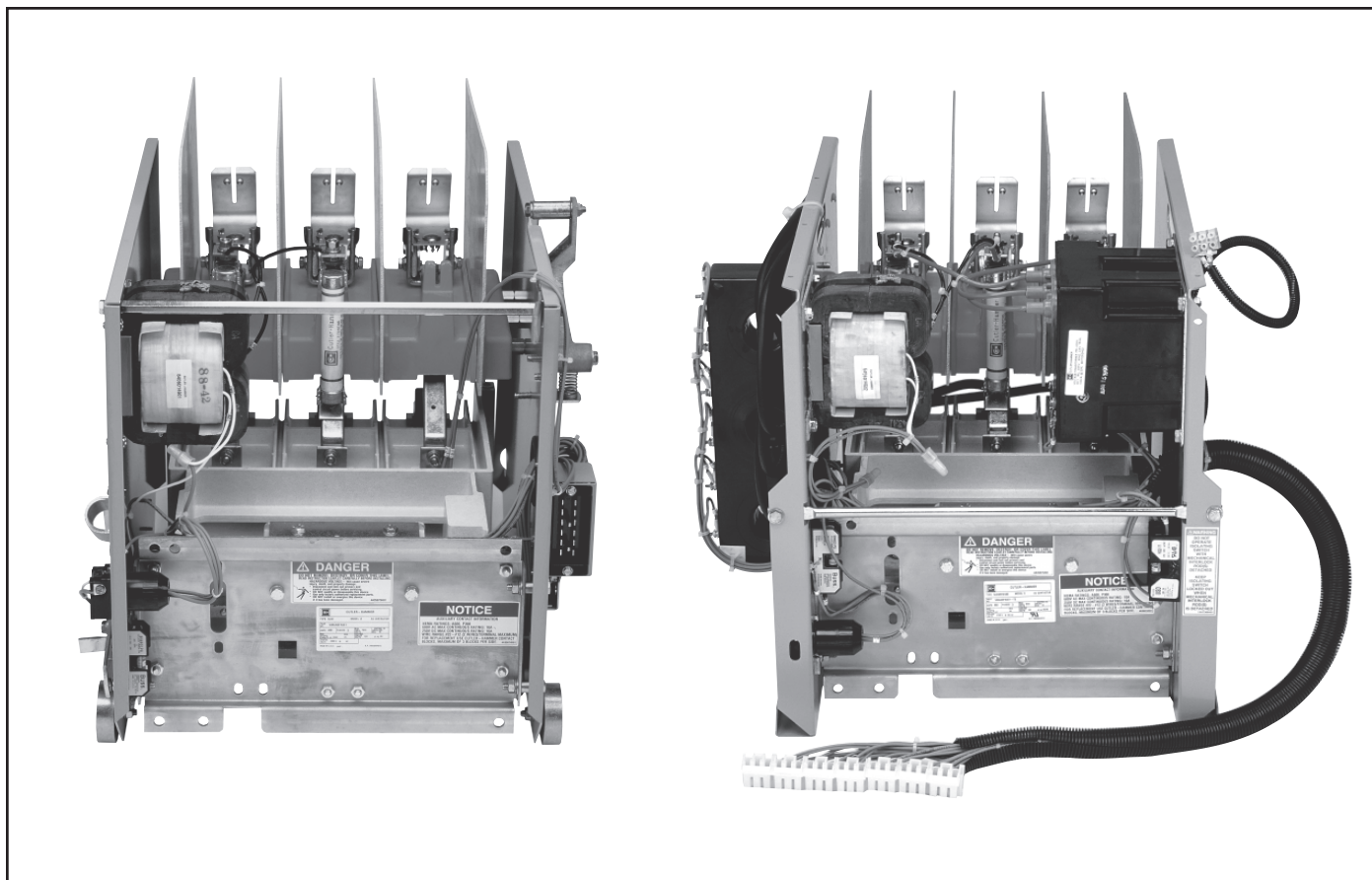




## Instructions for the Installation, Operation, and Maintenance of SL 400 Roll In and Slide In Medium Voltage Vacuum Contactors



**DANGER**

### HAZARDOUS VOLTAGE.

**READ AND UNDERSTAND THIS MANUAL IN ITS ENTIRETY BEFORE INSTALLING OR OPERATING THIS CONTACTOR. QUALIFIED PERSONNEL MUST PERFORM INSTALLATION, ADJUSTMENT, AND MAINTENANCE OF THESE CONTACTORS. A QUALIFIED PERSON IS ONE WHO IS FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THIS EQUIPMENT AND WHO IS AWARE OF THE HAZARDS INVOLVED. THIS INSTRUCTION BOOK SHOULD NOT**

**BE CONSIDERED ALL-INCLUSIVE REGARDING INSTALLATION, ADJUSTMENT, AND MAINTENANCE PROCEDURES.**

### DESCRIPTION

The Cutler-Hammer SL OEM Contactor is a medium voltage (7.2kV maximum) 400A vacuum contactor used for the control of three-phase motors, transformers, and other high voltage equipment. Refer to Table I for horsepower and kVA ratings for the contactor.

The SL Contactor utilizes Cutler-Hammer vacuum interrupters that exhibit both, a long electrical life and a high interruption capability. Ratings for the contactor are shown in Table II.

TABLE I. APPLICATION DATA

SL-400 amp	2200 to 2500 V	3000 to 3600 V	3800 to 4800 V	6000 to 6900 V
Induction Motor (HP)	1750	2250	3000	4500
Synchronous Motor (0.8 PF) (HP)	1750	2250	3000	4500
Synchronous Motor (1.0 PF) (HP)	2000	2500	3500	5500
Transformer (K VA)	1500	2000	2500	4000
Capacitor* (K VAR)	1200	1650	2400	3300
*NOT for back-to-back switching				

TABLE II. RATINGS

<b>Maximum Interrupting Current (3 OPS.)</b>	8500 Amps (SL-400)	<b>Control Voltages</b> AC DC	Selectable: Refer to Table IIIa 110/120, 220/240, 50/60Hz 125
<b>Rated Current</b>	400 A Enclosed (SL-400)	<b>Control Circuit Burden</b> Closing (200 Milliseconds) 110/120 AC, 125 DC 220/240 AC	1 kVA 1.8 kVA
<b>Maximum Rated Voltage</b>	7.2kV	Holding 110/120 AC, 125 DC 220/240 AC	40 VA 50 VA
<b>Making/Breaking Capacity</b>	4000 Amps	<b>Auxiliary Contact Rating</b> Voltage (Max.) Continuous Current Making Capacity (AC) (DC)	600 V 10 A 7200 VA 125 VA
<b>Short Time Current</b> 30 Sec. 1 Sec. 8.7 MS (0.5 Cycle)	2400 A 6000 A 63kA Peak (I <sup>2</sup> t=5.89mega-joules)	Breaking Capacity (AC) (DC) Min. Voltage/Current	720 VA 125 VA 5V/100mA
<b>Mechanical Life</b>	2,500,000 Operations	<b>Latch (when Specified)</b> Mechanical Life Trip Voltage (DC) (DC) (AC)	250,000 operations 24 Volts 125 Volts 110/120 volts
<b>Electrical Life</b>	300,000 Operations	Min. Trip Voltage	80% Rated Coil Voltage
<b>BIL</b>	60 kV (1.2 x 50 Microseconds)	Trip Burden (24 VDC) (125 VDC) (110 VAC & 120 VAC)	400 VA 400 VA 400 VA
<b>Dielectric Strength (60 Hz)</b>	20 kV (1 Minute)	Trip time	30 M sec (2 cycles)
<b>Closing Time</b> (Energization To Contact Touch)	80 Milliseconds		
<b>Opening Times</b>	30 to 330 Milliseconds Dip Switch Selectable Refer to Table IIIb		
<b>Arcing Time</b>	12 mS (0.75 Cycle) or Less		
<b>Pickup Voltage</b>	80% Rated Coil Voltage		
<b>Dropout Voltage</b>	60% Rated Coil Voltage		

