SIEMENS

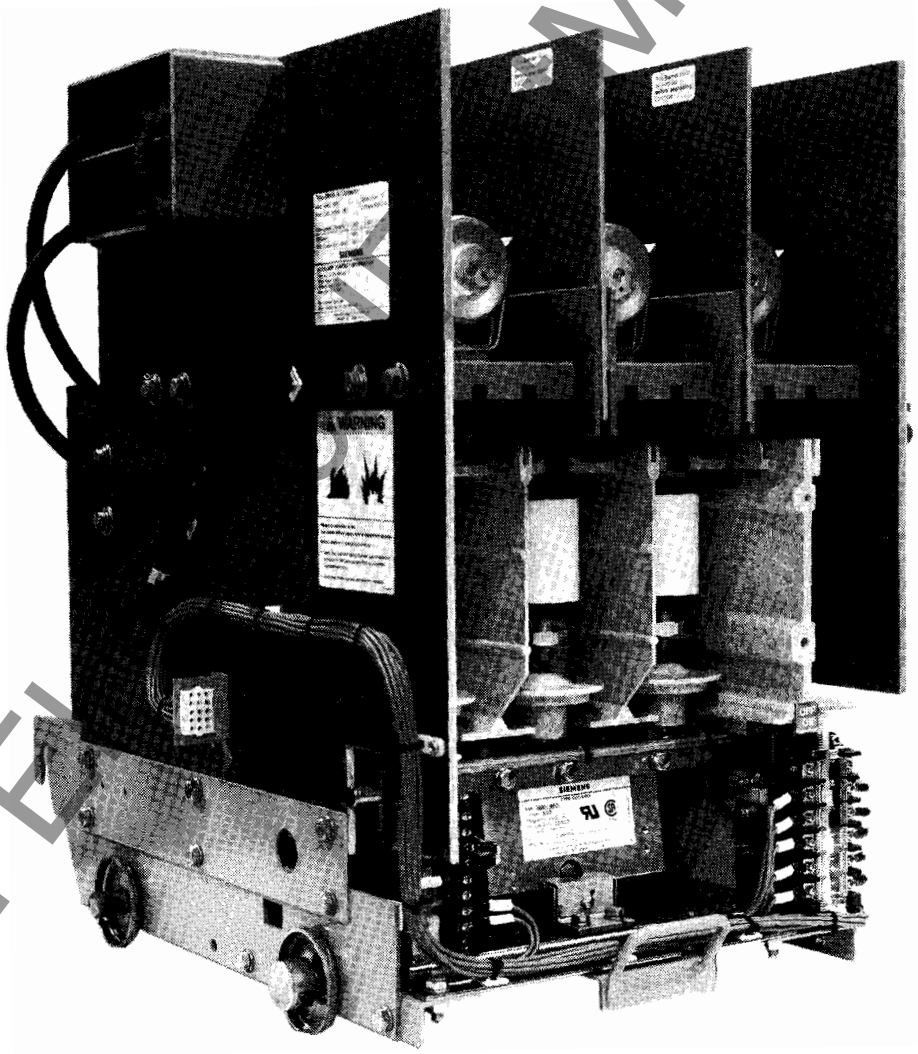
Series 81000™

5-7.2kV Medium Voltage Vacuum Contactors

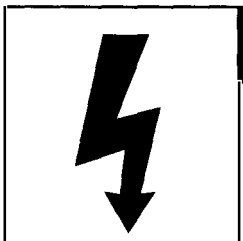
Types 93H35 or 94H35 (5kV)

Types 93H37 or 94H37 (7.2kV)

Instructions
Installation
Operation
Maintenance
MVC-9078



Bulletin MVC-9078



⚠ DANGER

Hazardous voltages.

Will cause death, serious personal injury or equipment damage.

Always de-energize and ground the equipment before maintenance.

Maintenance should be performed only by qualified personnel. The use of unauthorized parts in the repair of the equipment or tampering by unqualified personnel will result in dangerous conditions which will cause severe personal injury or equipment damage. Follow all safety instructions contained herein.

IMPORTANT

The information contained herein is general in nature and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation, and maintenance of the equipment purchased. Siemens reserves the right to make changes in the specifications shown herein or to make improvements at any time without notice or obligations. Should a conflict arise between the general information contained in this publication and the contents of drawings or supplementary material or both, the latter shall take precedence.

