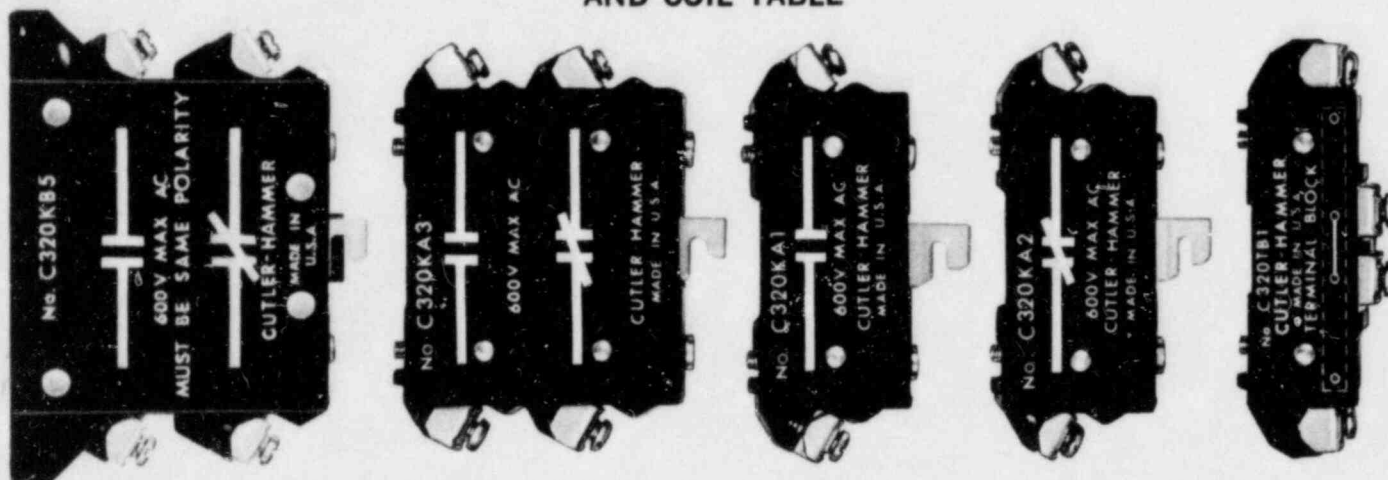
The electrical interlocks are renewable as a complete assembly. See illustrations and tables below for the various electrical interlocks.

LUBRICATION

Do not lubricate any part of this equipment.

ACCESSORIES

ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE



— ADD ON TYPE —

BASE MOUNTED

Circuit	Catalog No.
1 N.O.	C320KB4
1 N.O.-1 N.C.	C320KB5

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

TERMINAL BLOCK

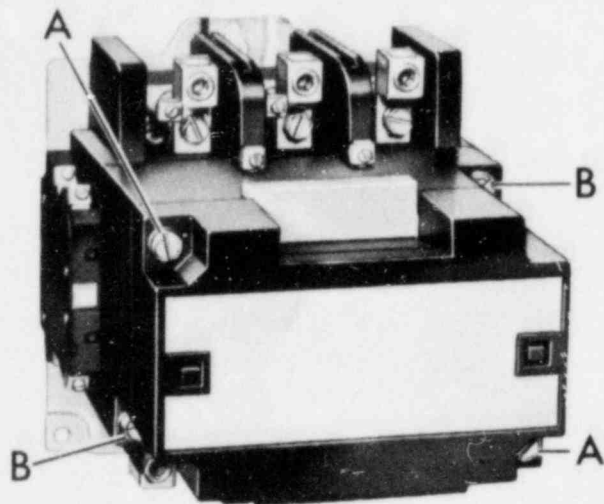
Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120 110	60 50	9-1889-1	A	600 550	60 50	9-1889-4	D
240 220	60 50	9-1889-2	B	208	60	9-1889-13	E
480 440	60 50	9-1889-3	C	380	50	9-1889-14	L

* Suffix letter required only when power unit is ordered.

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "3" 2 AND 3 POLE AC CONTACTORS



TYPICAL CONTACTOR THREE POLE
WITH TWO CIRCUIT ELECTRICAL INTERLOCK

INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are 2 and 3 pole A-c contactors for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These A-c contactors require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion — refer to publication 14183 for helpful information on inspecting and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 28 page 2.
2. Unfasten the four pan head screws item 27 securing the clamp item 25 and the armature item 22. Remove the clamp and the armature.
3. Pull the coil straight out.
4. Install the new coil with the coil terminal blades engaging the coil terminal clips.
5. Install the armature (narrow end to the left) into its seated operating position.

6. Install the clamp and secure the screws.
7. Install the cover.

RENEWAL OF POWER UNIT

NOTE • The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

Unfasten the two gold colored Hex. Head screws "B", pull out the power unit, plug-in the new and retighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from the coil table on page 4.

RENEWAL OF POWER CONTACTS

The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

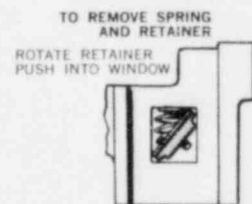
1. Remove the power unit assembly by loosening the two gold colored slotted hex. head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS

2. Remove the contact bar item 34 by removing the two screws and washers items 35 and 36.
3. Refer to sketch "A". Raise the retainer item 12 against the spring to free the contact so it can drop out.

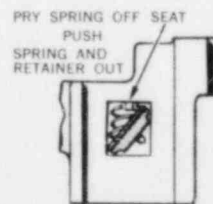


SKETCH "A"

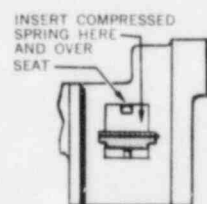


SKETCH "B"

4. Refer to sketch "B" and "C". Rotate the retainer into the position shown and push it into the window to hold it. Lift the spring off the seat with a small screwdriver. Push the spring and retainer through the window.



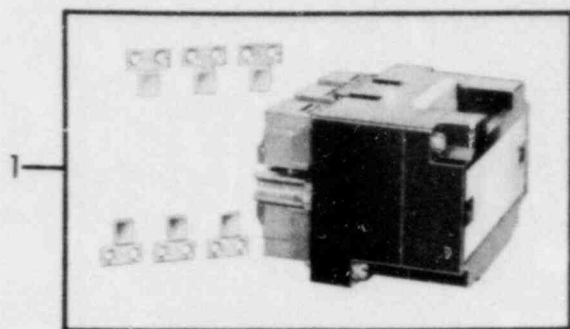
SKETCH "C"



SKETCH "D"

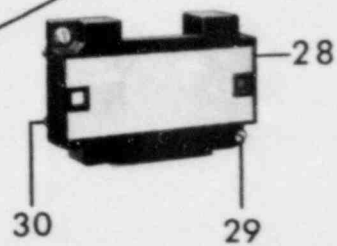
5. Refer to sketch "D". Place and hold the retainer in the position as shown.
 6. Compress the spring with the thumb and index finger and insert and seat in the cavity above the retainer.
 7. Raise the retainer against the spring, insert and position the contact. Contact tips must face away from the retainer.
 8. Install the contact bar to the push bars items 21 and 23 with screws and washers items 35 and 36.
- Note: The contact bar is not reversible. Match the ends of the contact bar to fit inside the raised projections on the push-bars.

(Continued on Page 4)



POWER UNIT

SEE
PAGE
4



RENEWAL PARTS — Information Required

To insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.**

PARTS LIST

Item No.	Description of Part	2 Pole Contactor		3 Pole Contactor		Item No.	Description of Part	2 Pole Contactor		3 Pole Contactor	
		No. Req.	Part No.	No. Req.	Part No.			No. Req.	Part No.	No. Req.	Part No.
• 1	Power unit (includes items 6, 8, 11 thru 36)	1	C10EX	1	C10EX	★18	Magnet Frame	1	48-1030	11	48-1030
2	Terminal Plate	4	80-2807	6	80-2807	19	Clamp	1	19-1570	1	19-1570
3	Control Terminal	2	80-2824	2	80-2824	20	Coil (see Coil Table on page 4)	1		1	
4	Auxiliary Terminal Clamp	*	55-1743	*	55-1743	21	Push Bar (Left Hand)	1	61-1612	1	61-1612
5	1/4-20 x .625 Slotted Hex Sems Screw	*	11-2912	*	11-2912	★22	Armature	1	48-1029	1	48-1029
6	10-32 x .438 Flathead Sems Screw (incl. w/item 53)	12		18		23	Push Bar (Right Hand)	1	61-1606	1	61-1606
7	Lug					24	Spring	2	69-2554	2	69-2554
	Copper (Furnished with Open Contactor)	4	80-2801	6	80-2801	25	Clamp Plate	1	79-8622	1	79-8622
	Aluminum (Furnished with Enclosed Contactor)	4	80-3307	6	80-3307	26	Indicating Plate	2	30-4864	2	30-4864
8	Stationary Contact (incl. w/item 53)	4		6		27	10-32 x .62 Pan Head Sems Screw	4	11-2523	4	11-2523
9	Coil Terminal Clip	2	80-2747	2	80-2747	28	Cover (includes items 29 and 30) (without nameplate) (give complete nameplate data for cover with nameplate)	1	49-4152	1	49-4152
10	Insulator	1	56-3494	1	56-3494	29	1/4-20 x 1.04 Pan Head Sems Screw	2	11-2313	2	11-2313
11	Movable Contact (incl. w/item 53)	2		3		30	Spring	4	69-2552	4	69-2552
12	Retainer (incl. w/item 53)	2		3		31	1/4-20 x 1.45 Slotted Hex Head Sems Screw	2	11-2522	2	11-2522
13	Spring (incl. w/item 53)	2		3		34	Contact Bar	1	23-4030-3	1	23-4030-3
14	8-18 x .625 Pan Head Screw	4	11-3106	6	11-3106	35	No. 10 Washer	4	916-166	4	916-166
	No. 8 Lockwasher	4	16-42	6	16-42	37	Molded Base	1	17-9043	1	17-9043
15	Blowout	4	62-531	6	62-531	51	10-32 x .938 Pan Head Screw	4	11-3107	4	11-3107
16	Magnet Housing (incl. 6 of item 14) (see item 31)	1	49-3626	1	49-3626	52	No. 10 Lockwasher	4	916-484Z	4	916-484Z
17	Spring	1	69-2770	1	69-2770	★53	Set of Contacts (incl. items 6, 8, 11, 12 & 13)	1	6-25	1	6-25-2

•Coil must be specified by suffix letter selected from coil table on page 4.

The power units are supplied only with 3 power poles.

▲Recommended Spare Parts.

*As Required.

★It is recommended that items 18 and 22 be replaced together.

(Continued from Page 1)

STATIONARY CONTACTS

Note: It is not necessary to disconnect any wiring.

9. Remove the screws securing the stationary contacts.
10. Install the new contacts and screws.

ELECTRICAL INTERLOCKS

The electrical interlocks are renewable as a complete assembly. See illustrations and tables below for the various electrical interlocks.

ARC CHUTES

These seldom require renewal. Some burning and discoloration are normal. When the contacts are renewed, brush out any loose accumulations.

MAGNET

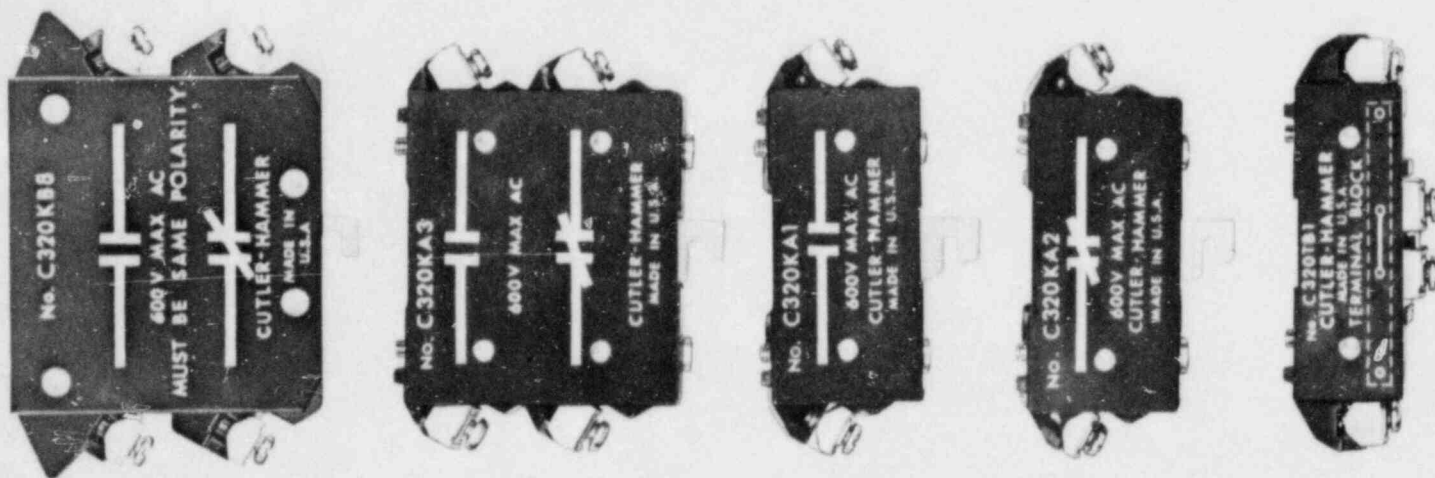
The magnet clamp screws item 33 are accessible when the two center arc chutes are removed.

LUBRICATION

Do not lubricate any part of this equipment.

ACCESSORIES

ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE



— ADD ON TYPE —

BASE MOUNTED

Circuit	Catalog No.
1 N.O.	C320KB7
1 N.O.-1 N.C.	C320KB8

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

TERMINAL BLOCK

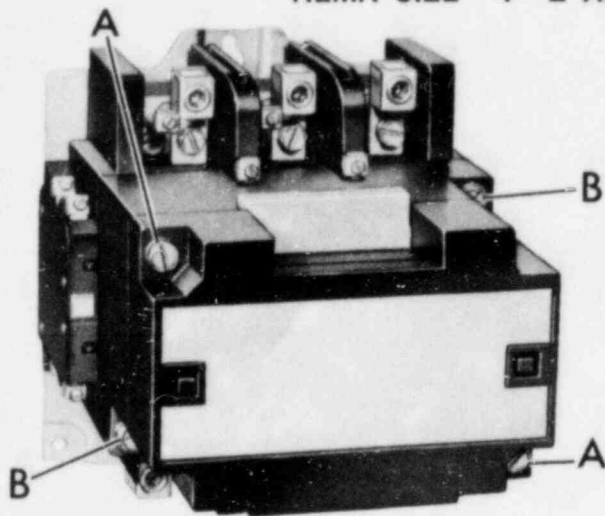
Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120 110	60 50	9-1891-1	A	600 550	60 50	9-1891-4	D
240 220	60 50	9-1891-2	B	208	60	9-1391-13	E
480 440	60 50	9-1891-3	C	380	50	9-1891-14	L

*Suffix letter required only when power unit is ordered.