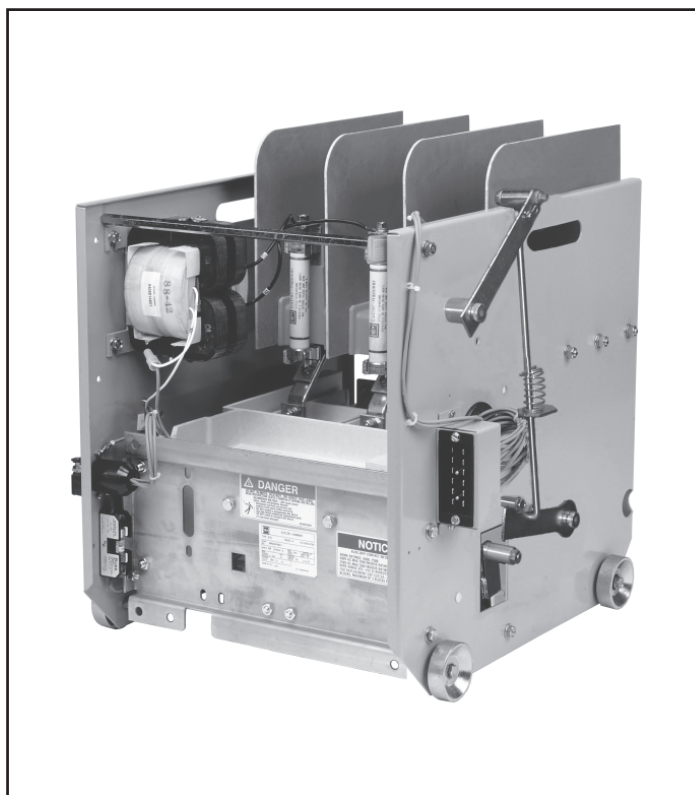


Fig. 1a. Front View – Roll In Contactor

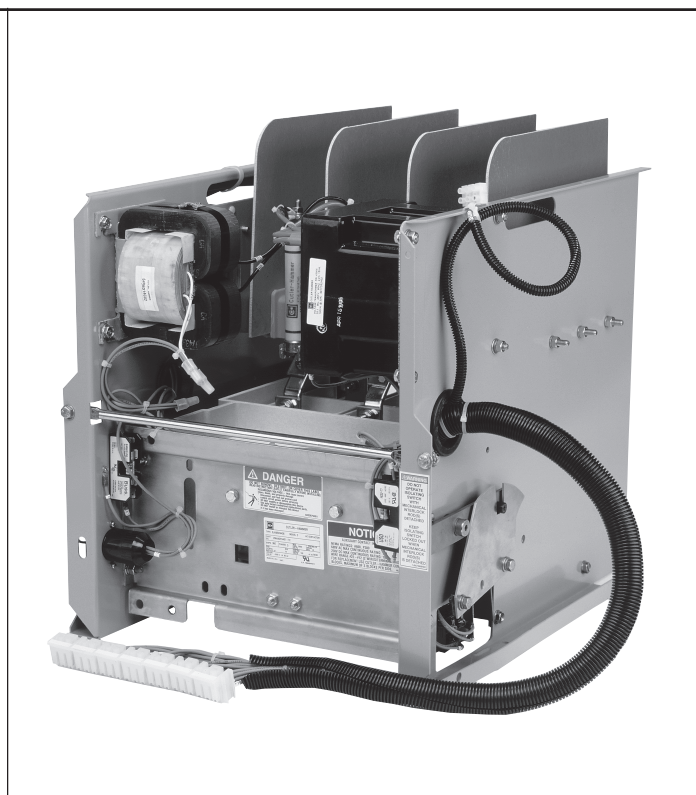


Fig. 1b. Front View – Slide In Contactor



Fig. 1c. Rear View – Roll In Contactor

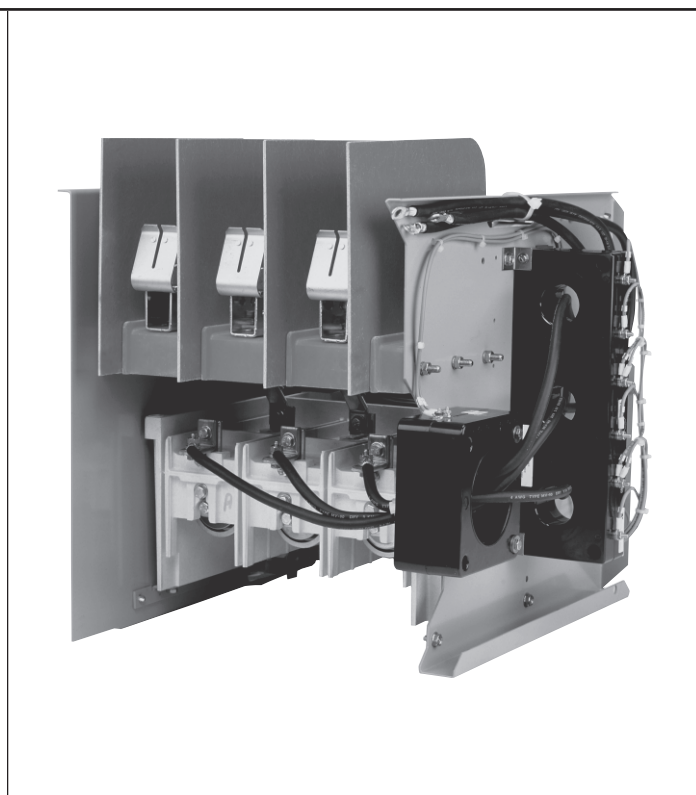
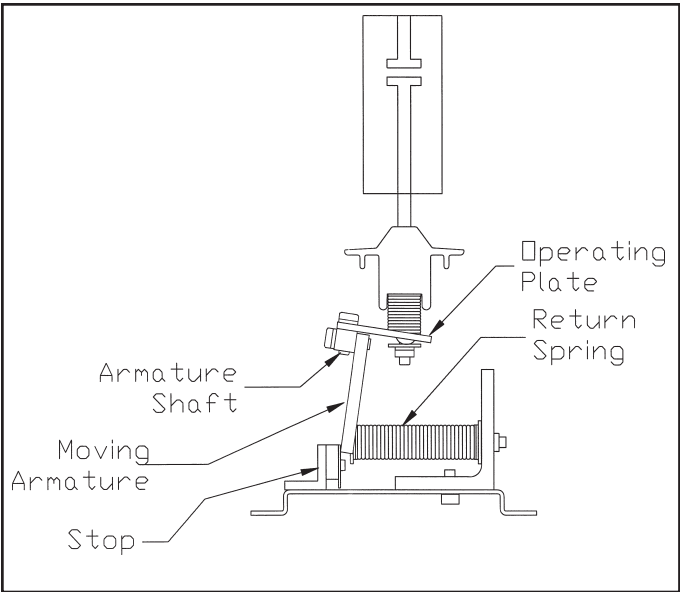