QUALIFIED PERSON

For the purpose of this manual a qualified person is one who is familiar with the installation, construction or operation of the equipment and the hazards involved. In addition, this person has the following qualifications:

(a) **is trained and authorized** to de-energize, clear, ground, and tag circuits and equipment in accordance with established safety practices.

(b) **is trained** in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.

(c) **is trained** in rendering first aid.

SUMMARY

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local sales office, listed on back of this instruction guide.

The contents of this instruction manual shall not become part of or modify any prior or existing agreement commitment or relationship. The sales contract contains the entire obligation of Siemens Energy & Automation, Inc. The warranty contained in the contract between the parties is the sole warranty of Siemens Energy & Automation, Inc. Any statements contained herein do not create new warranties or modify the existing warranty.

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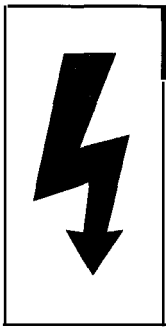
Introduction
The 93H3 and 94H3 families of Medium Voltage Contactors are designed to meet all applicable NEMA standards. Successful application and operation of this equipment depends as much upon proper installation and maintenance by the user as it does upon the careful design and fabrication by Siemens.

The purpose of this Instruction Manual is to assist the user in developing safe and efficient procedures for the installation, maintenance and use of the equipment.

Contact the nearest Siemens representative if any additional information is desired.



⚠ DANGER

Hazardous voltages.

Will cause death, personal injury or property damage.

Turn off power supplying this equipment before any adjustment, servicing, wiring, parts replacement, or any act requiring physical contact with electrical working components is performed.

This equipment must be installed, operated and maintained only by qualified persons thoroughly familiar with the equipment, instruction manuals and drawings.

Qualified Person

For the purpose of this manual a **"Qualified Person"** is one who is familiar with the installation, construction or operation of the equipment and the hazards involved. In addition, this person has the following qualifications:

- Training and authorization to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- Training in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses, face shields, flash clothing, etc., in accordance with established safety procedures.
- Training in rendering first aid.

Signal Words
The signal words **"Danger"**, **"Warning"** and **"Caution"** used in this manual indicate the degree of hazard that may be encountered by the user. These words are defined as:

Danger–Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Warning–Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Caution–Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Dangerous Procedures
In addition to other procedures described in this manual as dangerous, user personnel must adhere to the following:

1. Always work on de-energized equipment. Always de-energize a contactor, and remove it from the equipment before performing any tests, maintenance or repair.
2. Always let an interlock device or safety mechanism perform its function without forcing or defeating the device.

Field Service Operation
Siemens can provide competent, well-trained Field Service Representatives to provide technical guidance and advisory assistance for the installation, overhaul, repair and maintenance of Siemens equipment, processes and systems. Contact regional service centers, sales offices or the factory for details.

Description

General

Siemens Type 93H3 and 94H3 vacuum contactors are provided for use in Series 81000™ medium voltage controllers. These contactors provide the advantage of long mechanical and electrical life with low maintenance. They are suitable for loads of all types, including three-phase motors, transformers, capacitors and resistive loads.

The overall dimensions of the vacuum contactor are 18 inches (457mm) wide by 27.5 inches (699mm) high by 23.87 inches (606mm) deep. The vacuum contactor with single or double barrel power fuses can be installed in Series 81000 Class E2 controllers of either one high (5kV or 7kV), two high (5kV) or three high (5kV) construction.

The type 93H3 or 94H3 vacuum contactor consists of: (1) a low voltage section which contains the main coil drive and auxiliary contacts; (2) a medium voltage section which houses the vacuum interrupter, and (3) a support structure which provides mounting for the power fuses, control transformer and primary fuses, and drawout attachments. Since interruption is accomplished completely within the vacuum interrupters, items such as arc chutes, blowout coils and pole plates are not required with vacuum contactors.

Voltage surge suppressors are sometimes furnished at the controller load terminals to limit transient overvoltages caused by multiple reignitions which may occur due to the use of vacuum interrupters. For application guidelines see the instruction manual for Series 81000™ Controllers–MVC-9068.