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "4" 2 AND 3 POLE AC CONTACTORS



TYPICAL CONTACTOR THREE POLE
WITH TWO CIRCUIT ELECTRICAL INTERLOCK

INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are 2 and 3 pole A-c contactors for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These A-c contactors require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion — refer to publication 14183 for helpful information on inspecting and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 28 page 2.
2. Unfasten the four pan head screws item 27 securing the clamp item 25 and the armature item 22. Remove the clamp and the armature.
3. Pull the coil straight out.
4. Install the new coil with the coil terminal blades engaging the coil terminal clips.
5. Install the armature (narrow end to the left) into its seated operating position.

6. Install the clamp and secure the screws.
7. Install the cover.

RENEWAL OF POWER UNIT

NOTE • The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

Unfasten the two gold colored Hex. Head screws "B", pull out the power unit, plug-in the new and retighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from the coil table on page 4.

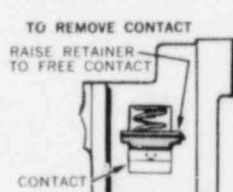
RENEWAL OF POWER CONTACTS

The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

1. Remove the power unit assembly by loosening the two gold colored slotted hex. head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS

2. Remove the contact bar item 34 by removing the two screws and washers items 35 and 36.
3. Refer to sketch "A". Raise the retainer item 12 against the spring to free the contact so it can drop out.

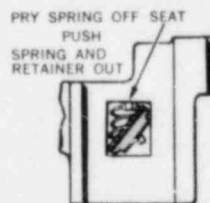


SKETCH "A"

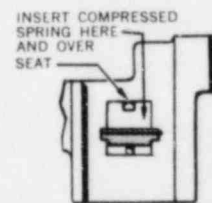


SKETCH "B"

4. Refer to sketch "B" and "C". Rotate the retainer into the position shown and push it into the window to hold it. Lift the spring off the seat with a small screwdriver. Push the spring and retainer through the window.



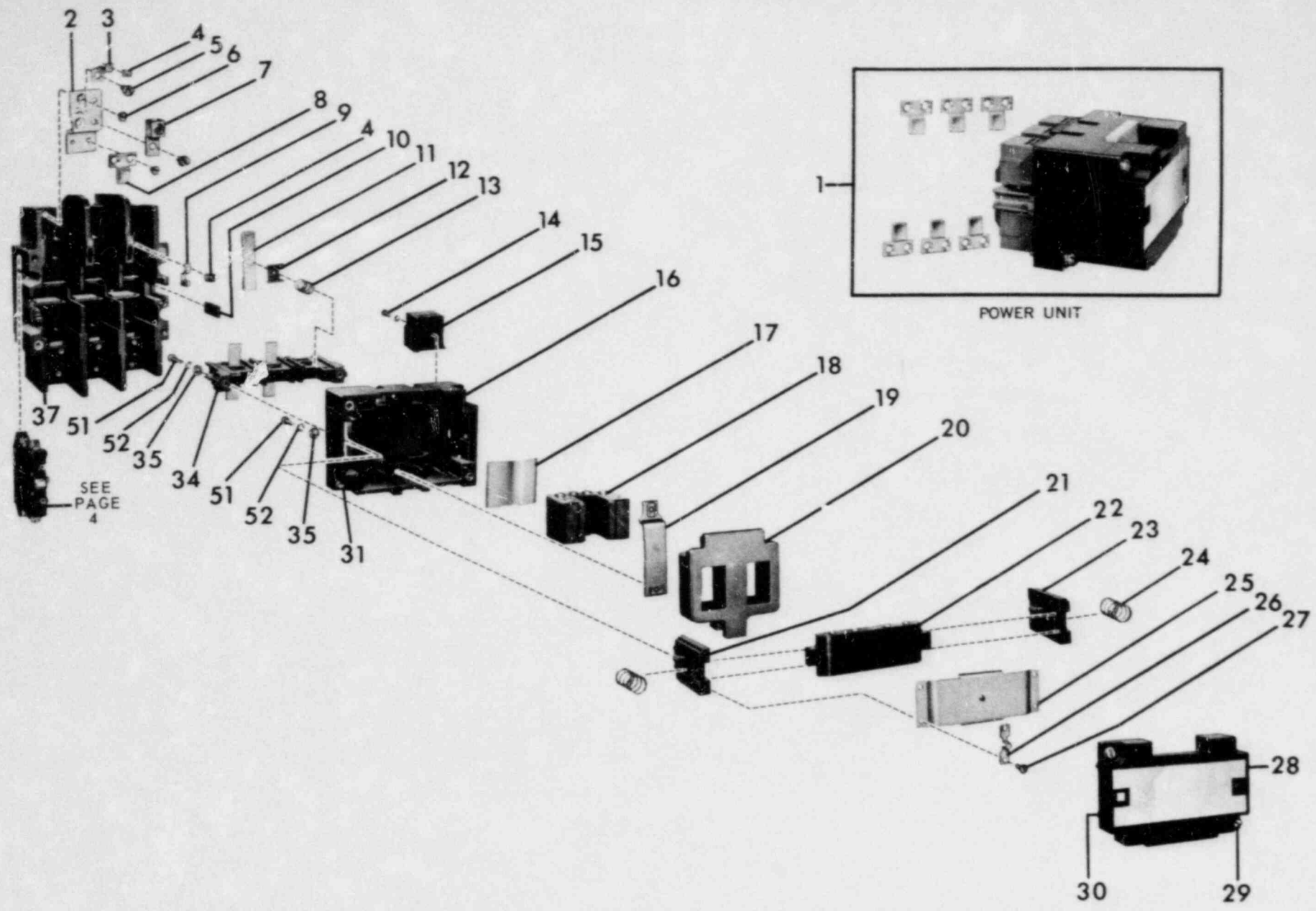
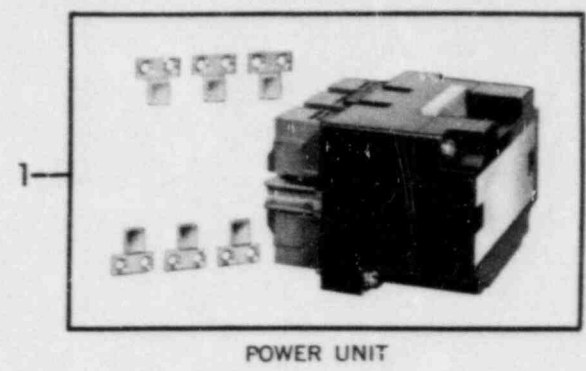
SKETCH "C"



SKETCH "D"

5. Refer to sketch "D". Place and hold the retainer in the position as shown.
6. Compress the spring with the thumb and index finger and insert and seat in the cavity above the retainer.
7. Raise the retainer against the spring, insert and position the contact. Contact tips must face away from the retainer.
8. Install the contact bar to the push bars items 21 and 23 with screws and washers items 35 and 36.
Note: The contact bar is not reversible. Match the ends of the contact bar to fit inside the raised projections on the push-bars.

(Continued on Page 4)



SEE
PAGE
4

RENEWAL PARTS — Information RequiredTo insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.****PARTS LIST**

Item No.	Description of Part	2 Pole Contactor		3 Pole Contactor		Item No.	Description of Part	2 Pole Contactor		3 Pole Contactor	
		No. Req.	Part No.	No. Req.	Part No.			No. Req.	Part No.	No. Req.	Part No.
• 1	Power unit (includes items 6, 8, 11 thru 36)	1	C10FX	1	C10FX	★18	Magnet Frame	1	48-1030	1	48-1030
2	Terminal Plate	4	80-2810	6	80-2810	19	Clamp	1	19-1570	1	19-1570
3	Control Terminal	2	80-2824	2	80-2824	20	Coil (see Coil Table on Page 4)	1		1	
4	Auxiliary Terminal Clamp	*	55-1743	*	55-1743	21	Push Bar (Left Hand)	1	61-1612	1	61-1612
5	1/4-20 x .625 Slotted Hex Sems Screw	*	11-2912	*	11-2912	★22	Armature	1	48-1029	1	48-1029
6	10-32 x .438 Flat Head Sems Screw (incl. w/item 53)	16		24		23	Push Bar (Right Hand)	1	61-1606	1	61-1606
7	Lug					24	Spring	2	69-2554	2	69-2554
	Copper (Furnished with Open Contactors)	4	80-2812	6	80-2812	25	Clamp Plate	1	79-8622	1	79-8622
	Aluminum (Furnished with Enclosed Contactors)	4	80-3379	6	80-3379	26	Indicating Plate	2	30-4864	2	30-4864
8	Stationary Contact (incl. w/item 53)	4		6		27	10-32 x .62 Pan Head Sems Screw	4	11-2523	4	11-2523
9	Coil Terminal Clip	2	90-2747	2	80-2747	28	Cover (includes items 29 and 30) (without nameplate) (give complete nameplate data for cover with nameplate)	1	49-4152	1	49-4152
10	Insulator	1	56-3494	1	56-3494	29	1/4-20 x 1.04 Pan Head Sems Screw	2	11-2313	2	11-2313
11	Movable Contact (incl. w/item 53)	2		3		30	Spring	4	69-2552	4	69-2552
12	Retainer (incl. w/item 53)	2		3		31	1/4-20 x 1.45 Slotted Hex Head Sems Screw	2	11-2522	2	11-2522
13	Spring (incl. w/item 53)	2		3		34	Contact Bar	1	23-3542-3	1	23-3542-3
14	8-18 x .625 Pan Head Screw	4	11-3106	6	11-3106	35	No. 10 Washer	4	916-166	4	916-166
	No. 8 Lockwasher	4	16-42	6	16-42	37	Molded Base	1	17-9044	1	17-9044
15	Blowout	4	62-531	6	62-531	51	10-32 x .938 Pan Head Screw	4	11-3107	4	11-3107
16	Magnet Housing (incl. 6 of item 14) (see item 31)	1	49-3626	1	49-3626	52	No. 10 Lockwasher	4	916-484Z	4	916-484Z
17	Spring	1	69-2770	1	69-2770	▲53	Set of contacts (includes items 6, 8, 11, 12 & 13)	1	6-26	1	6-26-2

•Coil must be specified by suffix letter selected from coil table on page 4.

The power units are supplied only with 3 power poles.

▲Recommended Spare Parts.

*As required.

★It is recommended that items 18 and 22 be replaced together.

(Continued from Page 1)

STATIONARY CONTACTS

Note: It is not necessary to disconnect any wiring.

9. Remove the screws securing the stationary contacts.
10. Install the new contacts and screws.

ELECTRICAL INTERLOCKS

The electrical interlocks are renewable as a complete assembly. See illustrations and tables below for the various electrical interlocks.

ARC CHUTES

These seldom require renewal. Some burning and discoloration are normal. When the contacts are renewed, brush out any loose accumulations.

MAGNET

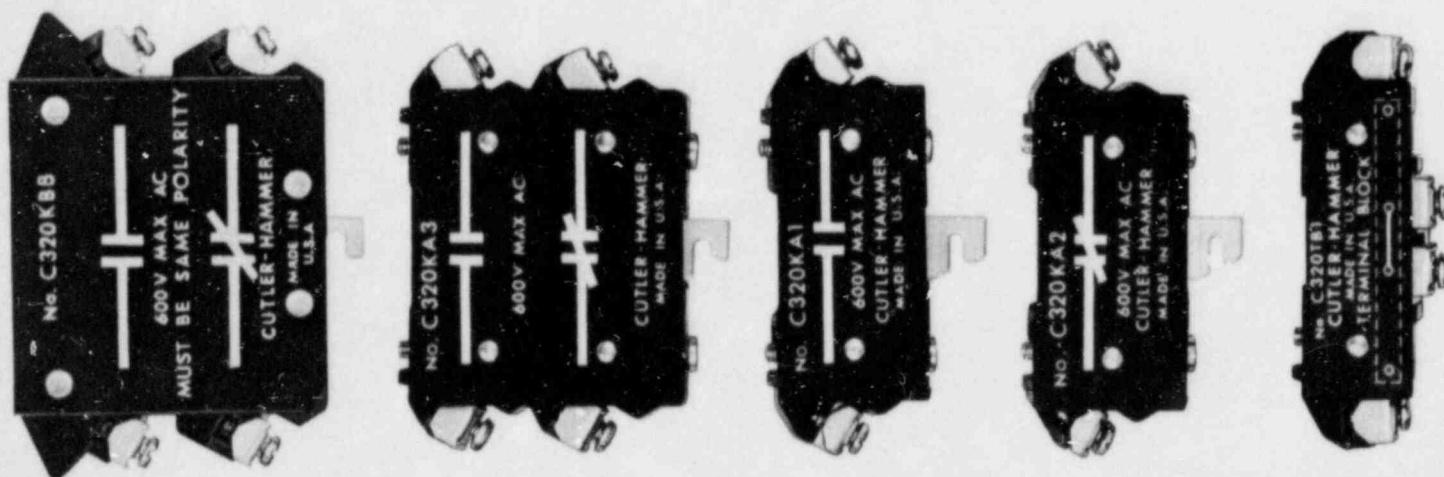
The magnet clamp screws item 33 are accessible when the two center arc chutes are removed.

LUBRICATION

Do not lubricate any part of this equipment.

ACCESSORIES

ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE



ADD ON TYPE

BASE MOUNTED

Circuit	Catalog No.
1 N.O.	C320KB7
1 N.O.-1 N.C.	C320KB8

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

TERMINAL BLOCK

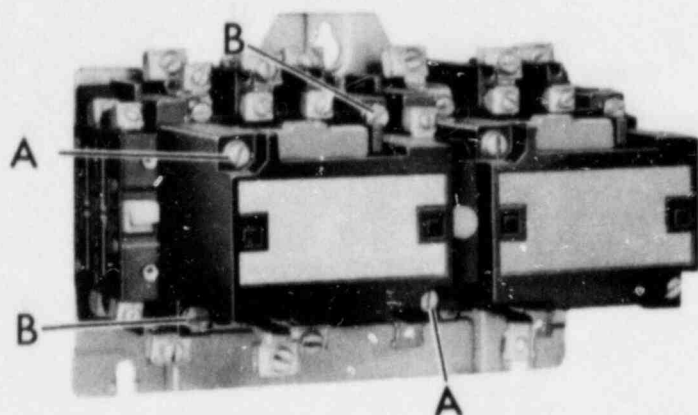
Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120 110	60 50	9-1891-1	A	600 550	60 50	9-1891-4	D
240 220	60 50	9-1891-2	B	208	60	9-1891-13	E
480 440	60 50	9-1891-3	C	380	50	9-1891-14	L

*Suffix letter required only when power unit is ordered.

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "1" 2 AND 3 POLE REVERSING STARTER WITHOUT OVERLOAD RELAY



Typical Starter Three Pole with Two Circuit Electrical Interlock

INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are 2 and 3 pole A-c magnetic reversing starters without overload relay for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These starters require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion — refer to publication 14183 for helpful information on inspecting and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 16.
2. Tilt the top of the armature item 11 away from the coil.
3. Slide the armature up and out.
4. Remove the spring plate item 12.
5. Pull the coil straight out.
6. Install the new coil with the coil terminal blades engaging the coil terminal clips.
7. Install and seat the spring plate.
8. Slide the armature (narrow end to the right) into its seated operating position.
9. Install the cover.