Fig. 1d. Rear View – Slide In Contactor

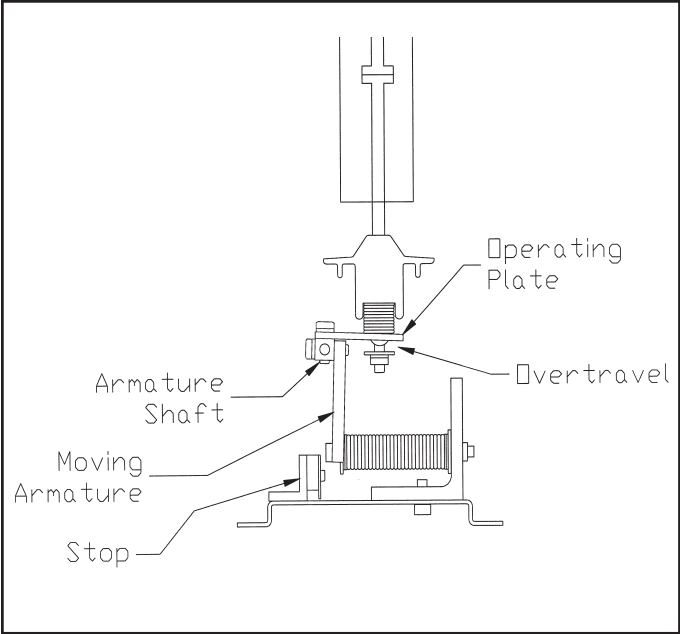


**WARNING**

**SATISFACTORY PERFORMANCE OF THESE CONTACTORS IS CONTINGENT UPON PROPER APPLICATION, CORRECT INSTALLATION AND ADEQUATE MAINTENANCE. THIS INSTRUCTION BOOK MUST BE CAREFULLY READ AND FOLLOWED IN ORDER TO OBTAIN OPTIMUM PERFORMANCE FOR THE LONG, USEFUL LIFE OF THE CONTACTOR.**



*Fig. 2 Contactor open*



*Fig. 3 Contactor closed*

**CONTACTOR OPERATION**

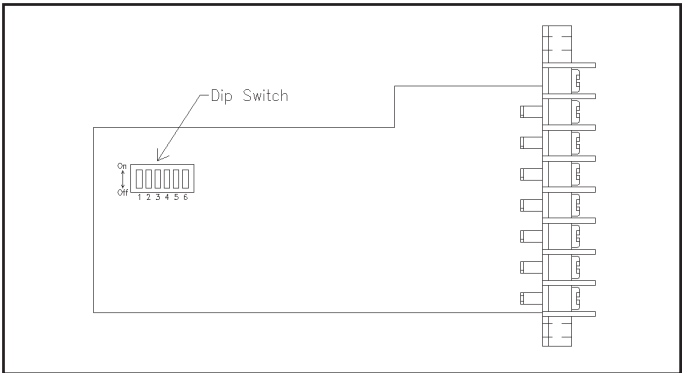
**Magnetically Held Contactor**

A return spring located behind the moving armature plate (Figure 2) holds the contactor in the open position with the main coils deenergized.

The contactor is closed by energizing the contactor control board with the appropriate control voltage at terminals 1 and 2. The control board rectifies the input voltage and applies a pulse width modulated DC output voltage to the coils. The output voltage is approximately full voltage for the first 200 milliseconds after energization, during which time the contactor closes and seals. The output voltage is then automatically reduced to approximately 15 VDC to maintain the contactor in the closed position.

The coil cores are magnetized which rotates the armature shaft, moving armature, and operating plate. As the operating plate moves toward the coil cores, the main contacts close. The plate continues to move an additional distance (known as overtravel) which allows for contact preload and wear (Figure 3).

When control power is removed from the control board, the SL is held closed for a preset time and then opens. The range of time between the removal of control power



*Fig. 4 Coil Control Board with Dip Switch*

TABLE IIIa. DIP SWITCH SETTING—CONTROL VOLTAGE			
Setting	SW1	SW2	SW3
110 Vac 50 Hz	Off	Off	Off
120 Vac 60 Hz	On	Off	Off
220 Vac 50 Hz	Off	On	Off
240 Vac 60 Hz	On	On	Off
125 VDC	Off	Off	On



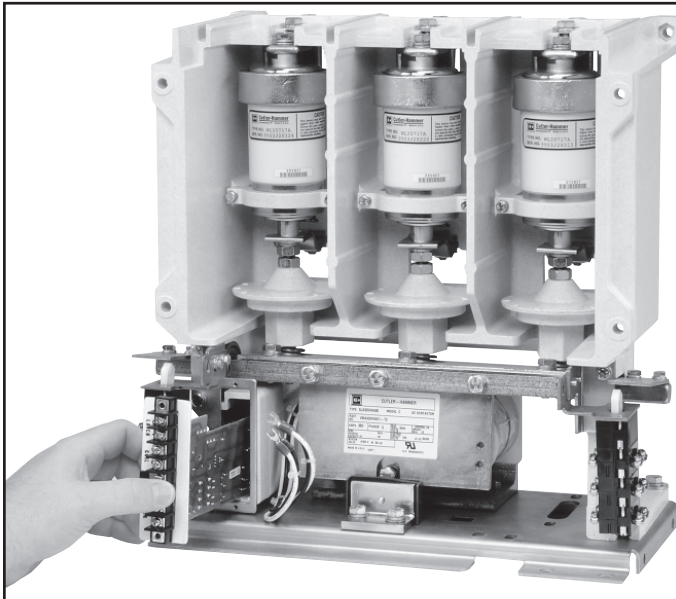


Fig. 5 Coil Control Board Removal

TABLE IIIb. CONTROL BOARD DROPOUT SETTINGS			
Delay Setting	SW4	SW5	SW6
30 ms	Off	Off	Off
50 ms	On	Off	Off
130 ms	Off	On	Off
250 ms	On	On	Off
330 ms	Off	Off	On

and contact opening is from 30 to 330 milliseconds. The time can be adjusted for such factors as fuse coordination and voltage loss ride-through. Unless otherwise specified, the factory default dropout setting is 50 milliseconds, or approximately 3 line cycles (60Hz). Refer to section on **Fuse Selection and Coordination**, located on page 7, for more information on selecting the correct dropout time.

As the moving armature is rotated to the open position by the return spring, it impacts the stop assembly located at the front of the contactor (Figure 2). The stop assembly absorbs much of the kinetic energy of the moving armature and reduces the over-travel of the vacuum interrupters as the contactor is forced open.

A selectable dip switch is located on the control board for setting the control voltage level and the contactor dropout time (Figure 4). The control board must be removed from its cavity in the contactor housing to gain access to the dipswitch. Table IIIa lists the available voltage settings and Table IIIb lists the available dropout settings. These tables are also printed on the back of the control board.