Table 1: 93H3/94H3 Contactor Ratings

Fused Contactor Type	Maximum Voltage Rating	Enclosed Continuous Ampere Rating	Interrupting Capacity		Impulse Level (BIL) (kV)
			Unfused Class E1 Controller (kA)	Fused Class E2 Controller (MVA)	
93H35 94H35	5.0kV	360	7kA	200 @ 2.3kV 350 @ 4.0kV 400 @ 4.6kV	60
93H37 94H37	7.2kV	360	7kA	570 @ 6.6kV	60

Table 2: Maximum motor fuse and transformer fuse rating.

Fused Contactor Type	3 Phase Horsepower Rating at Utilization Voltage									Maximum Motor Fuse Rating	Transformer Loads				
	2300V			4000-4600V			6600V				Maximum 3-Phase kVA at Distribution Voltage				Maximum Transf Fuse Rating
	Syn. Motors		Ind. Motors	Syn. Motors		Ind. Motors	Syn. Motors		Ind. Motors						
	0.8PF	1.0PF		0.8PF	1.0PF		0.8PF	1.0PF			2400V	4160V	4800V	6900V	
93H35 94H35	1500	1750	1500	2500	3000	2500	–	–	–	24R	1500	2500	2500	–	450E
93H37 94H37	–	–	–	–	–	–	4000	5000	4000	24R	–	–	–	1500	200E

Table 3: Operating Data (Mechanically Held)

Rated Voltage	7200 Volts
Rated Current	400 Amps (open), 360 Amps (enclosed)
Interrupting Capacity	7000 Amps RMS Symmetrical
Permissable Switching Frequency	1200/Hour
Mechanical Life	2,500,000 Operations
Electrical Life	250,000 Operations
Closing Time	80ms or less
Opening Time	340ms or less (optional 25ms, consult factory)
Arcing Time	10ms or less
Pick-Up Voltage AC or DC, Nominal	85% Rated (Hot) - 70% Rated (Cold)
Drop-Out Voltage AC or DC, Nominal	50% Rated (Hot) - 40% Rated (Cold)
Rated Control Voltage AC	115/120 or 230/240V 50/60Hz
Rated Control Voltage DC	120/125 or 240/250V
Coil Circuit Inrush	670VA AC (700W DC)
Coil Circuit Holding	85VA AC (85W DC)
Auxiliary Contact Arrangement	3 N.O. - 3 N.C. (2 N.O. and 2 N.C. available for purchaser's use)
Auxiliary Contact Rating	10A, 600V (NEMA Class A600)

Table 4: Operating Data (Latched Type)

Permissable Switching Frequency	300/Hour
Mechanical Life	250,000 Operations
Control Voltage Options Available	24VDC, 32VDC, 48VDC, 125VDC, 250VDC
Tripping Voltage	40-60% Rating DC
Tripping Current	4.8A DC Max

SVC-93H Contactor

The 93H3 and 94H3 families of drawout contactors incorporate the Siemens SVC-93H3 contactor, mounted in a drawout carriage. The construction of the basic SVC-93H3 contactor is shown in **Figure 1** on the following page.