RENEWAL OF POWER UNIT

NOTE • The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

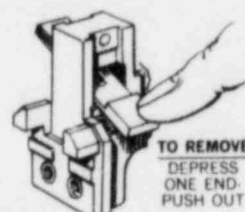
Unfasten the two gold colored Hex. Head screws "B", pull out the power unit, plug-in the new and retighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from coil table on page 4.

RENEWAL OF POWER CONTACTS

The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

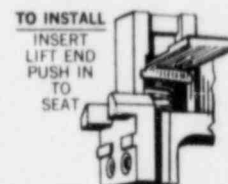
1. Remove the power unit assembly by loosening the two gold colored slotted hex. head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS



SKETCH "A"

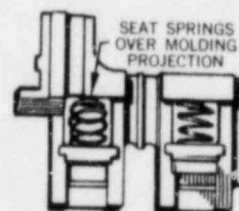
2. Depress one end of the movable contact and push the contact out (see sketch "A").
3. Remove the springs item 10.
4. Remove the retainers item 9.



SKETCH "B"



SKETCH "C"



SKETCH "D"

5. Install the new retainers item 9. (see sketch "C").
Note — the retainer must be installed so the springs will seat over the extruded hole, with the retainer ends extending away from the contacts.
6. Install the spring item 10. (see sketch "D").
7. Install the contact (see sketch "B"). Insert contact, raise end slightly and push in to seat.

STATIONARY CONTACTS

NOTE — It is not necessary to disconnect any wiring.

8. Remove the screws securing the stationary contacts.
9. Slide the contact out of the groove in the molding. A hole in the contact plate is provided for convenient removal with a screwdriver.
10. Install the new contacts.

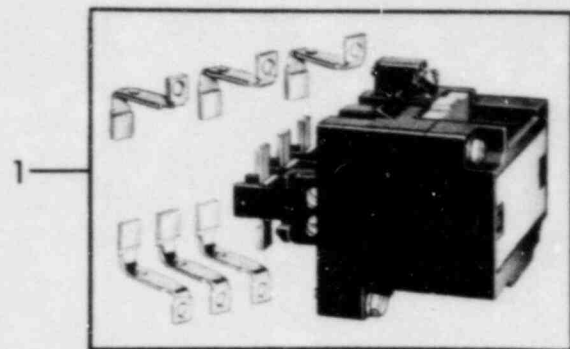
CAUTION — The stationary contacts must be installed so they seat on **top** of the terminal plates. (See typical assembly top of page 2).

ELECTRICAL INTERLOCKS

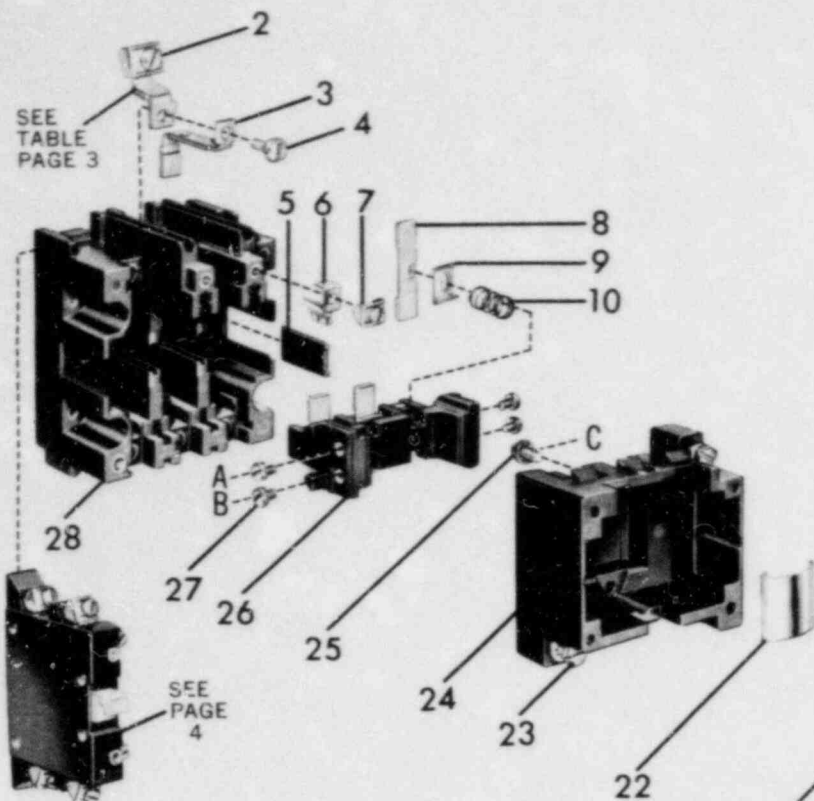
The electrical interlocks are renewable as a complete assembly. See page 4 for the various electrical interlocks.

LUBRICATION

Do not lubricate any part of this equipment.

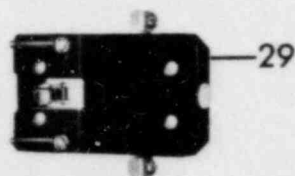
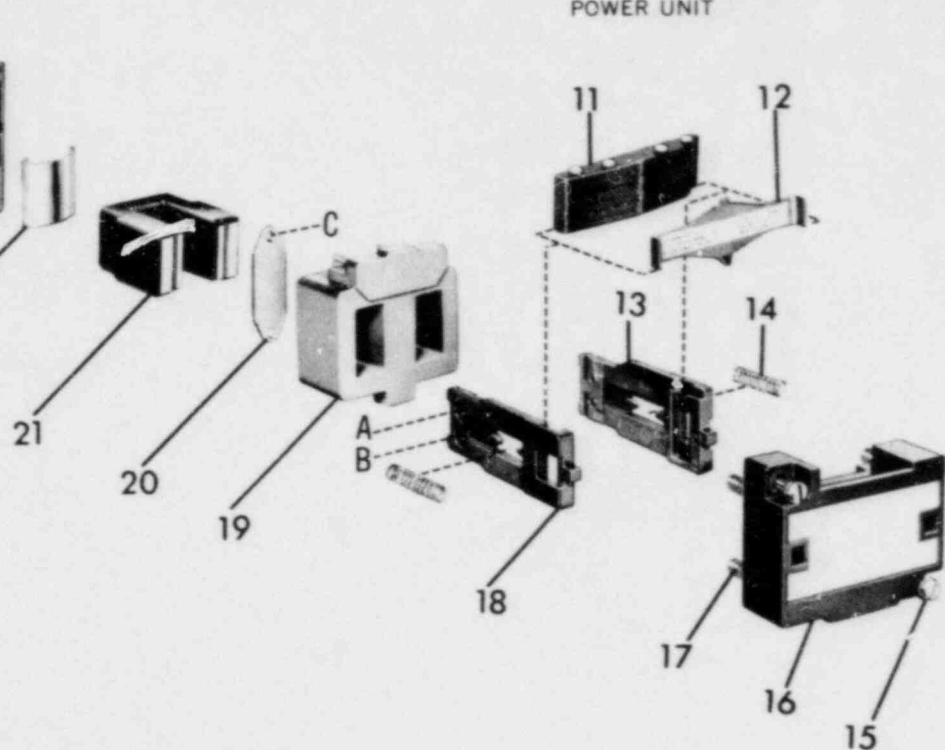


POWER UNIT



SEE
TABLE
PAGE 3

SEE
PAGE
4



MECHANICAL
INTERLOCK

RENEWAL PARTS — Information RequiredTo insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.****PARTS LIST**

Item No.	Description of Part	2 Pole Rev. Starter		3 Pole Rev. Starter		Item No.	Description of Part	2 Pole Rev. Starter		3 Pole Rev. Starter	
		No. Req.	Part No.	No. Req.	Part No.			No. Req.	Part No.	No. Req.	Part No.
• 1	Power unit (includes items 3, 4, 8 thru 27) (see coil table p. 4)	2	C10CX	2	C10CX	16	Cover (includes items 15 and 17 w/o nameplate) (give complete nameplate data for cover with nameplate)	2	49-4114	2	49-4114
2	Power Terminal Clamp	*	55-1763	*	55-1763	17	Spring	8	69-2508	8	69-2508
3	Stationary Contact (incl. w/item 30)	8		12		18	Push Bar (see item 13)	2		2	
4	Contact Mounting Screw (incl. w/item 30)	8		12		19	Coil (see coil table on page 4)	2		2	
5	Insulator	2	56-3493	2	56-3493	20	Strap	2	19-1723	2	19-1723
6	Coil Terminal Clip	4	55-1681	4	55-1681	★21	Magnet Frame	2	17-8911	2	17-8911
7	Auxiliary Terminal Clamp	*	55-1743	*	55-1743	22	Spring	2	69-2766	2	69-2766
8	Movable Contact (incl. w/item 30)	4		6		23	Slotted Hex. Head Screw	4	11-2518	4	11-2518
9	Retainer (incl. w/item 30)	4		6		24	Magnet Housing	2	49-3606	2	49-3606
10	Spring (incl. w/item 30)	4		6		25	8-32 x .50 Pan Head Screw	4	11-2515	4	11-2515
★11	Armature	2	48-1019	2	48-1019	26	Contact Bar Kit (includes item 13, does not include items 8, 9, 10)	2	61-2980	2	61-2980
12	Spring Plate	2	69-2765	2	69-2765	27	6-32 Pan Head Screw (included w/items 13 & 26)	8		8	
13	Push Bars (includes items 14, 18 and 27)	2	61-1857	2	61-1857	28	Molded Base	2	17-9014	2	17-9014
14	Spring	4	69-2507	4	69-2507	29	Mechanical Interlock	1	C321KM1	1	C321KM1
15	Pan Head Sems Screw	4	11-2517	4	11-2517	▲30	Set of Contacts (includes items 3, 4, 8, 9 & 10)	2	6-23	2	6-23-2

• Coil must be specified by suffix letter selected from coil table on page 4.
The power units are supplied only with 3 power poles.

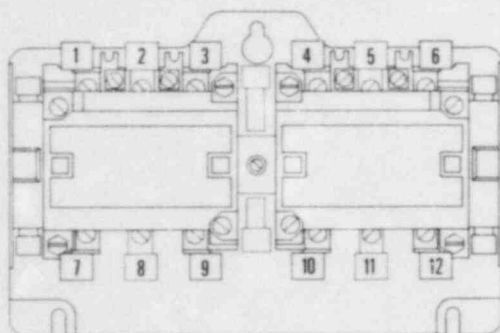
▲ Recommended Spare Parts.

* As Required.

★ It is recommended that items 11 and 21 be replaced together.

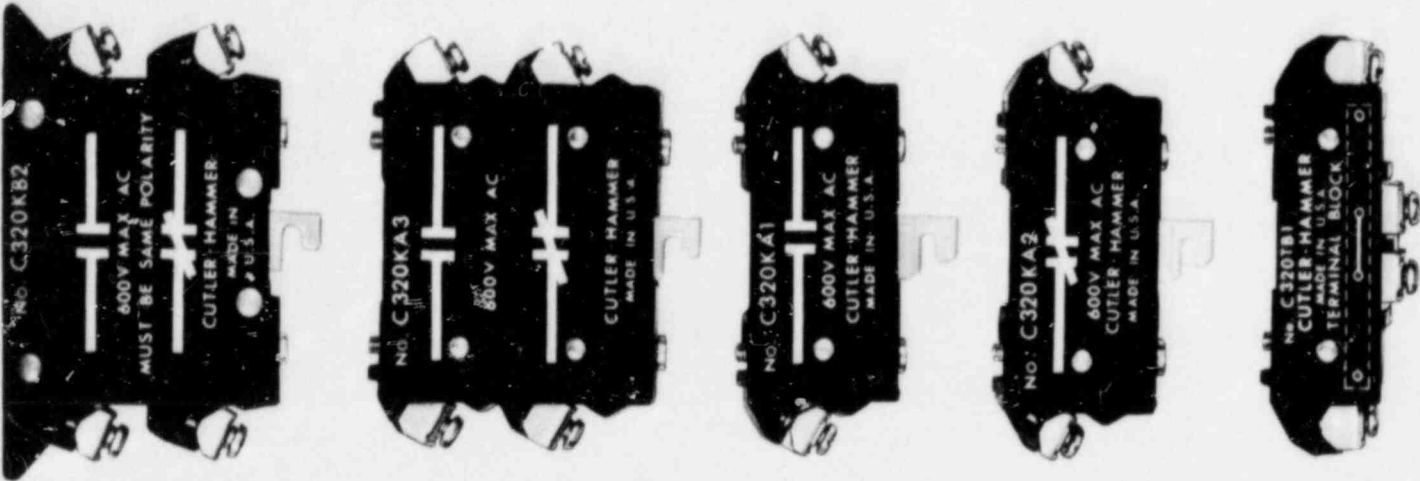
TERMINAL POSITIONS

Selection and arrangement see Adjacent table.

**TERMINALS**

	POSITION						TERMINAL CLAMPS	
	1, 4	2, 5	3, 6	7, 10	8, 11	9, 12	POWER	AUXILIARY
WITH PROVISION FOR AUXILIARY TERMINAL								
PART NO.	80-3167	80-3168	80-3167-2	.....	.....	.....	55-1763	55-1743
WITHOUT PROVISION FOR AUXILIARY TERMINAL							POWER 	
PART NO.	80-2788-2	80-2786	80-2788-3	80-2788-3	80-2786-3	80-2788-2	55-1763	

ACCESSORIES
ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE



BASE MOUNTED

Circuit	Catalog No.
None (Dummy)	10-3640-3
1 N.O.	C320KB1
1 N.O.-1 N.C.	C320KB2

ADD ON TYPE

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

TERMINAL BLOCK

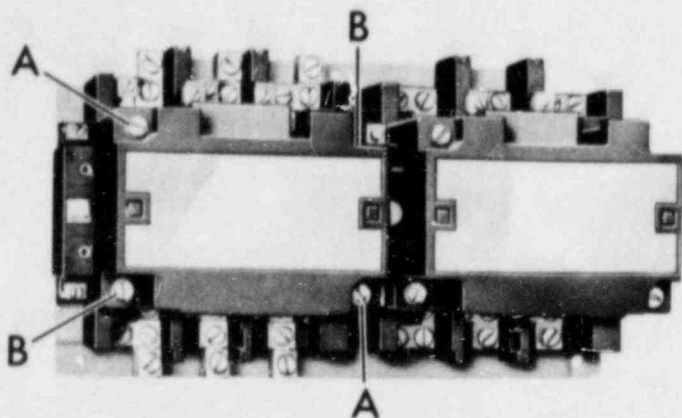
Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120	60	9-1887-1	A	600	60	9-1887-4	D
110	50			550	50		
240	60	9-1887-2	B	208	60	9-1887-5	E
220	50						
480	60	9-1887-3	C	380	50	9-1887-8	L
440	50						

*Suffix letter required only when power unit is ordered.

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "2" 2 AND 3 POLE REVERSING STARTER WITHOUT OVERLOAD RELAY



Typical Starter Three Pole with Two Circuit Electrical Interlock

INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are 2 and 3 pole A-c magnetic reversing starters without overload relay for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These starters require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion—refer to publication 14183 for helpful information on inspecting and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 26 page 2.
2. Unfasten the four pan head screws item 25 securing the clamp item 24 and the armature item 22. Remove the clamp and the armature.
3. Pull the coil straight out.
4. Install the new coil with the coil terminal blades engaging the coil terminal clips.
5. Install the armature (narrow end to the right) into its seated operating position.