**NOTE: PREVIOUS VERSIONS OF THIS BOARD HAVE BEEN RELEASED. IF THE CONTROL BOARD DOES NOT MATCH THE DESCRIPTION ABOVE, PLEASE REFER TO THE ORIGINAL DOCUMENTATION SUPPLIED WITH THE EQUIPMENT.**

### Mechanically Latched Contactor

The mechanically latched contactor is closed in the same manner as the magnetically held contactor. After the contactor is electrically closed, a mechanical latch is engaged that holds the moving armature plate in the closed position. Power should then be removed from the control board. Refer to Figure 10, on page 7, for typical schematic for latched contactor.

To open the contactor, the unlatch coil is energized with the appropriate control voltage. The coil engages a release lever on the latch mechanism. The contactor is then forced open by the return spring.

Refer to IB 48020 for instructions for the mechanical latch attachment. Dropout set to maximum delay.

### Auxiliary Contacts

An operating lever attached to the rotating shaft operates a set of auxiliary contacts located on the left side of the

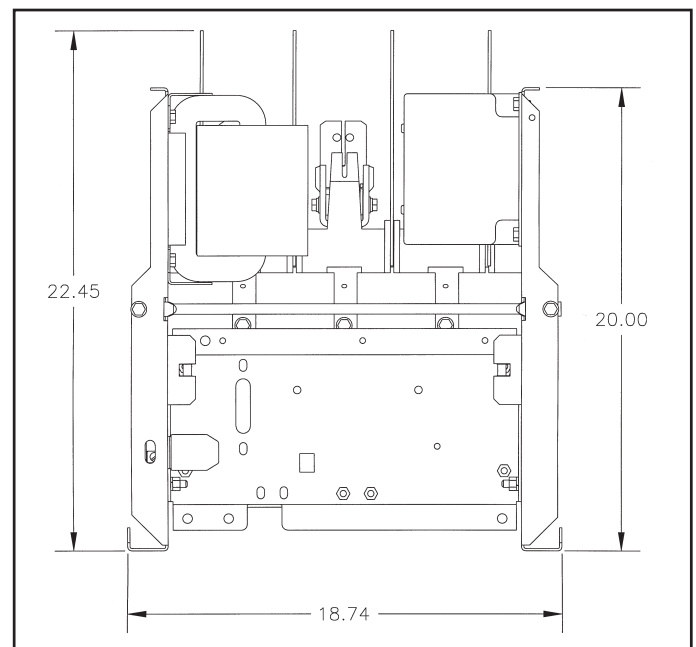


Fig. 6a Dimensions, Front View – Slide In

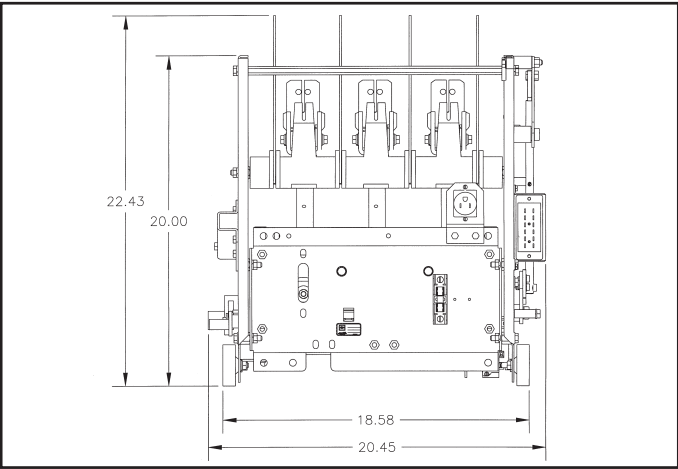


Fig. 6b Dimensions, Front View – Roll In

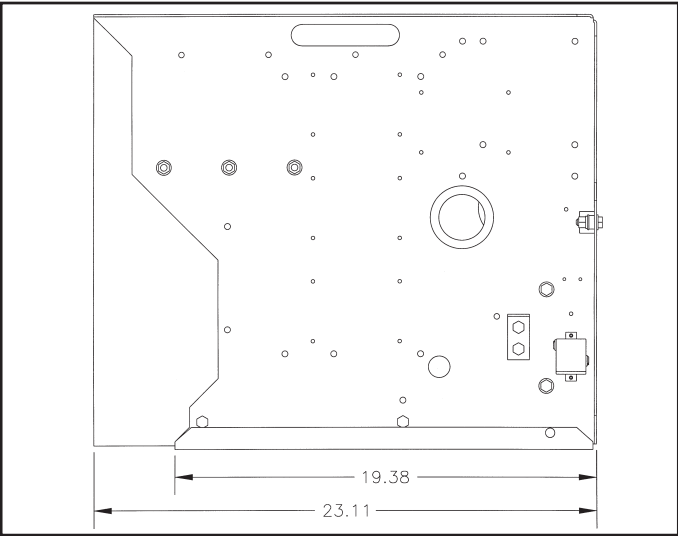


Fig. 6c Dimensions, Side View – Slide In

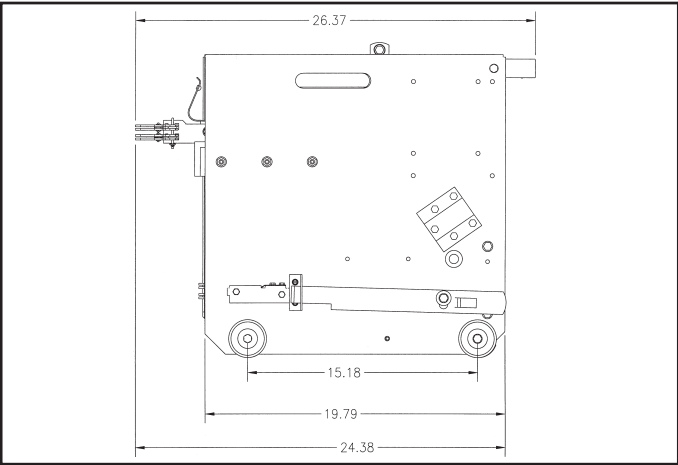


Fig. 6d Dimensions, Side View – Roll In

contactor (Figure 1a). The standard configuration is 2NO-2NC contacts. An additional set of 6 auxiliary contacts can be added to the right side of the contactor. The auxiliary contacts are rated 600VAC, 10 amps continuous. Minimum ratings are 5 volts, 100 milliamps. Refer to Table II for make/break ratings.

**Installation**

The contactor is designed to be mounted in either a vertical or horizontal configuration. Standard mounting is through the steel contactor base. Optional mounting is through the mounting points molded into the contactor frame. See Figures 6-a, b, c, d for dimensions.

The SL contactor is intended for installation in a suitable environment. Table IV lists the normal service conditions for the SL.

TABLE IV. SERVICE CONDITIONS		
Altitude:	Refer to factory	-3500 to -1001 meters
	Standard	-1000 to +2000 meters
	Refer to factory	+2001 to +5000 meters
Humidity:	95% max., non-condensing	
Temperature:	-5 to +40 degrees C	
Location:	Clean, free from moisture or corrosive atmospheres	

**Wiring**

Refer to Figure 7 for standard control wiring for magnetically held contactors. To close the contactor, apply power to terminals 1 and 2 on the control board. Power must be maintained to terminals 1 and 2 to keep the contactor in the closed position. The main coils are connected to terminals 5 and 6. Note that the white wire from coil one and the black wire from coil two are connected to terminal 5, while the black wire from coil one and the white wire from coil two are connected to terminal 6.

Refer to Figure 8 for standard control wiring for mechanically latched contactors. To close the contactor, apply power to terminals 1 and 2 on the control board.