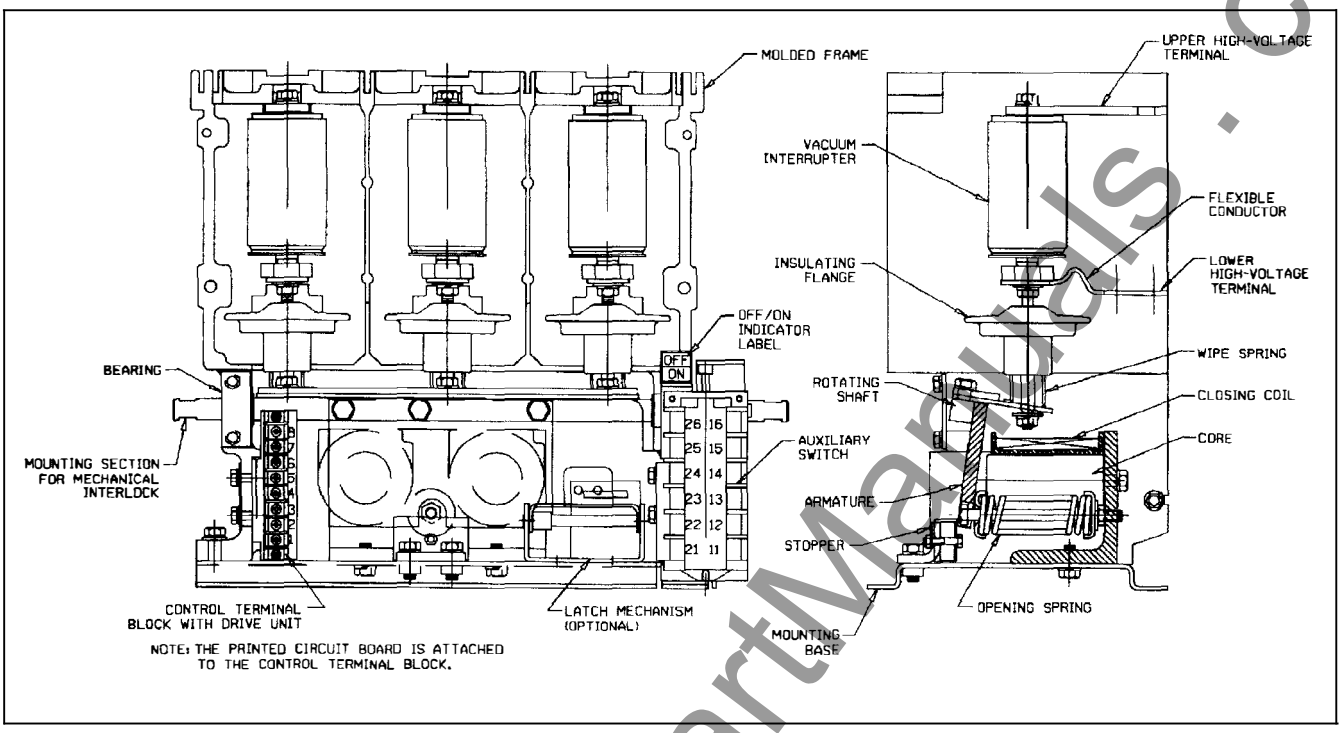


Figure 1: Construction of Basic SVC-93H3 Contactor

Use of 93H3 or 94H3 Contactor in Other Cells

The types 93H3 and 94H3 contactors differ in the manner in which the interlocks are constructed and operate. Therefore, 93H3 and 94H3 contactors are not interchangeable with each other. Similarly, these contactors are not directly interchangeable with the earlier 90H3 contactors. Modifications necessary to allow use of a 93H3 or a 94H3 contactor in a 90H3, 93H3, or 94H3 cell are summarized in **Table 5**.

Table 5: Modification Matrix for Use of 93H3/94H3 Contactor in 90H3/93H3/94H3 Cells

		Contactor Type	
		93H3	**94H3**
Power Cell (Compartment) Type	90H3	Cell modification kit 25-213-200-501 required. Mount per 25-154-488-424. Kit includes new interlock spring and replacement mechanical latch. Modified cell will allow use of either 90H3 or 93H3 contactor.	Cell modification kit 25-154-555-805 required. Mount per 25-213-213-405. Kit includes replacement interlock parts. Modified cell will no longer allow use of 90H3 contactor.
	93H3	—	Cell modification kit 25-154-555-804 required. Mount per 25-213-213-404. Kit includes replacement interlock parts. Modified cell will no longer allow use of 93H3 contactor.
	94H3	Modification of contactor required. Remove cable interlock assembly from 93H3 contactor, and replace with new interlock lever to convert to 94H3 configuration. Cell interlock modification also required. Use modification kit 25-154-555-811, which includes parts needed for contactor as well as for cell. Mount per 25-213-213-411.	—

Service Conditions
The 93H3 and 94H3 vacuum contactors should be used in the following conditions:

Table 6: Normal Service Conditions

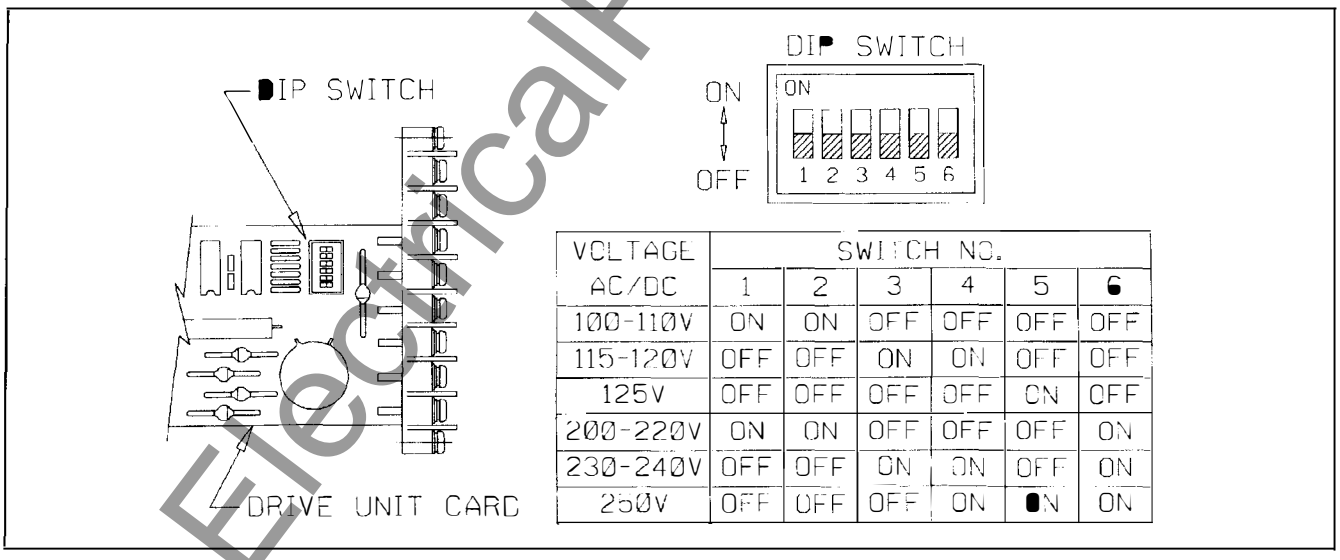
- Altitude:	Less than 2,000m (6600 ft) Above 2,000m consult factory
- Ambient temperature:	-5°C min. to +40°C max. Its average over a period of 24 hr does not exceed +35°C
- Relative humidity:	45% min. to 85% max.

If the contactor is to be used in conditions other than those specified above, please consult Siemens.

The location where the contactor is to be installed should be free from dust, corrosive gas and moisture. When it is to be used in a chemical plant or in outdoor panels, take necessary precautions against corrosion, water seepage and condensation.

Control Voltage Setting
The drive unit for the closing coil assembly is installed in a cavity in the molded frame housing. The closing circuit can be operated by applying either AC or DC to this drive unit. The optional latch trip circuit uses DC as standard. When a latched contactor is operated using AC power, it is recommended that a capacitor trip device be used.

The control voltage is preset at factory to match the CPT secondary voltage or external supplied power. Refer to **Figure 2** for dip switch setting.



VOLTAGE AC/DC	SWITCH NO. 1	2	3	4	5	6
100-110V	ON	ON	OFF	OFF	OFF	OFF
115-120V	OFF	OFF	ON	ON	OFF	OFF
125V	OFF	OFF	OFF	OFF	ON	OFF
200-220V	ON	ON	OFF	OFF	OFF	ON
230-240V	OFF	OFF	ON	ON	OFF	ON
250V	OFF	OFF	OFF	ON	ON	ON

Figure 2: Control Voltage Selection for Closing Coil

Application Considerations
1) Verify that the voltage and current applied is within the specified ratings. **(See Tables 1 and 2)**
2) When the contactor is used with an induction heater facility, the switching life of the vacuum interrupter is approximately 250,000 operations. The vacuum interrupter should be replaced after 250,000 operations.
3) When the contactor is applied to a capacitor load, be sure to use a space heater to keep humidity low. Be sure to use a heater adequately sized for the compartment in which the contactor is installed. The contactor should always be applied with a protective power fuse.
4) Avoid touching the surface of the vacuum interrupter with soiled hands. Damage to the silicone finish on the interrupter may result. If the interrupter becomes dirty, simply clean it with a non-toxic cleaner such as denatured alcohol.

Blown Fuse Trip Mechanism
Contactors can be supplied with an anti-single phase trip mechanism which offers protection from single phasing due to a blown power fuse. Fused contactors equipped with the blown fuse trip mechanism are pre-adjusted at the factory so that the opening of one or more power fuses results in de-energizing the contactor coil, thus interrupting current to the load. When a power fuse blows, a plunger extends from the load end of the fuse which rotates the spring-loaded trip bar and releases a pre-compressed micro-switch on the side of the contactor. A contact on the micro-switch opens at this time and de-energizes the contactor magnet coil.