6. Install the clamp and secure the screws.
7. Install the cover.

RENEWAL OF POWER UNIT

NOTE—The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

Unfasten the two gold colored hex. head screws "B", pull out the power unit, plug-in the new and re-tighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from the coil table on page 4.

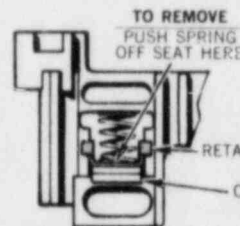
RENEWAL OF POWER CONTACTS

The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

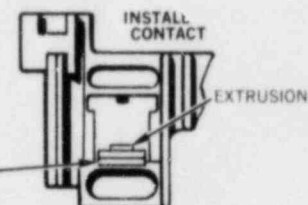
1. Remove the power unit assembly by loosening the two gold colored slotted hex. head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS

2. Remove the contact bar item 30 by removing the two screws item 31.
3. Push the springs item 10 off their seat on the retainer item 9 and push out. (See sketch "A".)
4. Remove the retainers thru the wide opening in the molding. The contacts item 8 will be free to come out.

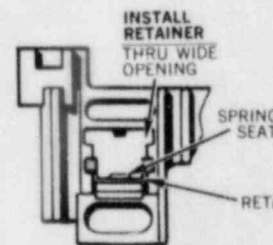


SKETCH "A"

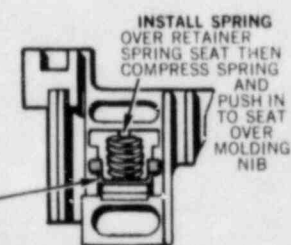


SKETCH "B"

5. Install the new contacts. (See sketch "B".)
6. Install the new retainers. (See sketch "C".) The square openings must be keyed with the extrusions on the contacts.
7. Install the springs, insert one end over the seat on the retainer, compress springs and push in to seat over the molding nib. (See sketch "D".)



SKETCH "C"



SKETCH "D"

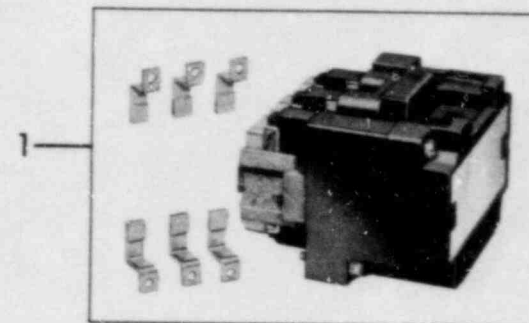
8. Install the contact bar to the push bars items 19 and 20 with screws item 31.

NOTE: The contact bar is keyed with projections on the push bars. Match the keys to insure correct fit and assembly.

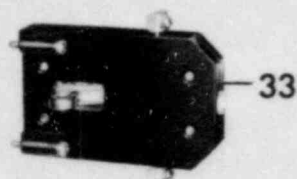
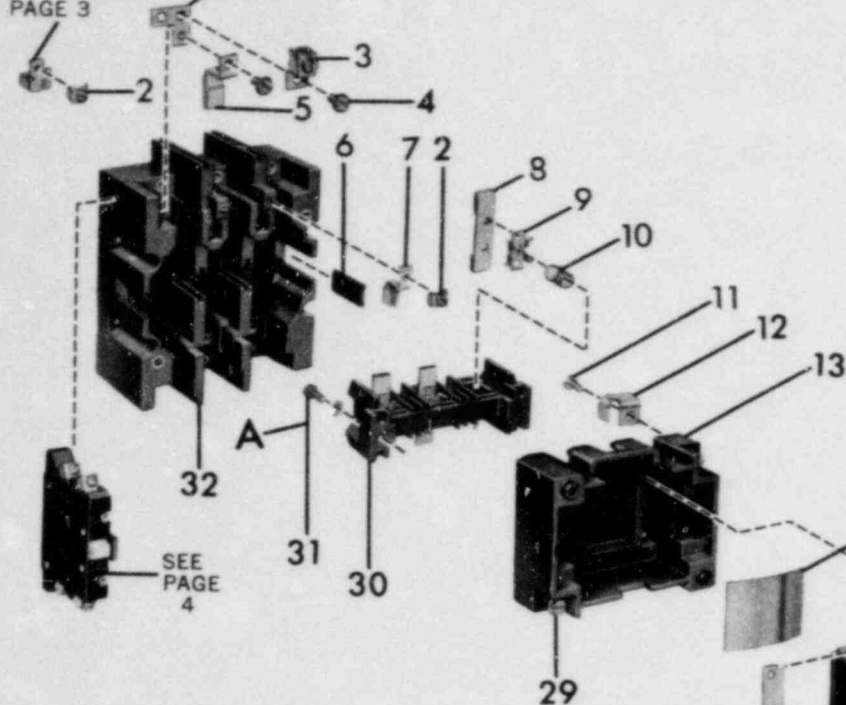
(Continued on Page 4)

CONTROL
TERMINAL
SEE TABLE
PAGE 3

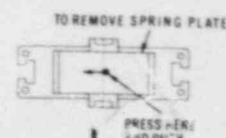
TERMINAL PLATE
SEE TABLE PAGE 3



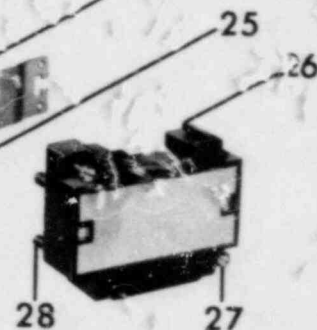
POWER UNIT



MECHANICAL
INTERLOCK



TO REMOVE SPRING PLATE
PRESS PIN AND PULL



RENEWAL PARTS — Information Required

To insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.**

PARTS LIST

Item No.	Description of Part	3 Pole Reversing Starter		Item No.	Description of Part	3 Pole Reversing Starter	
		No. Req.	Part No.			No. Req.	Part No.
• 1	Power unit (includes items 4, 5, 8 thru 32) (see coil table page 4)	2	C10DX	17	6-32 x .312 Pan Head Sems Screw	8	11-2538-4
2	Auxiliary Terminal Clamp	*	55-1743	18	Coil (see coil table on page 4)	2	
3	Lug			19	Push Bar (Left Hand)	2	61-1629
	Copper (furnished with open contactors)		80-2819	20	Push Bar (Right Hand)	2	61-1628
	Aluminum (furn. with enclosed contactors)		80-2798	21	Spring	4	69-2692
4	10-32 x .437 Pan Head Sems Screw (incl. w/item 34)	*		★22	Armature	2	48-1020
5	Stationary Contact (included w/item 34)	12		23	Spring Plate	2	69-2515
6	Insulator	2	56-3494	24	Clamp Plate	2	55-1878
7	Coil Terminal Clip	4	80-2871	25	6-32 x .50 Pan Head Sems Screw	8	11-2668
8	Movable Contact (included w/item 34)	6		26	Cover (includes items 27 and 28) (without nameplate) (give complete nameplate data for cover with nameplate)	2	49-4151
9	Retainer (included w/item 34)	6		27	10-32 x 1.25 Pan Head Sems Screw	4	11-2310
10	Spring (included w/item 34)	6		28	Spring	8	69-2599
11	8-32 x .50 Flat Head Thread Cutting Screw	12	11-2251	29	10-32 x 1.143 Slotted Hex. Head Sems Screw	4	11-2525
12	Blowout	12	62-529	30	Contact Bar	2	23-3619-3
13	Magnet Housing (see item 29)	2	49-3664	31	8-32 x .688 Round Head Sems Screw with Washers	4	11-2524
14	Spring	2	69-2604	32	Molded Base	2	17-9255
★15	Magnet Frame	2	17-8955	33	Mechanical Interlock	1	C321KM2
16	Clamp	4	55-1877	▲34	Set of Contacts (incl. items 4, 5, 8, 9 & 10)	2	6-24-2

•Coil must be specified by suffix letter selected from coil table on page 4.

The power units are supplied only with 3 power poles.

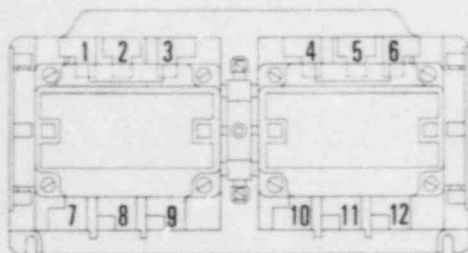
▲Recommended Spare Parts.

*As Required.

★It is recommended that items 15 and 22 be replaced together.

TERMINAL PLATE POSITIONS

Selection and arrangement see adjacent table.



TERMINAL PLATES

Position	1, 4, 7 thru 12	2, 5	3, 6
PICTURE			
Part No.	80-2879	80-2740	80-2433
Mounting Screws	10-32 Item 4 in Parts List		
Part No.	11-2425		

CONTROL TERMINALS

Position	1, 4	2 or 3 5 or 6
PICTURE		
Part No.	80-3392	80-2805
Terminal Clamp	 6-32 Item 2 in Parts List	
Part No.	55-1743	

(Continued from Page 1)

STATIONARY CONTACTS

Note: It is not necessary to disconnect any wiring.

9. Remove the screws securing the stationary contacts.
10. Install the new contacts and screws.

Caution: The stationary contacts must be installed so they seat on top of the terminal plates.

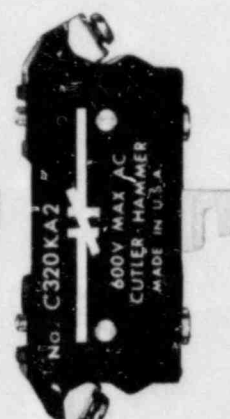
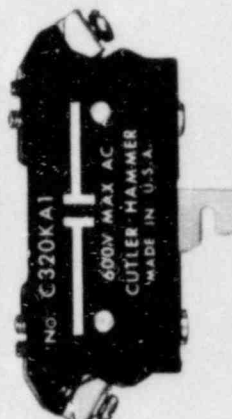
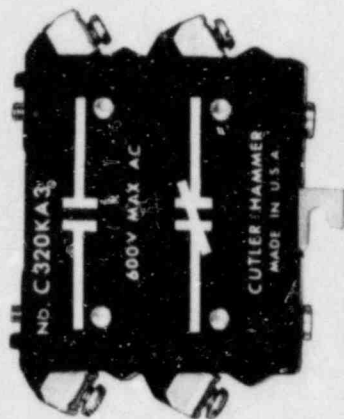
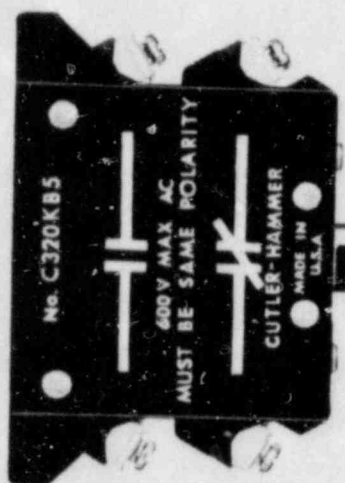
A control terminal, when used, (see table page 3) must be mounted on top of the stationary contacts.

ELECTRICAL INTERLOCKS

The electrical interlocks are renewable as a complete assembly. See illustrations and tables below for the various electrical interlocks.

LUBRICATION

Do not lubricate any part of this equipment.

ACCESSORIES**ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE**

— ADD ON TYPE —

BASE MOUNTED

Circuit	Catalog No.
1 N.O.	C320KB4
1 N.O.-1 N.C.	C320KB5

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

TERMINAL BLOCK

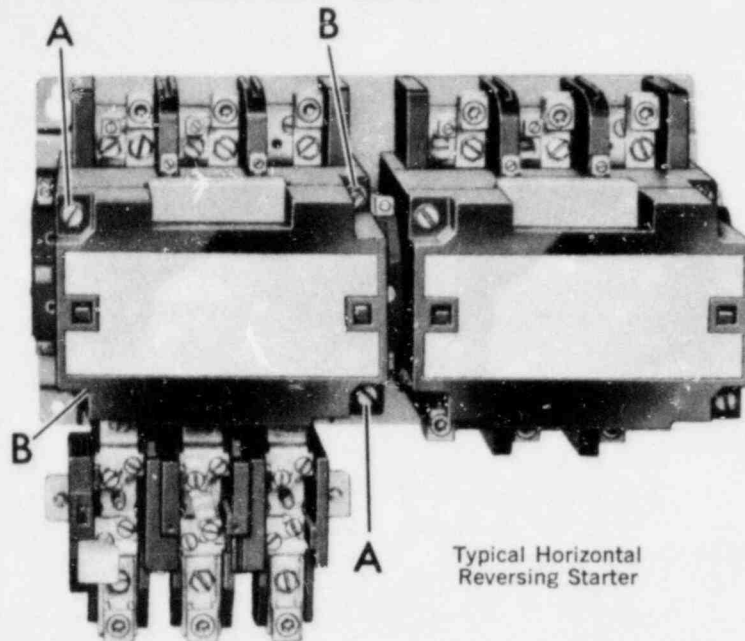
Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120	60	9-1889-1	A	600	60	9-1889-4	D
110	50			550	50		
240	60	9-1889-2	B	208	60	9-1889-13	E
220	50						
480	60	9-1889-3	C	380	50	9-1889-14	L
440	50						

*Suffix letter required only when power unit is ordered.

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "3" 3 POLE THREE PHASE REVERSING STARTER WITH STANDARD TRIP EUTECTIC OVERLOAD RELAY



Typical Horizontal
Reversing Starter

INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are three pole, three phase, reversing A-c magnetic starters for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These starters require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

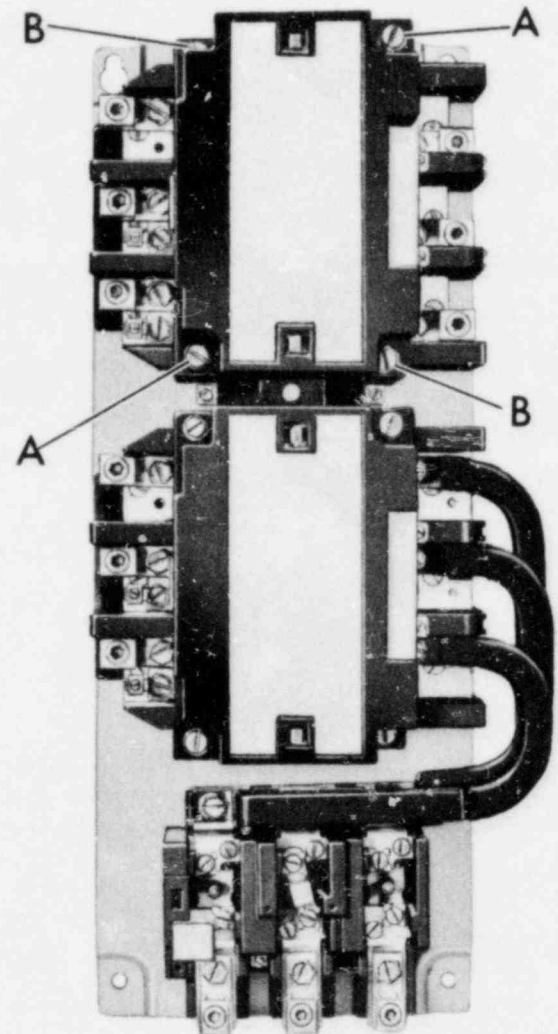
When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion — refer to publication 14183 for helpful information on inspection and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 28 page 2.
2. Unfasten the four pan head screws item 27 securing the clamp item 25 and the armature item 22. Remove the clamp and the armature.
3. Pull the coil straight out.
4. Install the new coil with the coil terminal blades engaging the coil terminal clips.