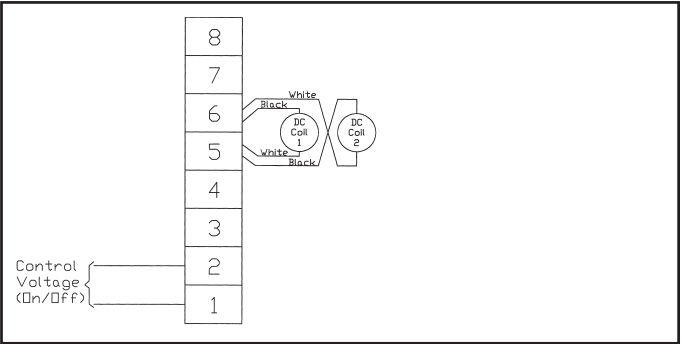


Fig. 7 Connections for Magnetically Held Contactor

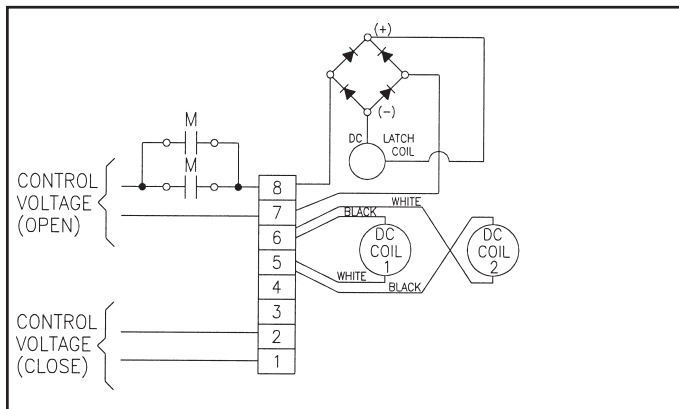


Fig. 8 Connections for Mechanically Latched Contactor

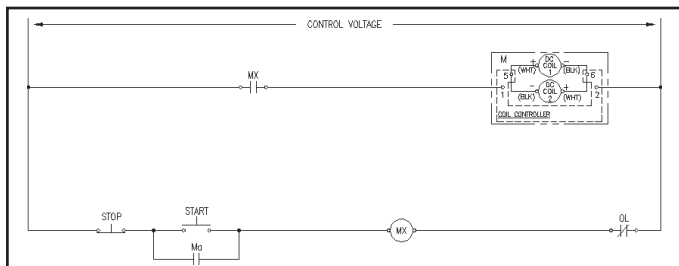


Fig. 9 Typical Schematic for Magnetically Held Contactor

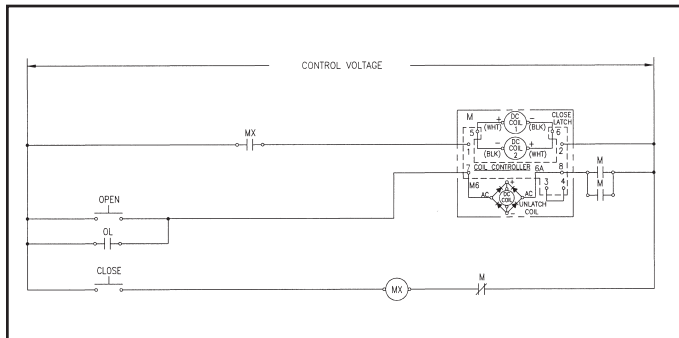


Fig. 10 Typical Schematic for Mechanically Latched Contactor

After the contactor is closed, control power must be removed from terminals 1 and 2. Terminals 7 and 8 are connected to the unlatch coil through a fullwave diode bridge. A normally open auxiliary contact (Ma) must be wired in series with the unlatch coil to prevent burnout of the coil. For more information refer to IB48020.

Typical schematics for magnetically held and mechanically latched contactors are shown in Figures 9 and 10.

### Fuse Selection and Coordination

Fuse selection is dependent on motor locked rotor current, acceleration time, and full load current. To prevent fuse fatigue it is recommended that the minimum melting time of the fuse always exceed the locked rotor current times a safety factor of 1.25 at the motor acceleration

time. The motor full load current must always be less than the fuse continuous current rating. Unless more specific information is known, the fuse may be selected from Table V, which is based on typical motor data.

During high-power testing the SL contactor was confirmed to properly coordinate with Cutler-Hammer Type CLS current limiting motor starting fuses. Tests were conducted with 5.08kV-24R and 7.2kV-24R fuses. The contactor successfully withstood the let-through energy of each fuse for a 50kA available symmetrical fault at the rated voltage of the fuse. Maximum let-through occurred with the 5.08kV fuse. The maximum observed current was a 63kA peak, with  $I^2t$  equal to 5.89 mega-joules. If fuses with greater values are to be applied with the SL contactor, retesting is required.

Proper coordination must be maintained between the contactor interrupting rating, contactor dropout time, and the total clearing time of the main fuse. Care must be exercised when selecting the dropout time setting on the contactor control board. The contactor must not open on a fault greater than its rated interrupting current. By holding the contactor closed for the appropriate time, the fuse will clear if the fault current exceeds the contactor rating. Delays in relay settings should not be included in the calculation since it is likely that the voltage will collapse and allow the contactor to drop open no matter what the setting of the relay. Table V on the next page lists the Cutler-Hammer CLS motor starting fuses and the minimum contactor dropout setting to insure proper coordination. Minimum dropout times may be preferred since they will minimize fault damage when used in conjunction with protective relays with instantaneous trip functions.

To prevent significant overvoltage when a fuse interrupts a fault current, select the fuse with the minimum voltage rating that exceeds the maximum voltage of the power system.

For more information, refer to Cutler-Hammer Application Data 36-693, which includes minimum-melt, total clearing, and let-through curves for Type CLS motor fuses.

### INITIAL START-UP

Before the initial start-up of the contactor, the following tasks should be completed:

1. Inspect the contactor for any damage during shipment and installation.
2. Perform a vacuum integrity test as described in the section on maintenance.
3. Set dip switches on the coil control board for the proper control voltage and dropout time. Factory setting is for 120 volts, 50 milliseconds (unless otherwise specified).
4. Sequence the control circuit, including closing the contactor with the main power circuits deenergized and locked out.

**TABLE V. FUSE APPLICATION TABLE FOR SL CONTACTORS**

SL-400	Motor FI Voltage	Fuse	Rating	Min. Opening Time	
	11.0-18 2400-4800V	449D597G06	170-6R	30	
	18-31	449D597G06	170-6R	30	
	31-46	449D597G06	170-6R	30	
	46-62	449D597G06	170-6R	30	
	62-74	449D597G06	170-6R	30	
	74-93	449D597G06	170-6R	30	
	93-137	151D933G02	230-12R	30	
	137-187	151D933G02	230-12R	30	
	187-244	151D933G03	390-18R	60	
	244-360	151D933G04	450-24R	130	
	360-400**	151D933G04	450-24R	130	**For FLA>360,Max Accel Time = 6 seconds
	11.0-34 5500-6900	151D963G05	170-6R	30	
	34-46	151D963G05	170-6R	30	
	46-56	151D963G05	170-6R	30	
	56-68	151D963G05	170-6R	30	
	68-85	151D963G05	170-6R	30	
	85-137	151D963G07	230-12R	30	
	137-187	151D963G07	230-12R	30	
	187-273	151D963G10	390-18R	60	
	273-400	151D963G11	450-24R	250	

Note: Fuse selections based on LRC = FLA x 6, acceleration time of 10 seconds except where noted.