Mechanically Latched Contactors
Mechanically latched contactors are available which consist of a standard 93H3 or 94H3 contactor with the addition of a mechanical latch assembly. The mechanical latch holds the armature of the contactor closed against the magnet core after the contactor is energized (closed) and control power is removed. A pushbutton on the high voltage compartment door, when manually depressed, trips the contactor by releasing the mechanical latch. Electrical trip with an internal solenoid is optionally available from the normal control transformer source or from a stored energy (capacitor) source which is charged from the normal control source. The stored energy source provides reliable trip power for a

maximum delay of 5 minutes after loss of control power. Special trip circuits energized from remote power sources can be provided. The contactor latch is designed for DC control power. Standard control circuit options are available for 115V and 230 VAC trip circuits using rectifiers or rectifiers with capacitors to convert AC to DC to operate the mechanical latch.

Refer to **Tables 3 and 4** for latched contactor operating data. Refer to specific drawings supplied with the equipment for details on connection and operation.

Nomenclature

The contactor configuration can be identified through the nomenclature description shown in **Table 7.**

Table 7: Contactor Catalog Number System

9XH3 X X X XX X X X X X

Contactor Type
93H3 = Cable interlock
94H3 = Lever interlock

Insulation Voltage
5 = 5 kV
7 = 7.2 kV

Number of Poles
3 = 3 Poles

Interruption Capacity
1 = 7.0 kA
2 = 200 MVA
3 = 350 MVA
4 = 400 MVA
5 = 570 MVA

Main Fuse Rating

00-NONE	33 = 150E
02 = 2R	34 = 200E
03 = 3R	35 = 250E
04 = 4R	36 = 300E
06 = 6R	37 = 325E
09 = 9R	39 = 350E
10 = 10E	40 = 375E
12 = 12R	41 = 400E
15 = 15E	42 = 450E
18 = 18R	99 = MISC
20 = 20E	
24 = 24R	
25 = 25E	
26 = 30E	
27 = 40E	
28 = 50E	
29 = 65E	
30 = 80E	
31 = 100E	
32 = 125E	

CPT Primary Voltage
0 = No CPT
2 = 2300V 60Hz
3 = 3300V 60Hz
4 = 4000V 60Hz
5 = 4600V 60Hz
6 = 3300V 50Hz
7 = 6600V 60Hz
8 =
9 = Other (Max. 7200V)

CPT Secondary or Control Circuit Voltage
A = 115VAC
B = 230VAC
C = 125VDC
D = 250VDC
E = Other
N = None

CPT capacity in kVA
0 = No CPT
1 = 0.75 kVA
2 = 1.5 kVA
3 = 2.0 kVA
4 = 2.5 kVA
5 = 3.0 kVA
6 = 3.25 kVA
7 = Other

A = Drawout Contactor
F = Fuse Carriage (for 720A Controller)
T = Drawout Contactor
w/ Anti-Single Phase Trip Bar

Variable (if used)
L = Latched Contactor w/Electrical Trip
C = Latched Contactor w/Capacitor Trip
S = Special Contactor, See drawing

Receiving Inspection

An immediate inspection should be made for any damage which may have occurred during shipment upon receipt of this equipment. The inspection should include examination of the packaging material and the contactor. Be sure to look for concealed damage and do not discard the packaging material. If damage is found, note damage on "Bill of Lading" prior to accepting receipt of the shipment, if possible.

NOTE: The way visible shipping damage is treated by the consignee prior to signing the delivery receipt can determine the outcome of the damage claim to be filed. Notification to the carrier within the 15 day limit on concealed damage is essential if loss resulting from unsettled claims is to be eliminated or minimized.

A claim should be immediately filed with the carrier, and the Siemens sales office should be notified if damage or loss is discovered. A description of the damage and as much identification information as possible should accompany the claim.

Handling

For convenience and safety in lifting or moving the contactor, a lifting device similar to that shown in **Figure 3** should be used.

NOTE: The lifting device is not intended to be used as a means of transporting the contactor in the raised position. The contactor should be transported with the lifting device in its lowered position.

A crane or hoist is not recommended for lifting of the contactor.