Typical Vertical
Reversing Starter

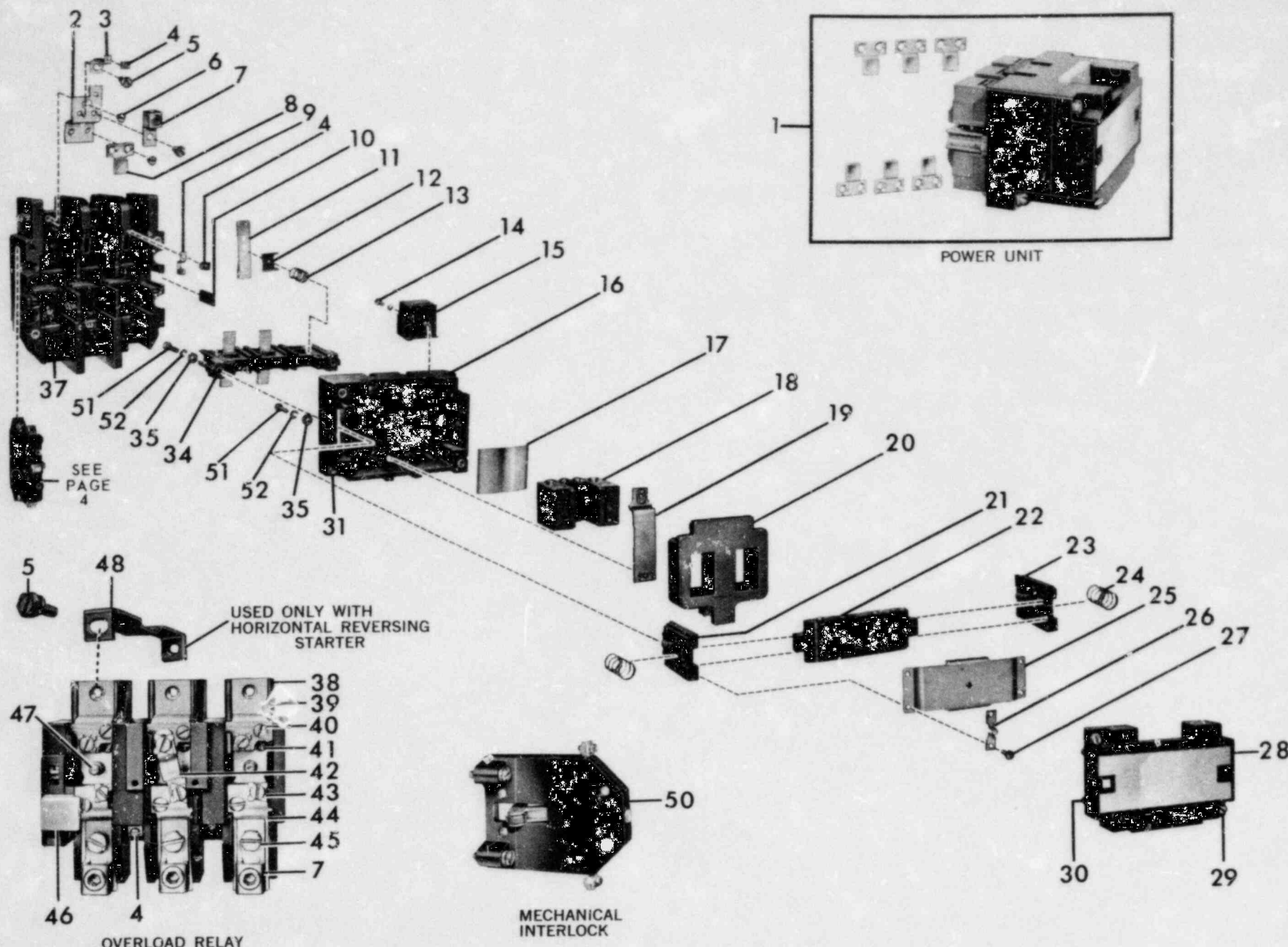
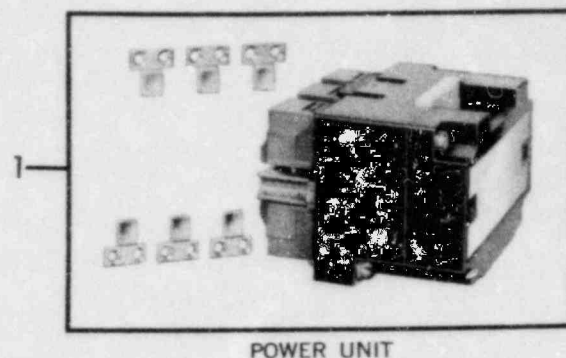
5. Install the armature (narrow end to the left) into its seated operating position.
6. Install the clamp and secure the screws.
7. Install the cover.

RENEWAL OF POWER UNIT

NOTE • The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

Unfasten the two gold colored Hex. Head screws "B", pull out the power unit, plug-in the new and retighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from the coil table on page 4.

(Continued on Pages 4 and 6)



The parts listed and illustrated are available for repairs. Should other parts be required order a complete overload relay.

RENEWAL PARTS — Information Required

To insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.**

HORIZONTAL REVERSING STARTER

PARTS LIST

Item No.	Description of Part	3 Pole Reversing Starter		Item No.	Description of Part	3 Pole Reversing Starter	
		No. Req.	Part No.			No. Req.	Part No.
• 1	Power Unit (includes items 6, 8, 11 thru 36)	2	C10EX	26	Indicating Plate	4	30-4864
2	Terminal Plate	12	80-2807	27	10-32 x .62 Pan Head Sems Screw	8	11-2523
3	Control Terminal	2	80-2824	28	Cover (includes items 29 and 30) (without nameplate) (give complete nameplate data for cover with nameplate)	2	49-4152
4	Auxiliary Terminal Clamp	*	55-1743	29	1/4-20 x 1.04 Pan Head Sems Screw	4	11-2313
5	1/4-20 x .625 Slotted Hex Sems Screw	*	11-2912	30	Spring	8	69-2552
6	10-32 x .438 Flathead Sems Screw (included w/item 53)	36		31	1/4-20 x 1.45 Slotted Hex Head Sems Screw	4	11-2522
7	Lug			34	Contact Bar	2	23-4030-3
	Copper (furnished with open starter)	6	80-2801	35	No. 10 Washer	4	916-166
	Aluminum (furnished with enclosed starter)	6	80-3307	37	Molded Base	2	17-9043
8	Stationary Contact (included w/item 53)	12		38	Overload Relay (includes items 4, 7, 39, 40, 41, 43 thru 47)		
9	Coil Terminal Clip	4	80-2747		With Copper Lugs	1	10-3563-5
10	Insulator	2	56-3494		With Aluminum Lugs	1	10-3563-13
11	Movable Contact (included w/item 53)	6		39	Terminal Plate	3	80-2889
12	Retainer (included w/item 53)	6		40	10-32 x .50 Pan Head Sems Screw	6	11-2537
13	Spring (included w/item 53)	6		41	6-32 x 3.12 Round Head Sems Screw	3	11-1525
14	8-18 x .625 Pan Head Screw	12	11-3106	42	Connector	1	25-2217-2
	No. 8 Lockwasher	12	16-42	43	Screw	6	11-2581
15	Blowout	12	62-531	44	Terminal Plate	3	80-3321
16	Magnet Housing (incl. 6 of it. 14) (see it. 31)	2	49-3626	45	1/4-20 x .75 Slotted Hex Head Sems Screw	3	11-2683
17	Spring	2	69-2770	46	Button (white)	1	53-1346-6
★18	Magnet Frame	2	48-1030	47	Thermal Element	3	10-4057
19	Clamp	2	19-1570	48	Connector (contactor to overload relay)	3	25-2848
20	Coil (see coil table on page 4)	2	61-1612	50	Mechanical Interlock	1	C321KM3
21	Push Bar (left hand)	2		51	10-32 x .938 Pan Head Screw	8	11-3107
★22	Armature	2	48-1029	52	No. 10 Lockwasher	8	916-484Z
23	Push Bar (right hand)	2	61-1606	▲53	Set of Contacts (incl. items 6, 8, 11, 12 & 13)	2	6-25-2
24	Spring	4	69-2554				
25	Clamp Plate	2	79-8622				

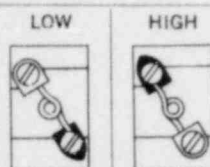
•Coil must be specified by suffix letter selected from coil table on page 4.
The power units are supplied only with 3 power poles.
▲Recommended Spare Parts.

*As required.
★It is recommended that items 18 and 22 be replaced together.

(Continued from Page 1)

EUTECTIC OVERLOAD RELAY

This overload relay has two steps of adjustment (low or high) obtained by POSITIONING THE HEATER COILS as shown in the adjacent illustrations. Note the location of the pointed terminal on the heater coil.

HEATER COIL POSITION

The heater coil selection table furnished with the starter illustrates the proper mounting position. All coils must be mounted in the same position for a given overload relay.

Reset and tripped indication —

A transparent rectangular window above the reset button provides visual indication.

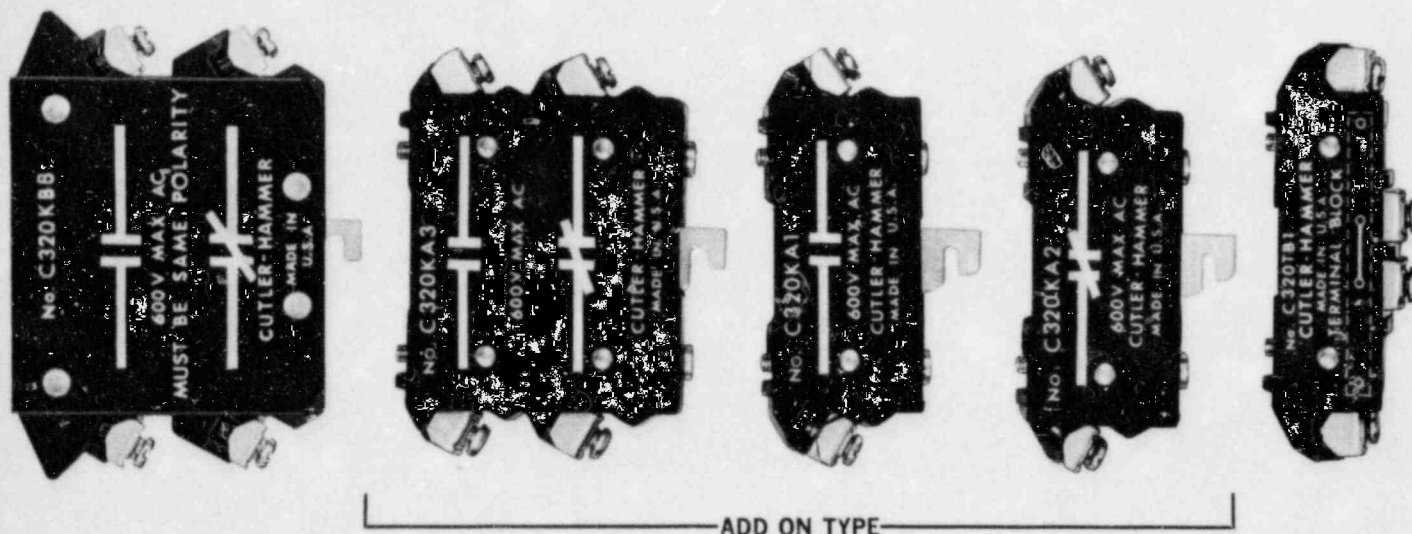
Relay Reset — Dark Window.

Relay Tripped — Light (silver) Window.

Do not disassemble this relay.

The parts called out on page 2 and listed on page 3 and 5 are available for repairs. If parts are required other than those listed replace the complete relay.

(Continued on Page 6)

ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE**ADD ON TYPE****BASE MOUNTED**

Circuit	Catalog No.
1 N.O.	C320KB7
1 N.O.-1 N.C.	C320KB8

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

TERMINAL BLOCK

Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120	60	9-1891-1	A	600	60	9-1891-4	D
110	50			550	50		
240	60	9-1891-2	B	208	60	9-1891-13	E
220	50						
480	60	9-1891-3	C	380	50	9-1891-14	L
440	50						

*Suffix letter required only when power unit is ordered.

RENEWAL PARTS — Information Required

To insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.**

VERTICAL REVERSING STARTER

PARTS LIST

Item No.	Description of Part	3 Pole Reversing Starter		Item No.	Description of Part	3 Pole Reversing Starter	
		No. Req.	Part No.			No. Req.	Part No.
• 1	Power unit (includes items 6, 8, 11 thru 36)	2	C10EX	24	Spring	4	69-2554
2	Terminal Plate	12	80-2807	25	Clamp Plate	2	79-8622
3	Control Terminal	2	80-2824	26	Indicating Plate	4	30-4864
4	Auxiliary Terminal Clamp	*	55-1743	27	10-32 x .62 Pan Head Sems Screw	8	11-2523
5	1/4-20 x .625 Slotted Hex Sems Screw	*	11-2912	28	Cover (includes items 29 and 30) (without nameplate) (give complete nameplate data for cover with nameplate)	2	49-4152
6	10-32 x .438 Flathead Sems Screw (included w/item 53)	36		29	1/4-20 x 1.04 Pan Head Sems Screw	4	11-2313
7	Lug			30	Spring	8	69-2552
	Copper (furnished with open starter)	6	80-2801	31	1/4-20 x 1.45 Slotted Hex Head Sems Screw	4	11-2522
	Aluminum (furnished with enclosed starter)	6	80-3307	34	Contact Bar	2	23-4030-3
8	Stationary Contact (incl. w/item 53)	12		35	No. 10 Washer	4	916-166
9	Coil Terminal Clip	4	80-2747	37	Molded Base	2	17-9043
10	Insulator	2	56-3494	38	Overload Relay (includes items 4, 7, 39, 40, 41, 43 thru 47) (with copper lugs)	1	10-3563-5
11	Movable Contact (incl. w/item 53)	6		39	Terminal Plate	3	80-2889
12	Retainer (incl. w/item 53)	6		40	10-32 x .50 Pan Head Sems Screw	6	11-2537
13	Spring (incl. w/item 53)	6		41	6-32 x .312 Round Head Sems Screw	3	11-1525
14	8-18 x .625 Pan Head Screw	12	11-3106	42	Connector	1	25-2217-2
	No. 8 Lockwasher	12	16-42	43	Screw	6	11-2581
15	Blowout	12	62-531	44	Terminal Plate	3	80-3321
16	Magnet Housing (incl. 6 of it. 14) (see item 31)	2	49-3626	45	1/4-20 x .75 Slotted Hex Head Sems Screw	3	11-2683
17	Spring	2	69-2770	46	Button (white)	1	53-1346-6
★18	Magnet Frame	2	48-1030	47	Thermal Element	3	10-4057
19	Clamp	2	19-1570	50	Mechanical Interlock	1	C321KM3
20	Coil (see coil table on page 4)	2		51	10-32 x .938 Pan Head Screw	8	11-3107
21	Push Bar (left hand)	2	61-1612	52	No. 10 Lockwasher	8	916-484Z
★22	Armature	2	48-1029	▲53	Set of Contacts (incl. items 6, 8, 11, 12 & 13)	2	6-25-2
23	Push Bar (right hand)	2	61-1606				

•Coil must be specified by suffix letter selected from coil table on page 4.
The power units are supplied only with 3 power poles.
▲Recommended Spare Parts.