- Verify that the contactor will be connected to an incoming power supply and outgoing load with characteristics agreeing with the contactor ratings.
- Verify that all connections are neat, tight, and of the proper capacity for the connected load. Power cables must be installed to exit perpendicular to the rear face of the contactor to prevent phase-to-phase creepage and clearance problems.
- Check the insulation level of the starter and record for future reference. See section on **Maintenance** below.
- Be certain that all safety precautions have been taken and the installation conforms to applicable regulations and safety practices.

The contactor should be serviced on a regular basis. The time interval between maintenance checks is variable and dependant on factors such as environment, duty cycle, etc. Unless the experience of the maintenance personnel suggests a different service interval, the contactor should go through a checkout after each 50,000 operations or annually, whichever occurs first.

#### GENERAL

The contactor should be kept clean and free from dust and other accumulated deposits. Dust can be removed from the contactor by blowing with dry air that is free from lubricants.

Inspect for loose joints that produce excess heat and discolor conductors. Verify that insulation has not been damaged by high temperatures. Do not over-torque bolts while verifying tightness. All hardware is metric property class 8.8. Refer to Table VI for recommended torque values.

#### MAINTENANCE



**DANGER**

**ALL WORK PERFORMED ON THIS CONTACTOR SHOULD BE DONE WITH THE MAIN DISCONNECT DEVICE OPEN AND LOCKED OUT. AS WITH ANY CONTACTOR OF THIS VOLTAGE, THERE IS DANGER OF ELECTROCUTION AND/OR SEVERE BURNS. MAKE CERTAIN THAT POWER IS OFF. CHECK FOR VOLTAGE WITH VOLTAGE SENSOR OR A METER OF THE APPROPRIATE RANGE. MAKE CERTAIN THAT ALL TRANSFORMERS ARE ISOLATED TO PREVENT FEEDBACK AND THE RESULTANT GENERATION OF HIGH VOLTAGE.**

**Table VI. Recommended Torque Values for Property Class 8.8 Metric Hardware\***

Diameter (mm)	Torque N-m	lb-in	lb-ft
4	2.8 - 3.1	24 - 27	-
5	5.6 - 6.2	49 - 55	-
6	9.4 - 10.4	83 - 92	-
8	22.9 - 25.4	203 - 225	17 - 19
10	45.5 - 50.6	402 - 447	34 - 37
12	79.2 - 88.0	701 - 779	58 - 65

\*unless otherwise specified



Verify wiring by grasping each wire and pulling to check tightness.

Check for hairline cracks in high stress areas such as auxiliary contact operating arm, baseplate, auxiliary contact mounting bracket, etc.

### VACUUM INTEGRITY CHECK



**DANGER**

**THIS PROCEDURE REQUIRES THE USE OF A HIGH POTENTIAL TEST UNIT WHICH PRODUCES HAZARDOUS VOLTAGES.**



**WARNING**

**APPLYING HIGH VOLTAGES ACROSS THE OPEN CONTACTS OF A VACUUM INTERRUPTER MAY PRODUCE X-RAYS. THE RADIATION MAY INCREASE WITH AN INCREASE IN THE VOLTAGE OR A DECREASE IN THE DISTANCE BETWEEN THE OPEN CONTACTS. THE LEVELS OF RADIATION GENERATED AT THE RECOMMENDED TEST VOLTAGES AND NORMAL CONTACTOR OPEN GAP SPACING ARE EXTREMELY LOW. HOWEVER, AS A PRECAUTIONARY MEASURE IT IS RECOMMENDED THAT ALL OPERATING PERSONNEL STAND AT LEAST THREE FEET AWAY FROM THE CONTACTOR WHILE PERFORMING THIS TEST.**

Vacuum contactors depend on the vacuum in each interrupter to successfully stop current flow to the connected load when the contactor opens.

SL contactors are thoroughly tested at the factory prior to shipment. They can, however, be damaged by improper handling during shipment and storage. The integrity of the vacuum interrupters should therefore be verified before the contactor is energized for the first time. The check should also be made each time the contactor is serviced or repaired; otherwise the test should be performed each 50,000 operations or annually, whichever occurs first.

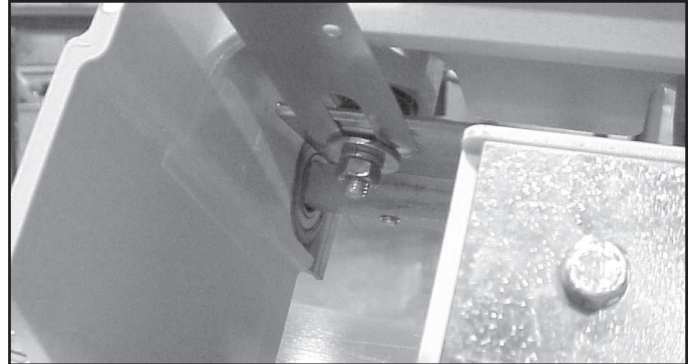
To verify the integrity of the vacuum interrupters a voltage of 16kV-ac should be applied across the open contacts of the interrupters. The voltage should be applied for 60 seconds without breakdown. Breakdown is defined as a current of 5mA or more flowing across the open contacts. Note that approximately 1mA of current will flow through each interrupter during the AC test due to the capacitance of the vacuum interrupter.

If a DC high potential test unit is used, make certain that the peak voltage does not exceed 23kV, the peak of the corresponding AC RMS test voltage. A megger cannot be used to verify vacuum integrity due to its limited output voltage.

### INTERRUPTER WEAR CHECK

The interrupters used in the SL contactor are designed for long electrical life. Replacement should be at 300,000 operations except in cases of plugging or jogging, which may require more frequent replacement. Verification of contact wear can be made by following the procedure below.

The overtravel gap for a new SL contactor is .080" and is set at the factory. As the contacts wear, the overtravel is reduced. The SL interrupter design allows for .080" wear before replacement is required. To verify that the contacts are not worn beyond their allowable limits, close the contactor with rated control power. Insert the .020" contactor wear gauge, p/n 5259C11H01, between the operating plate and the washer on the lower insulator stem of each pole. Refer to Figure 11. If the gauge cannot be freely inserted on each pole, all three interrupters must be replaced. Refer to the section **VI Replacement** for instructions on replacing the interrupters.



*Fig. 11 – Interrupter Wear Check*

### VI REPLACEMENT

If the vacuum interrupters fail the vacuum integrity or wear check, or if they have more than 300,000 operations, they must be replaced. The three interrupters must be replaced as a set.