*As required.

★It is recommended that items 18 and 22 be replaced together.

Continued from Page 4

RENEWAL OF POWER CONTACTS

The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

1. Remove the power unit assembly by loosening the two gold colored slotted hex. head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS

2. Remove the contact bar item 34 by removing the two screws and washers items 36 and 35.
3. Refer to sketch "A". Raise the retainer item 12 against the spring to free the contact so it can drop out.

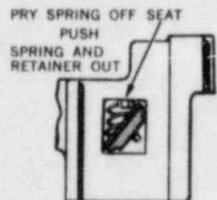


SKETCH "A"

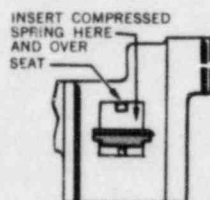


SKETCH "B"

4. Refer to sketch "B and C". Rotate the retainer into the position shown and push it into the window to hold it. Lift the spring off the seat with a small screw driver. Push spring and retainer thru the window.



SKETCH "C"



SKETCH "D"

5. Refer to sketch "D". Place and hold the retainer in the position as shown.
6. Compress the spring with the thumb and index finger and insert and seat in the cavity above the retainer.

7. Raise the retainer against the spring, insert and position the contact. Contact tips must face away from the retainer.
8. Install the contact bar to the push bars item 21 and 23 with screws and washers items 35 and 36.

Note: The contact bar is not reversible. Match the ends of the contact bar to fit inside the raised projections on the push-bars.

STATIONARY CONTACTS

Note: It is not necessary to disconnect any wiring.

9. Remove the screws securing the stationary contacts.
10. Install the new contacts and screws.

ELECTRICAL INTERLOCKS

The electrical interlocks are renewable as a complete assembly. See illustrations and tables below for the various electrical interlocks.

ARC CHUTES

These seldom require renewal. Some burning and discoloration are normal. When the contacts are renewed, brush out any loose accumulations.

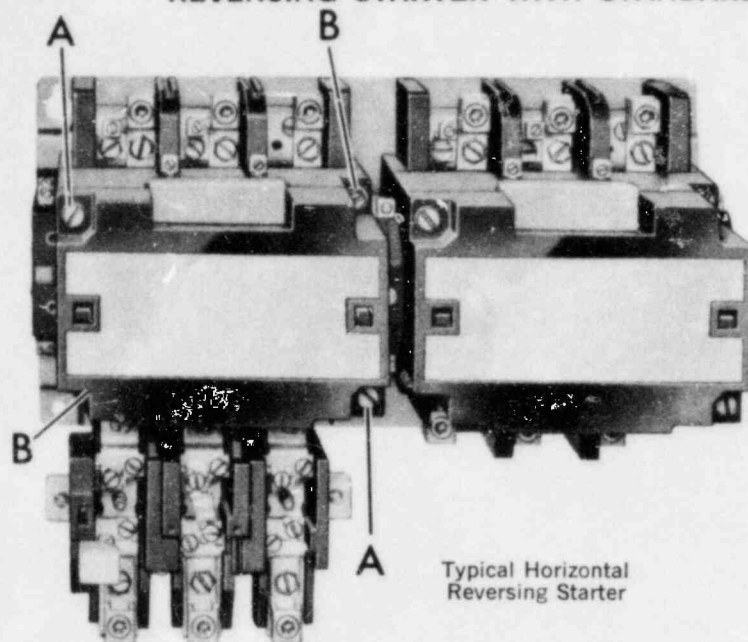
MAGNET

The magnet clamp screws item 33 are accessible when the two center arc chutes are removed.

LUBRICATION

Do not lubricate any part of this equipment.

RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR NEMA SIZE "4" 3 POLE THREE PHASE REVERSING STARTER WITH STANDARD TRIP EUTECTIC OVERLOAD RELAY



Typical Horizontal Reversing Starter

INTRODUCTION

This publication is designed to simplify inspection and maintenance. It features . . .

1. A publication number keyed to the ordering number of the device . . . to simplify filing and fact finding.
2. A nameplate inscription keyed to the specific renewal parts publication . . . to eliminate cross referencing.
3. An exploded view for easy, positive identification of parts with illustrated steps on "how to assemble and disassemble" . . . to conserve time and eliminate guesswork.
4. Comprehensive maintenance information to provide maximum performance. This information should be read carefully.

DESCRIPTION

These are three pole, three phase, reversing A-c magnetic starters for across the line applications within the ratings shown on the nameplate of the equipment.

CARE

These starters require no mechanical maintenance. Any maintenance required can be performed with an electrician's screwdriver. For continued uninterrupted performance, renew all of the power contacts and springs at the same time before the contact tip material has worn away.

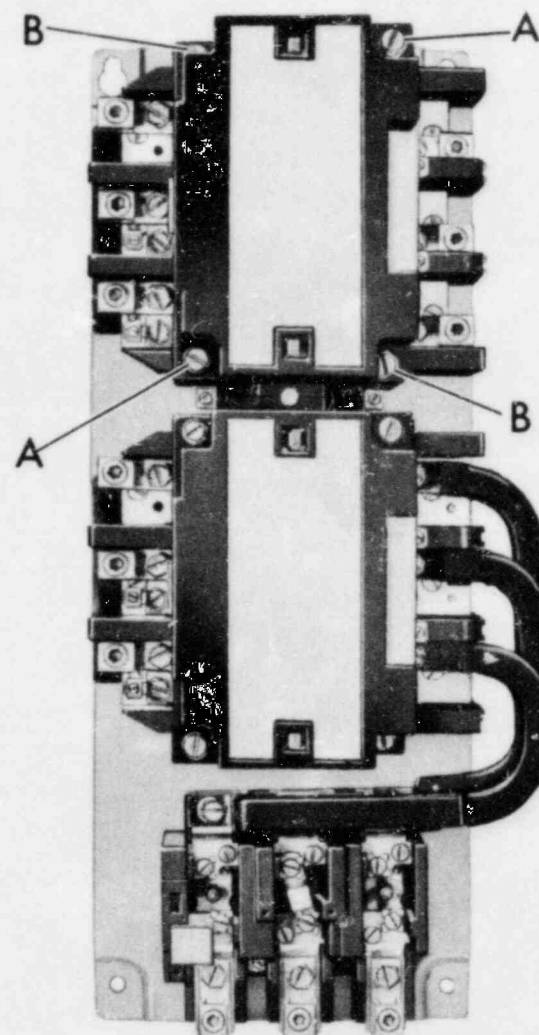
When renewing the contacts check all terminal screws to insure they are tight and secure.

Suggestion — refer to publication 14183 for helpful information on inspection and determining when to replace contacts.

RENEWAL OF OPERATING COIL

The operating coil is epoxy encapsulated and so constructed to provide long service life. Should the coil require changing, the entire operation can be performed in a few minutes.

1. Unfasten the two pan head cover screws "A" and remove the cover item 28 page 2.
2. Unfasten the four pan head screws item 27 securing the clamp item 25 and the armature item 22. Remove the clamp and the armature.
3. Pull the coil straight out.
4. Install the new coil with the coil terminal blades engaging the coil terminal clips.



Typical Vertical Reversing Starter

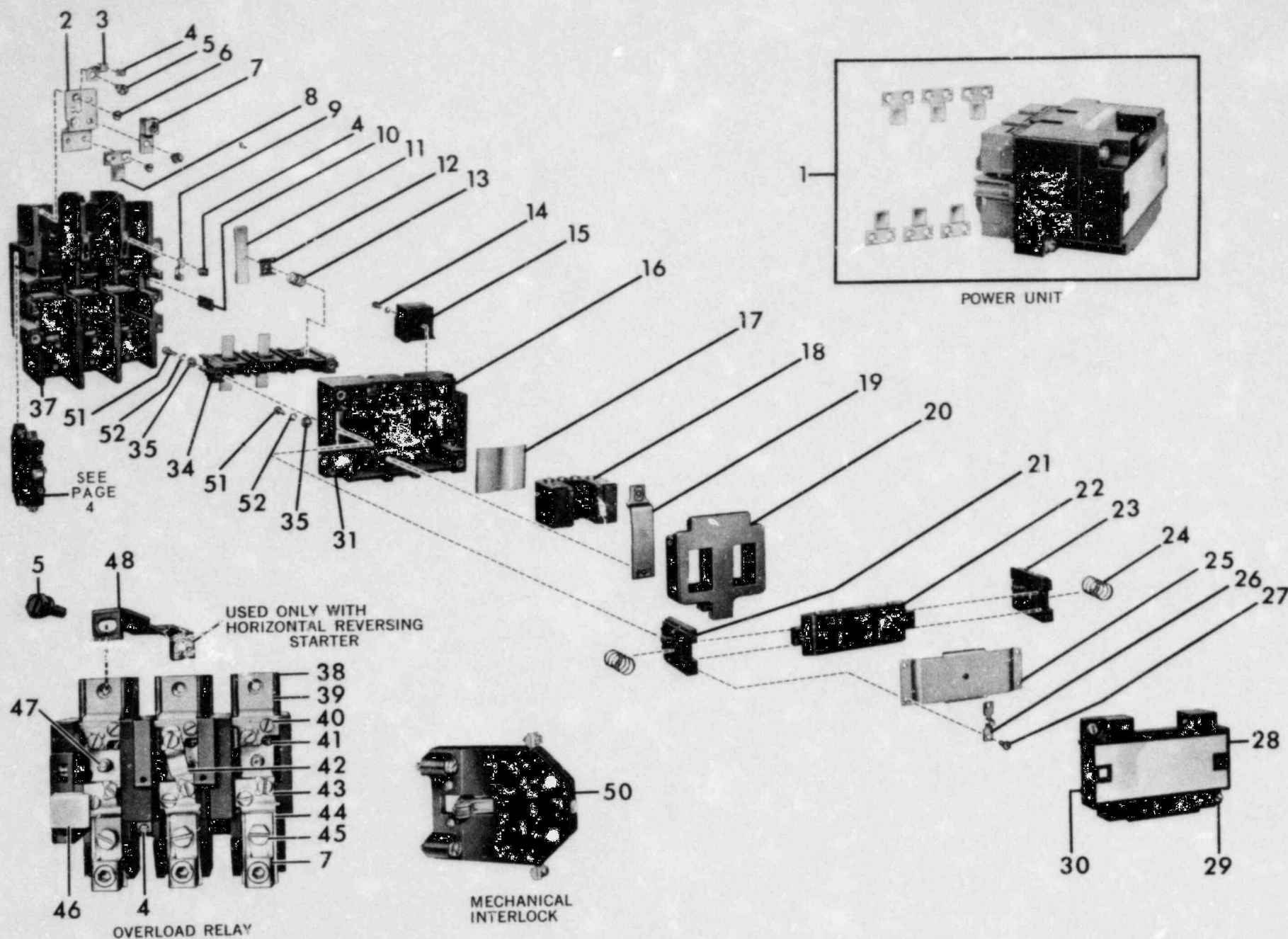
5. Install the armature (narrow end to the left) into its seated operating position.
6. Install the clamp and secure the screws.
7. Install the cover.

RENEWAL OF POWER UNIT

NOTE • The power unit item 1 consists of a factory assembly of all the magnetic parts, movable contacts, and their carrier assembly. This unit usually permits immediate restoration to service of a device which may have become inoperative.

Unfasten the two gold colored Hex. Head screws "B", pull out the power unit, plug-in the new and retighten the screws "B". A set of stationary contacts is included with the power unit. It is advisable to install these stationary contacts at the same time, particularly if visual inspection indicates that both the movable and stationary contacts need replacement. Specify coil by suffix letter selected from the coil table on page 4.

(Continued on Pages 4 and 6)



The parts listed and illustrated are available for repairs. Should other parts be required order a complete overload relay.

RENEWAL PARTS — Information RequiredTo insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.****HORIZONTAL REVERSING STARTER****PARTS LIST**

Item No.	Description of Part	3 Pole Reversing Starter		Item No.	Description of Part	3 Pole Reversing Starter	
		No. Req.	Part No.			No. Req.	Part No.
• 1	Power Unit (includes items 6, 8, 11 thru 36)	2	C10FX	26	Indicating Plate	4	30 4864
2	Terminal Plate	12	80-2810	27	10-32 x .62 Pan Head Sems Screw	8	11-2523
3	Control Terminal	2	80-2824	28	Cover (includes items 29 and 30) (without nameplate) (give complete nameplate data for cover with nameplate)	2	49-4152
4	Auxiliary Terminal Clamp	*	55-1743	29	1/4-20 x 1.04 Pan Head Sems Screw	4	11-2313
5	1/4-20 x .625 Slotted Hex Sems Screw	*	11-2912	30	Spring	8	69-2552
6	10-32 x .438 Flathead Sems Screw (included w/item 53)	48		31	1/4-20 x 1.45 Slotted Hex Head Sems Screw	4	11-2522
7	Lug			34	Contact Bar	2	23-3542-3
	Copper (furnished with open starter)	6	80-2812	35	No. 10 Washer	4	916-166
	Aluminum (furnished with enclosed starter)	6	80-3379	37	Molded Base	2	17-9044
8	Stationary Contact (included w/item 53)	12		38	Overload Relay (incl. items 4, 7, 39 thru 47)		
9	Coil Terminal Clip	4	80-2747		With Copper Lugs	1	10-3563-11
10	Insulator	2	56-3494		With Aluminum Lugs	1	10-3563-15
11	Movable Contact (included w/item 53)	6		39	Terminal Plate	3	80-2889
12	Retainer (included w/item 53)	6		40	10-32 x .50 Pan Head Sems Screw	6	11-2537
13	Spring (included w/item 53)	6		41	6-32 x 3.12 Round Head Sems Screw	3	11-1525
14	8-18 x .625 Pan Head Screw	12	11-3106	42	Connector	1	25-2217-2
	No. 8 Lockwasher	12	16-42	43	Screw	6	11-2581
15	Blowout	12	62-531	44	Terminal Plate	3	80-2793
16	Magnet Housing (incl. 6 of it. 14) (see it. 31)	2	49-3626	45	1/4-20 x .75 Slotted Hex Head Sems Screw	3	11-2683
17	Spring	2	69-2770	46	Button (White)	1	53-1346-6
★18	Magnet Frame	2	48-1030	47	Thermal Element	3	10-4057
19	Clamp	2	19-1570	48	Connector (contactor to overload relay)	3	25-2718
20	Coil (see coil table on page 4)	2		49	1/4 Washer	3	916-801Z
21	Push Bar (left hand)	2	61-1612	50	Mechanical Interlock	1	C321KM3
★22	Armature	2	48-1029	51	10-32 x .938 Pan Head Screw	8	11-3107
23	Push Bar (right hand)	2	61-1606	52	No. 10 Lockwasher	8	916-484Z
24	Spring	4	69-2554	▲53	Set of Contacts (incl. items 6, 8, 11, 12 & 13)	2	6-26-2
25	Clamp Plate	2	79-8622				

•Coil must be specified by suffix letter selected from coil table on page 4.

The power units are supplied only with 3 power poles.

▲Recommended Spare Parts.

*As Required.

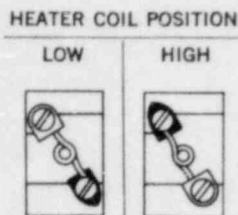
★It is recommended that items 18 and 22 be replaced together.

(Continued from Page 1)

EUTECTIC OVERLOAD RELAY

This overload relay has two steps of adjustment (low or high) obtained by POSITIONING THE HEATER COILS as shown in the adjacent illustrations. Note the location of the pointed terminal on the heater coil.

The heater coil selection table furnished with the starter illustrates the proper mounting position. All coils must be mounted in the same position for a given overload relay.



Reset and tripped indication —

A transparent rectangular window above the reset button provides visual indication.

Relay Reset — Dark Window.**Relay Tripped** — Light (silver) Window.

Do not disassemble this relay.

The parts called out on page 2 and listed on page 3 and 5 are available for repairs. If parts are required other than those listed replace the complete relay.

(Continued on Page 6)

ELECTRICAL INTERLOCKS, TERMINAL BLOCK AND COIL TABLE**BASE MOUNTED**

Circuit	Catalog No.
1 N.O.	C320KB7
1 N.O.-1 N.C.	C320KB8

FOR MOUNTING ABOVE BASE MOUNTED INTERLOCK

Circuit	Catalog Number
1 N.O.	C320KA1
1 N.C.	C320KA2
1 N.O.-1 N.C.	C320KA3

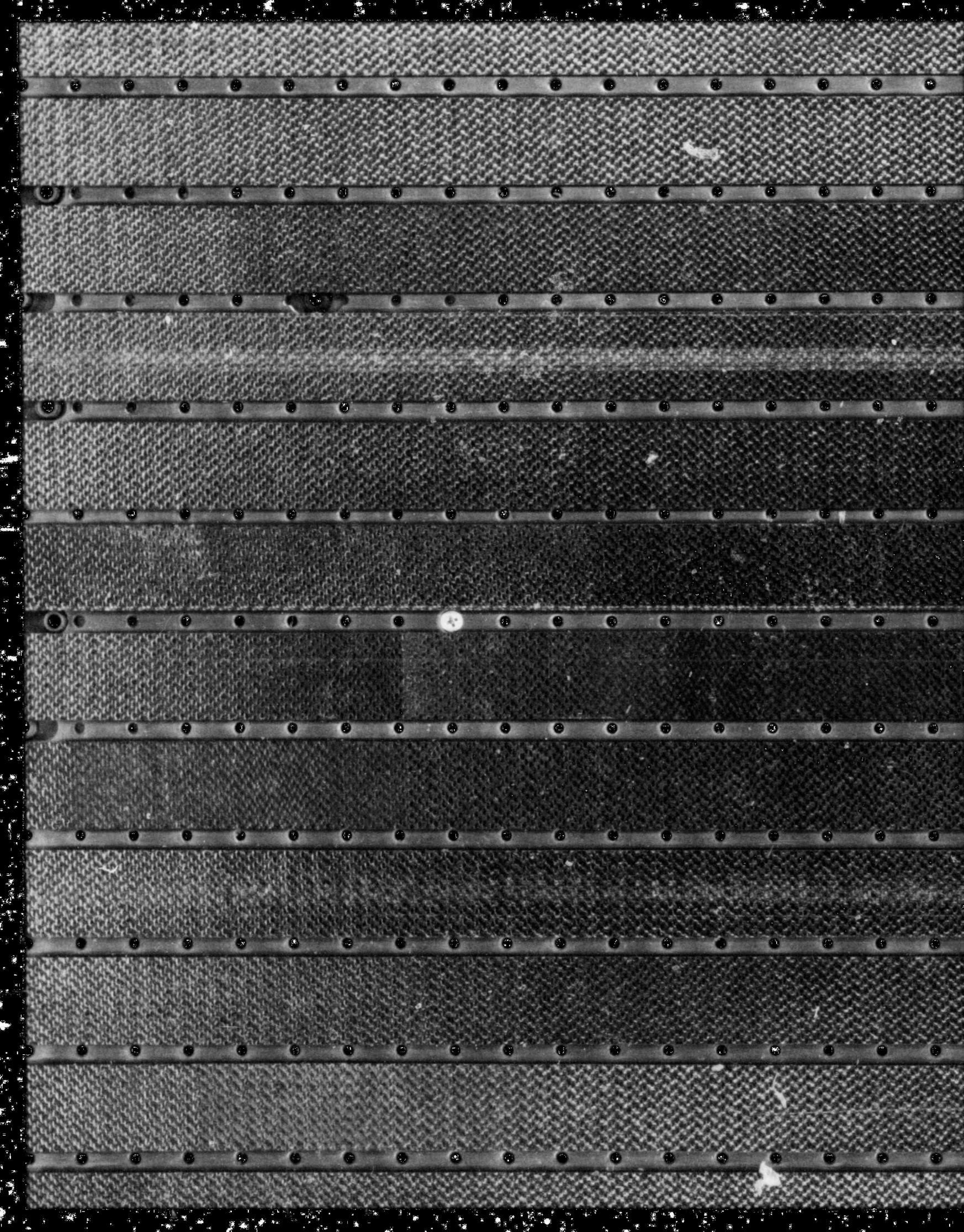
TERMINAL BLOCK

Cat. No.
C320TB1

Operating Coils Selection Table

Volts	Cycles	Part Number	* Suffix Letter	Volts	Cycles	Part Number	* Suffix Letter
120 110	60 50	9-1891-1	A	600 550	60 50	9-1891-4	D
240 220	60 50	9-1891-2	B	208	60	9-1891-13	E
480 440	60 50	9-1891-3	C	380	50	9-1891-14	L

*Suffix letter required only when power unit is ordered.



RENEWAL PARTS — Information Required

To insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.**

VERTICAL REVERSING STARTER

PARTS LIST

Item No.	Description of Part	3 Pole Reversing Starter		Item No.	Description of Part	3 Pole Reversing Starter	
		No. Req.	Part No.			No. Req.	Part No.
• 1	Power Unit (includes items 6, 8, 11 thru 36)	2	C10FX	25	Clamp Plate	2	79-8622
2	Terminal Plate	12	80-2810	26	Indicating Plate	4	30-4864
3	Control Terminal	2	80-2824	27	10-32 x .62 Pan Head Sems Screw	8	11-2523
4	Auxiliary Terminal Clamp	*	55-1743	28	Cover (includes items 29 and 30) (without nameplate) (give complete nameplate data for cover with nameplate)	2	49-4152
5	1/4-20 x .625 Slotted Hex Sems Screw	*	11-2912	29	1/4-20 x 1.04 Pan Head Sems Screw	4	11-2313
6	10-32 x .438 Flathead Sems Screw (included w/item 53)	48		30	Spring	8	69-2552
7	Lug			31	1/4-20 x 1.45 Slotted Hex Head Sems Screw	4	11-2522
	Copper (furnished with open starter)	6	80-2812	34	Contact Bar	2	23-3542-3
	Aluminum (furnished with enclosed starter)	6	80-3379	35	No. 10 Washer	8	916-166
8	Stationary Contact (included w/item 53)	12		37	Molded Base	2	17-9044
9	Coil Terminal Clip	4	80-2747	38	Overload Relay (includes items 4, 7, 39 thru 47) (with copper lugs)	1	10-3563-11
10	Insulator	2	56-3494	39	Terminal Plate	3	80-2889
11	Movable Contact (included w/item 53)	6		40	10-32 x .50 Pan Head Sems Screw	6	11-2537
12	Retainer (included w/item 53)	6		41	6-32 x .312 Round Head Sems Screw	3	11-1525
13	Spring (included w/item 53)	6		42	Connector	1	25-2217-2
14	8-18 x .625 Pan Head Screw	12	11-3106	43	Screw	6	11-2581
	No. 8 Lockwasher	12	16-42	44	Terminal Plate	3	80-2793
15	Blowout	12	62-531	45	1/4-20 x .75 Slotted Hex Head Sems Screw	3	11-2683
16	Magnet Housing (incl. 6 of it. 14) (see it. 31)	2	49-3626	46	Button (white)	1	53-1346-6
17	Spring	2	69-2770	47	Thermal Element	3	10-4057
★18	Magnet Frame	2	48-1030	50	Mechanical Interlock	1	C321KM3
19	Clamp	2	19-1570	51	10-32 x .938 Pan Head Screw	8	11-3107
20	Coil (see coil table on page 4)	2		52	No. 10 Lockwasher	8	916-484Z
21	Push Bar (left hand)	2	61-1612	▲53	Set of Contacts (incl. items 6, 8, 11, 12 & 13)	2	6-26-2
★22	Armature	2	48-1029				
23	Push Bar (right hand)	2	61-1606				
24	Spring	4	69-2554				

●Coil must be specified by suffix letter selected from coil table on page 4.
The power units are supplied only with 3 power poles.

▲Recommended Spare Parts.

*As Required.

★It is recommended that items 18 and 22 be replaced together.

Continued from Page 4

RENEWAL OF POWER CONTACTS

The power contacts when used within their rating will provide long trouble free life. They should not be filed or dressed.

1. Remove the power unit assembly by loosening the two gold colored slotted hex. head screws "B" and pull the power unit straight out.

MOVABLE CONTACTS

2. Remove the contact bar item 34 by removing the two screws and washers items 36 and 35.
3. Refer to sketch "A". Raise the retainer item 12 against the spring to free the contact so it can drop out.

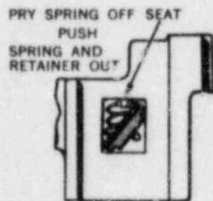


SKETCH "A"

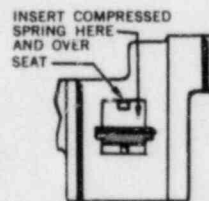


SKETCH "B"

4. Refer to sketch "B and C". Rotate the retainer into the position shown and push it into the window to hold it. Lift the spring off the seat with a small screw driver. Push spring and retainer thru the window.



SKETCH "C"



SKETCH "D"

5. Refer to sketch "D". Place and hold the retainer in the position as shown.
6. Compress the spring with the thumb and index finger and insert and seat in the cavity above the retainer.

7. Raise the retainer against the spring, insert and position the contact. Contact tips must face away from the retainer.
8. Install the contact bar to the push bars item 21 and 23 with screws and washers items 35 and 36.

Note: The contact bar is not reversible. Match the ends of the contact bar to fit inside the raised projections on the push-bars.

STATIONARY CONTACTS

Note: It is not necessary to disconnect any wiring.

9. Remove the screws securing the stationary contacts.
10. Install the new contacts and screws.

ELECTRICAL INTERLOCKS

The electrical interlocks are renewable as a complete assembly. See illustrations and tables below for the various electrical interlocks.

ARC CHUTES

These seldom require renewal. Some burning and discoloration are normal. When the contacts are renewed, brush out any loose accumulations.

MAGNET

The magnet clamp screws item 33 are accessible when the two center arc chutes are removed.

LUBRICATION

Do not lubricate any part of this equipment.



RENEWAL PARTS AND INSTRUCTION PUBLICATION FOR MULTIPOLE TYPE M RELAY



BASIC MAGNET
AND REAR DECK



WITH
OPTIONAL FRONT
DECK ATTACHMENT

DESCRIPTION

The type M relay is a modular component relay for maximum convenience and flexibility. Contact Poles, stamped with an "R" or a similar marking, are separate, self-contained, sealed units which become either normally open or normally closed contacts depending upon how they are inserted into the molded, insulated deck. The Rear Deck and Magnet will accept up to four rear contact poles in any combination, and to this unit a front deck may be added to provide a total of eight poles.

APPLICATION

The relay is designed for adjacent mounting on a vertical plane using 2 or 3 No. 10 mounting screws, and it may be mounted at a 90° position (contact poles horizontal) if necessary, requiring only 2.4" x 3.5" of panel area. Electrical ratings are 10 ampere, 600 VAC — Heavy Pilot Duty, 600 VAC. The Manual Operator knob is electrically isolated and can be used to manually test the relay circuits.

FRONT DECK ATTACHMENT

An eight pole relay will consist of two parts — the Rear Deck and Magnet plus the Front Deck Attachment. As each rear deck contact drives a corresponding front deck contact, all rear deck poles must be in place before adding the front deck unit. The front deck contacts, marked with an "F" or similar marking are electrically identical to those of the rear deck but are physically shorter and, therefore, are not interchangeable.

To add the Front Deck Attachment remove the cover plate and the short pullrod. Attach the front deck, long pullrod complete with knob and red collar, insert the front poles, and replace the cover on the front deck. Tighten the cover screws securely to position the front poles correctly and test relay operation by lifting the knob to close the armature and contacts.

CARE

These devices require no mechanical maintenance or lubrication under average operating conditions. The cover plate must be securely positioned for proper contact action.

CONTACT POLES

Poles are available as a catalog item and are not individually repairable. Special contact poles can be inter-mixed with the regular bifurcated poles without adverse effect. Remove the cover plate to change or add contact poles.

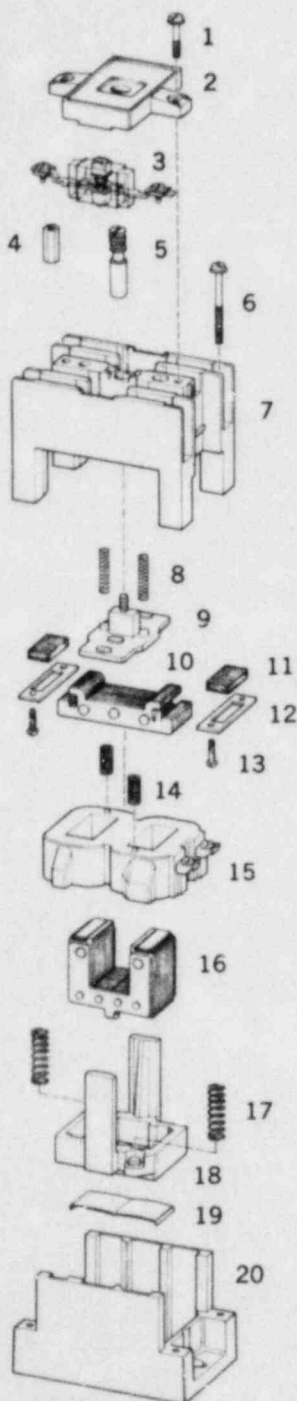
DISASSEMBLY

To change the coil or to renew parts, loosen the four screws at each corner that hold the rear deck to the metal base and separate these two sections. This will expose the coil, movable "C" magnet and carrier, and the armature return springs in the metal base. The upper half is a self-contained section including the coil retaining springs which are held captive. The individually parts assembly sketch best illustrates the assembly of individual parts for this section. Certain parts have been keyed to facilitate reassembly, otherwise no special attention is necessary.