**CAUTION**

**THERE ARE BELLOWS IN EACH INTERRUPTER THAT SEAL THE MOVING CONTACT FROM THE ATMOSPHERE. THESE BELLOWS ARE FRAGILE AND**

**MUST BE PROTECTED FROM ANY TORSIONAL LOADING. AN APPROPRIATE TOOL MUST SUPPORT THE MACHINED FLATS ON EACH END OF THE INTERRUPTER WHEN TIGHTENING ANY HARDWARE ON THE INTERRUPTER. BOTTLE WRENCH, CUTLER-HAMMER PART NUMBER 4A36081H01, IS PROVIDED WITH EACH SET OF REPLACEMENT VI'S AND SHOULD BE USED IN THIS APPLICATION.**

Remove each VI using the steps listed below:

1. Loosen locknut securing threaded rod to top of standoff insulator (Figure 12). Note the number of threads between the two 10mm nuts.
  2. Rotate insulator clockwise to screw insulator off threaded rod.
  3. Remove clamp securing lower end of VI to housing (Figure 13).
  4. Remove bolt and shunt supports securing end of lower terminal to housing (Figure 14).
  5. Remove the bolt securing VI to upper terminal (Figure 15).
  6. Hold insulator down and rotate lower portion of VI assembly forward to remove (Figure 16).
  7. Insert new VI assembly (reverse of step 6).
  8. Install the bolt securing VI to upper terminal; do not tighten.
  9. Install bolt and shunt supports securing lower terminal to housing (Figure 17). When tightening, insure laminated shunt is straight and shunt supports are in correct position.
  10. Tighten bolt securing VI to upper terminal while holding bottle wrench on upper VI stem. Torque to 200 lb-in (22.6 Nm). Insure the laminated shunt is not twisted.
  11. Install clamp securing lower end of VI to housing.
  12. Rotate insulator counter-clockwise until the number of threads noted in step 1 is obtained.
3. From the point the light flickers, rotate insulator on middle phase bottle counter-clockwise three and two-thirds turns to establish a 5.5mm open gap. Use markings on insulator to verify correct rotation. (Two-thirds turn is equal to 8 divisions that are molded on the surface of the insulator.)
  4. Slowly rotate the main shaft, closing the VI's, until the middle phase light is on. Adjust the insulators on the two outside phases so that the lights on all three phases come on simultaneously, (DO NOT MOVE THE INSULATOR ON THE MIDDLE PHASE) while rocking the main shaft open and closed.
  5. Tighten locknuts securing threaded rod to top of each insulator. Use bottle wrench to insure standoff insulator does not rotate during this operation.
  6. Perform test as described in section on **Vacuum Integrity Check** on page 19 before returning contactor to service.

#### Coil Replacement

1. Remove the coil leads from terminals 5 and 6 on the control board. Cut the wire-tie securing the coil leads to the baseplate.
2. Remove the coil mounting angle by removing the two angle mounting bolts located on the bottom of the contactor baseplate (Figure 18). Be careful not to allow the angle to move abruptly as the bolts are removed since there is pressure applied to the angle by the return spring. Remove coil assembly from contactor.
3. Remove the locknut holding the return spring bolt on the back of the mounting angle (Figure 19). Note: After removing locknut, count the threads protruding through the mounting angle to insure correct length during reassembly.
4. Unscrew the spring assembly by hand and remove from the angle (Figure 20).
5. Slip the two coils from the cores.
6. Install the two new coils over the cores (Figure 21).
7. Thread the return spring assembly into the mounting angle until the locknut under the bottom spring retainer just contacts the angle. The number of threads protruding through the mounting angle should be the same as counted in step 3 above. Do not overtighten since this would compress the return spring and prevent the proper force from being applied to the operating plate on opening. The rear locknut for the return bolt should then be tightened on the back of the angle.

#### Adjusting VI's

After 3 new VI's have been installed, set the proper open gap using the steps listed below. Three battery operated test lights or continuity testers are needed for the proper setting of the open gap.

1. Attach test lights across the upper and lower terminals of each interrupter.
2. Rotate insulator on middle phase bottle until light flickers. Rotate clockwise if light is not on, counter-clockwise if light is on.



Fig. 12



Fig. 16



Fig. 13

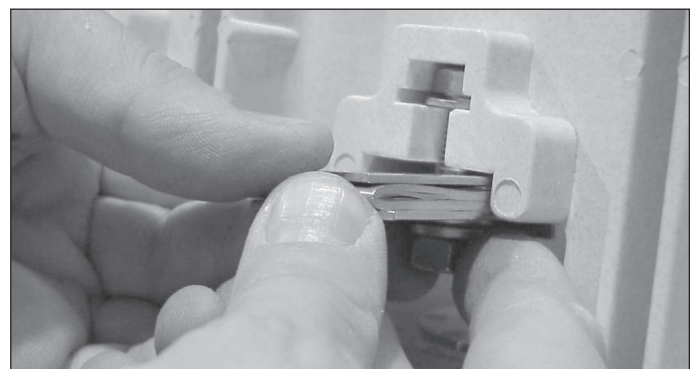


Fig. 17

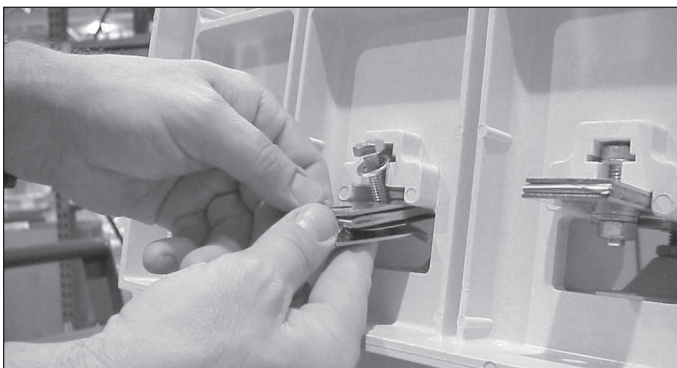


Fig. 14



Fig. 15

8. Secure the angle to the contactor baseplate using the two mounting bolts. Sufficient force must be applied to the angle to compress the return spring and allow the threaded holes in the angle to align with the appropriate holes in the baseplate.
9. Connect the coil leads to the appropriate terminals on the control board. Secure the leads using a wire tie and the hole in the baseplate to insure that the leads do not become abraded. Before the contactor is reinstalled, verify proper operation using test power. When power is applied, the contactor should close cleanly. When power is removed, the moving armature should securely contact the stop assembly.

#### Control Board Check and Replacement

To verify the output of the control board, apply rated control voltage to terminals one and two.



**WARNING**

**VERIFY THAT THE APPLIED POWER CANNOT BE FED BACK INTO ANY CPT OR OTHER CIRCUIT, WHICH MAY GENERATE DANGEROUS VOLTAGES.**



Using a standard hand-held multimeter, check the dc output of the board at terminals 5 and 6. The voltage should be approximately 9 to 16 volts. If there is no output, the board must be replaced. If there is an output voltage, but it is not within this range, remove the board and verify the dip switch settings.

To remove the board, wires connected to terminals 1, 2, 5, and 6 (7 and 8 also, if mechanical latch is installed) must be disconnected. Make certain that the wires are properly marked before disconnecting to insure the ability to reconnect them to the proper terminal. After the wires are disconnected, loosen the mounting screws located at the top and the bottom of the terminal block. The board may now be withdrawn from its mounting compartment.

Before a new board is installed, make certain that the dip switches are properly set. Refer to Table IIIa, Table IIIb or pages 4 and 5. Installation is the opposite of removal.

### Stop Assembly Replacement

If the stop assembly becomes worn, it should be replaced.

To replace, close the contactor with test power. Remove the two bolts securing the assembly to the baseplate. Install a new assembly. Hand-tighten bolts. Set gap between the armature plate and stop to 0.534 in.  $\pm$  0.004 in. using adjustment block provided with replacement stop assembly, torque bolts to 214 lb-in (24.2 N-M). (See fig. 22).

### Auxiliary Contact Maintenance and Replacement

If standard contact blocks become oxidized due to very low current levels passing through the contacts, they may be cleaned by periodically disconnecting them from the circuit and circulating approximately 10 amps through the contacts for a short period of time.

If one or more of the auxiliary contacts fail, it is recommended that the complete contact block assembly be replaced. Disconnect wiring to each contact, making sure to properly mark each wire to insure proper reconnection. Remove the two mounting screws securing the contact assembly to the bearing retainer. Install the replacement assembly, securing with the two mounting screws. The contacts are properly adjusted when the plunger to operating arm gap is .110 inches (Figures 23 and 24).



Fig. 18 Remove the coil mounting angle



Fig. 19 Remove the locknut securing the return spring bolt



Fig. 20 Unscrew the return spring assembly

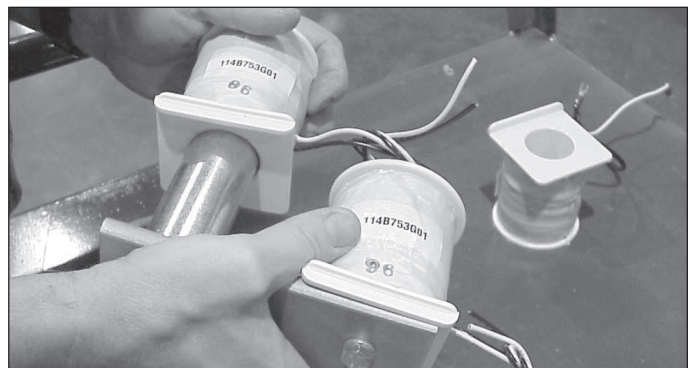


Fig. 21 Install new coils on cores

### Insulation Level Check

After installation and before energizing the contactor for the first time, the insulation level should be checked and recorded. Check the resistance between poles and from each pole to ground with a megger. Record all readings. It is not practical to specify an absolute value for this reading since it is dependent on other connected apparatus and conditions of service. However, any unusually low readings (below 1 meg per 1000 volts), or abrupt reduction in a reading would indicate a possible source of trouble, and the cause should be investigated and corrected. As previously discussed, the insulation level check cannot verify vacuum interrupter integrity.

### Contact Resistance Check

Testing that measures the contact resistance of the VI's is not recommended since the results can vary widely on good contacts. If a resistance check is performed, the best results will be with a test module that will force 50 to 100 amps through the contacts while measuring resistance. Any value under 300 micro-ohms can be considered typical, although higher readings may be measured if the test equipment is not connected near the contactor terminals.

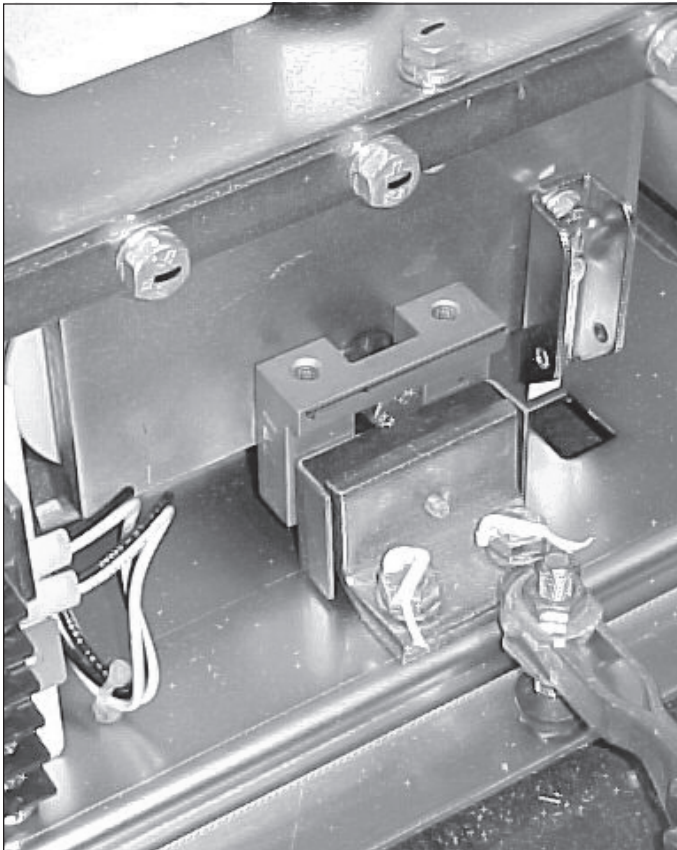


Fig. 22 Stop assembly adjustment block

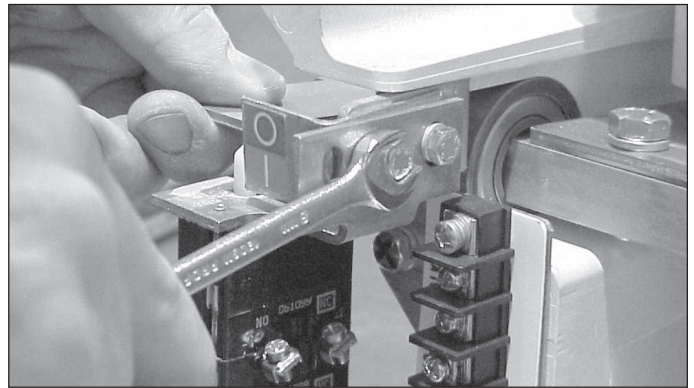


Fig. 23 Remove the two mounting screws securing the contact assembly to bearing retainer

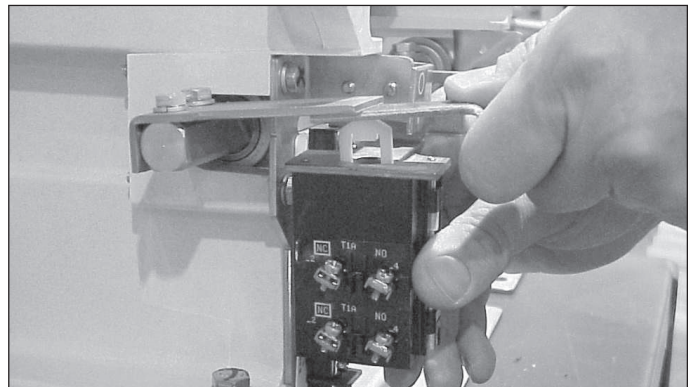


Fig. 24 Adjust the gap between plunger and operating arm to .110 inches



**Replacement Parts**

Following is a partial list of the replacement parts available for the SL Contactor. Contact your Cutler-Hammer distributor for price and availability.

P/n	Description
2147A58G02	Vacuum Interrupter Assembly for SL-160/200/320/400
2147A58G03	Coil Control Board
2147A58G04	Auxiliary Contact Kit (2NO-2NC)
2147A58G05	Auxiliary Contact Kit 3NO-3NC (for Latched Contactor)
2147A58G11	Dual Coil Assembly (all voltages)
2147A58G14	Stop Assembly
2147A58G22	Return Spring Assembly
2147A58G25	24VDC Latch Coil with Rectifier
2147A58G27	110/120VAC, 125VDC Latch Coil with Rectifier
2147A58G28	220/240VAC Latch Coil with Rectifier



**Cutler-Hammer**

221 Heywood Road  
Arden, NC 28704

---

Effective 04/03  
Printed in U.S.A./CCI