RENEWAL PARTS

All parts are renewable and require no special adjustments or tools. Matching and related parts should be replaced at one time for best performance. Screw threads in the pullrods can be damaged if excessive torque is applied in re-assembly. All parts are listed in the table.

MULTIPOLE TYPE M RELAY



Item No.	Description of Part	No. Req'd	Part No.
REAR DECK ASSEMBLY			
1	Cover screws	2	11-2494
2	Cover plate	1	99-849
3	Contact pole	1-4	D26MPR
4	Connector—0.6" for attachment (with 4 pole only) or 1.9" (with Front Deck included)	1 1	61-1728 61-1723
5	Manual operator — 1.2" (4 pole relay) or 2.4" (8 pole structure)	1 1	61-1897 61-1897-2
6	Deck fastening screws	4	11-2619
7	Rear deck	1	99-849-3
8	Push bar return springs	2	69-2741
9	Push bar	1	61-1721
10	Stationary "I" magnet	1	48-1155
11	Cushion	2	18-1775
12	"I" magnet retaining clamps	2	55-1855
13	Retaining screws 6-32x.438	4	911-594
MAGNET SECTION			
14	Coil retaining springs	2	69-2740
15	Magnet coil (Give no. stamped on coil)	1	See table below
16	Armature "C" magnet	1	17-9958
17	Armature return springs	2	69-2760
18	Armature magnet carrier (includes item 19)	1	99-926
19	Armature retainer clip	1	69-2739
20	Base	1	17-9959
FRONT DECK ATTACHMENT (Not Shown)			
	Front Deck	1	D26MD
	Contact Pole	1-4	D26MPF

MAGNET COIL TABLE

50 Hz	60 Hz	Part No.
110V	120V	9-1884-1
220V	240V	9-1884-2
440V	480V	9-1884-3
550V	600V	9-1884-4
—	208V	9-1884-9

To insure prompt handling of renewal parts orders, please include the following: **DESCRIPTION, PART NO., AND QUANTITY REQUIRED.**

INSTRUCTION SHEET

No. 538 Definite Time Armature Accelerating Contactor

DESCRIPTION

FUNCTION

The function of this contactor is to short out steps of armature resistance. One contactor will short out a maximum of two steps of resistance. The center bridging contact is an interlock in the control circuit and its timing is not adjustable.

OPERATION

As the main line contactor closes to start the motor with resistance in series with the motor armature, the No. 538 contactor coil, which is paralleled with a condenser, is disconnected from the line. The condenser immediately discharges through this coil to keep the number 1 and number 2 contacts open for a definite time depending upon their settings. Number 1 contact operates first to short out the first step of the resistor, increasing the rate of acceleration. Number 2 contact then closes to short out another step of resistance to connect the armature across-the-line.

The maximum total timing is about 4 seconds and the number 1 contact must always be adjusted to close before the number 2 contact closes.

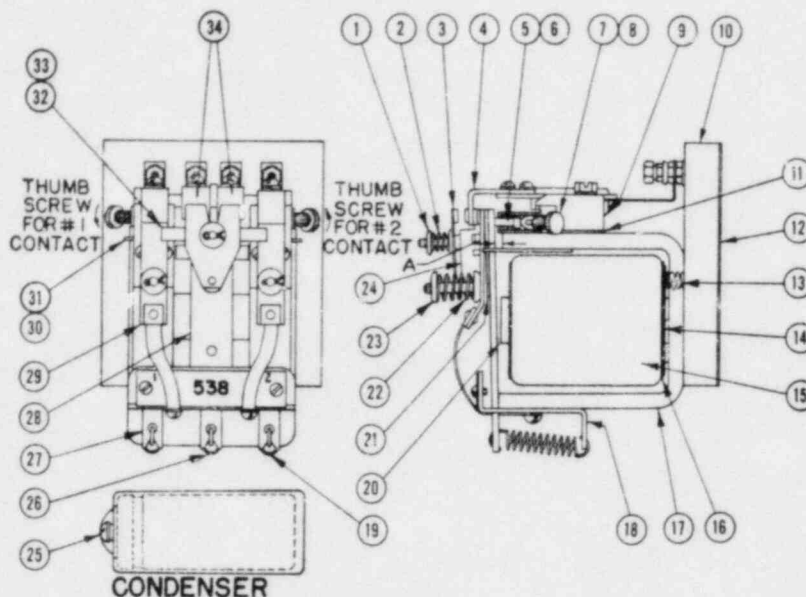
ADJUSTMENT

The contactor is set at the factory for average operating conditions. If it is necessary to change the adjustment, proceed as follows, remembering that contact number 1 must close before contact number 2 closes. The timing on each contact is independent of the setting on the other contact.

TO INCREASE THE TIMING ON THE CONTACTS

Face the contactor and:

- 1—Turn the thumb screws out a slight amount (about $\frac{1}{8}$ to $\frac{1}{4}$ turn) against the direction of the arrow, turning the screw for contact number 2 slightly more than the screw for contact number 1. The armatures of the contactor should be held closed (contacts open) when this is done. Turning the screws in this direction will allow the armatures to move closer to the frame of the contactor, increasing the timing.
- 2—Try the new settings and make further adjustments if necessary.



TO DECREASE THE TIMING OF THE CONTACTS

Face the contactor and:

- 1—Turn the thumb screws in a slight amount (about $\frac{1}{8}$ to $\frac{1}{4}$ turn) in the direction of the arrow, turning the screw for contact number 2 slightly less than the screw for contact number 1. The contactor should be held with its armature closed (contacts open) when this is done, with the contact fingers free to move. Turning the screws in this direction will force the contact fingers away from the frame of the contactor.
- 2—Try the new settings and if not satisfactory make further adjustment.

Important: If it is necessary to replace the contacts, replace all of them at the same time. When replacing these contacts place a $\frac{13}{64}$ " spacer between the outside levers and the ends of the frame at "A" and then set the adjustable stationary contact bracket, item 4, so the contacts just touch. Lock the brackets in this position with the locking screws. For the center contact the dimension "A" should be slightly less than $\frac{7}{32}$ ", but not equal to $\frac{13}{64}$ ".

The above dimensions will provide the proper wear allowance on the contacts which need not be adjusted during their normal life.

RENEWAL PARTS—Information Required

Parts CANNOT be sent promptly unless you include the FOLLOWING with your order: PUBLICATION NO. 12394, ITEM NO., PART NO., DESCRIPTION and COMPLETE NAMEPLATE DATA ON THE CONTROLLER.

Item No.	Description of Part	No. Req.	Part No.	Item No.	Description of Part	No. Req.	Part No.
1	Cup washer	2	16-934-10	21	Plate	2	20-196-2
2	Spring	1	69-348	22	Spring	2	69-698
3	Contact plate	1	21-385	23	Cup washer	4	16-934-11
4	Stationary contact bracket	2	21-470	24	Base	1	17-1145-2
	Insulator (not shown) used between item 4 and item 9	As Req.	56-1938	25	Condenser	1	
5	Pin	2	13-1027		115 volt		42-143-6
6	Spring	2	69-645		230 volt		42-143-5
7	Thumb screw	1	11-592		550 volt (bridging circuit used to provide only 230 volts on condenser)		42-143-5
8	Locking spring	1	69-592	26	Spring	1	69-643
9	Contact base	1	17-1149	27	Armature lever (For No. 1 & 2 contact fingers)	2	24-1186-2
10	Base	1	81-2488	28	Armature lever (center)	1	24-1186
11	Insulator	1	56-867	29	Contact finger with connector	2	21-471
12	Insulator	1	56-1166	30	Guide	1	54-866
13	Spring	1	69-600	31	Guide (For No. 1 contact finger)	1	54-876
14	Steel washer	1	16-1944	32	Interlock bar (For No. 1 contact finger)	1	61-420
15	Coil (Give No. on Coil)	1		33	Interlock bar (For No. 1 and 2 contact fingers)	1	61-419
16	Bakelite washer	2	4416-134	34	Stationary contact bracket	2	21-337-2
17	Frame	1	17-1147		Insulator (not shown) used between item 34 and item 9	As Req.	56-1938
18	Guide	1	54-867	35	Renewal set of contacts (includes items 4, 22 & 29)	1	6-167-2
19	Spring	2	69-843				
20	Core plate	1	51-303				

▲We recommend that these items be stocked. The quantity to be stocked will depend upon the total number in use.

INSTRUCTION SHEET

No. 673 Definite Time Armature Accelerating Contactor

DESCRIPTION

FUNCTION

The function of this contactor is to short out steps of armature resistance. One contactor will short out a maximum of two steps of resistance. The center bridging contact is an interlock in the control circuit and its timing is not adjustable.

OPERATION

As the main line contactor closes to start the motor with resistance in series with the motor armature, the No. 673 contactor coil, which is paralleled with a condenser, is disconnected from the line. The condenser immediately discharges through this coil to keep the number 1 and number 2 contacts open for a definite time depending upon their settings. Number 1 contact operates first to short out the first step of the resistor, increasing the rate of acceleration. Number 2 contact then closes to short out another step of resistance to connect the armature across-the-line.

The maximum total timing is about 4 seconds and the number 1 contact must always be adjusted to close before the number 2 contact closes.

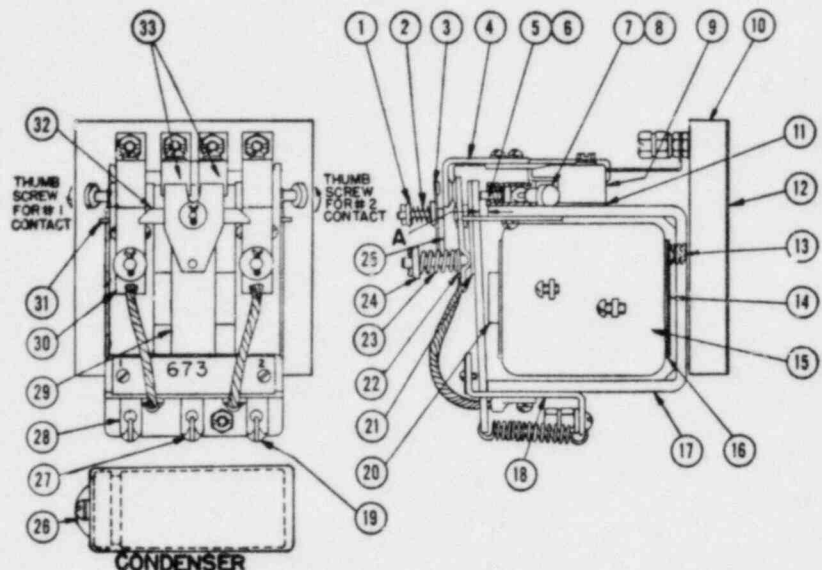
ADJUSTMENT

The contactor is set at the factory for average operating conditions. If it is necessary to change the adjustment, proceed as follows, remembering that contact number 1 must close before contact number 2 closes. The timing on each contact is independent of the setting on the other contact.

TO INCREASE THE TIMING ON THE CONTACTS

Face the contactor and:

- 1—Turn the thumb screws out a slight amount (about $\frac{1}{8}$ to $\frac{1}{4}$ turn) against the direction of the arrow, turning the screw for contact number 2 slightly more than the screw for contact number 1. The armatures of the contactor should be held closed (contacts open) when this is done. Turning the screws in this direction will allow the armatures to move closer to the frame of the contactor, increasing the timing.
- 2—Try the new settings and make further adjustments if necessary.



C10-3487

TO DECREASE THE TIMING OF THE CONTACTS

Face the contactor and:

- 1—Turn the thumb screws in a slight amount (about $\frac{1}{8}$ to $\frac{1}{4}$ turn) in the direction of the arrow, turning the screw for contact number 2 slightly less than the screw for contact number 1. The contactor should be held with its armature closed (contacts open) when this is done, with the contact fingers free to move. Turning the screws in this direction will force the contact fingers away from the frame of the contactor.
- 2—Try the new settings and if not satisfactory make further adjustment.

Important: If it is necessary to replace the contacts, replace all of them at the same time. When replacing these contacts place a 13/64" spacer between the outside levers and the ends of the frame at "A" and then set the adjustable stationary contact bracket item 4 so the contacts just touch. Lock the brackets in this position with the locking screws. For the center contact the dimension "A" should be slightly less than 7/32".

The above dimensions will provide the proper wear allowance on the contacts which need not be adjusted during their normal life.

RENEWAL PARTS—Information Required

Parts CANNOT be sent promptly unless you include the FOLLOWING with your order: PUBLICATION NO. 12396, ITEM NO., PART NO., DESCRIPTION and COMPLETE NAMEPLATE DATA ON THE CONTROLLER.

Item No.	Description of Part	No. Req.	Part No.	Item No.	Description of Part	No. Req.	Part No.
1	Cupwasher.....	2	16-934-10	20	Core plate.....	1	51-303
▲ 2	Spring.....	1	69-348	21	Plate.....	2	20-448
▲ 3	Contact plate.....	1	21-385	22	Sleeve.....	2	29-1841
▲ 4	Stationary contact bracket.....	2	21-577	▲ 23	Spring.....	2	69-1110
	Insulator (not shown) used between item 4 and item 9.....	As Req.	56-1938	24	Cupwasher.....	2	916-561Z
5	Pin.....	2	13-1027	25	Base.....	1	17-1145-2
▲ 6	Spring.....	2	69-645	26	Condenser.....		
7	Thumb screw.....	2	11-592		For steel panel or insulated panel		
8	Locking spring.....	1	69-592		115 volts.....	...	42-143-6
9	Contact base.....	1	17-1149		230 volts.....	...	42-143-8
10	Base (when used).....	1	81-2488	▲ 27	Spring (center).....	1	69-643
11	Insulator.....	1	56-867	28	Armature lever (For No. 1 & 2 contact fingers).....	2	24-2161
12	Insulator (when used).....	1	56-1166	29	Armature lever (center).....	1	24-1186
13	Spring.....	1	69-600	▲ 30	Contact finger w/connector.....	2	40-376
14	Steel washer.....	1	16-1944	31	Guide.....	1	54-606
▲ 15	Coil (Give No. on Coil).....	1		32	Interlock bar.....	1	61-419
16	Bakelite washer.....	2	4416-134	▲ 33	Stationary contact bracket.....	2	21-387-2
17	Frame.....	1	17-1147		Insulator (not shown) used between item 33 and item 9.....	As Req.	56-1938
18	Guide.....	1	54-867	▲ 34	Renewal set of contacts (includes items 4, 24, 31).....	1	6-167-4
▲ 19	Spring (For No. 1 & 2 contact fingers).....	2	69-843				

▲ We recommend that these items be stocked. The quantity to be stocked will depend upon the total number in use.