If a forklift is utilized, the following precautions should be taken when moving contactors:

1. Keep the contactor in an upright position only.
2. Make sure the load is properly balanced on the forks.
3. Place protective material between the contactor and the forklift to prevent bending or scratching.
4. Securely strap the contactor to the forklift to prevent shifting or tipping.
5. Excessive speeds and sudden starts, stops, and turns must be avoided when handling the contactor.
6. Lift the contactor only high enough to clear obstructions on the floor.
7. Take care to avoid collisions with structures, other equipment, or personnel when moving the contactor.
8. **Never lift a contactor above an area where personnel are located.**

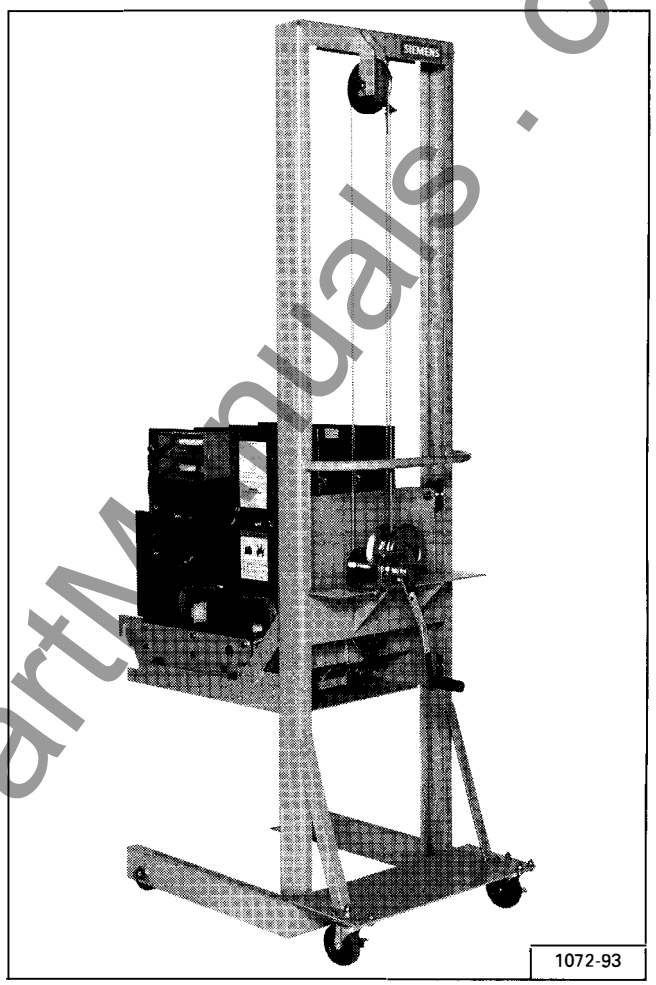


Figure 3: Use of lift device with 93H3 or 94H3 contactor

Storage

The contactor must be stored in a clean, dry, dust and condensation free environment if it cannot be placed into service reasonably soon after receipt. Do not store equipment outdoors. A standard 150 watt light bulb, connected to burn continuously, should be placed within the contactor to prevent condensation.

⚠ WARNING

Hazardous voltages.

Can cause electric shock, burn or electrocution.

Disconnect and lockout incoming power and control voltage sources before beginning work on this or any other electrical equipment.

Check all control circuit terminals with a voltmeter to make certain that the equipment is totally de-energized.

Use only approved high voltage test equipment to check voltage on power terminals. Do not attempt to measure high voltage with a volt-ohm meter.

It is recommended that a safety ground be connected to the power bus after the system has been de-energized, and prior to working on the equipment.

Follow the procedure outlined in the pre-energization check section of this manual before power is restored.

Site Preparation and Mounting

Installation shall be in accordance with the National Electric Code, ANSI, and NFPA 70 Standards.

The contactor should be installed in a clean, dry, heated location with good ventilation. It should be readily accessible for cleaning and inspection and should be carefully set up and leveled on its supporting foundation and secured in place.

All adjustments have been made at the factory before shipping and generally no change is required. See that all contact surfaces are clean and smooth, and that current-carrying parts are not damaged.

⚠ WARNING

Hazardous voltages.

Can cause shock, burn or electrocution.

Dielectric or megger testing should only be conducted by qualified personnel. Refer to instructions provided with the testing equipment for safety instructions.

Electrical Connections

Inspect all insulated wiring to see that no damage has occurred. Test the high voltage wiring for possible grounds or short circuits.

A dielectric test at 2.25 times the nominal system voltage plus 2000 volts, applied for one minute between phases and from all phases to ground is the preferred method. Do not exceed 10kV when testing across the open contacts of a vacuum interrupter. Be sure to disconnect any devices (control power transformer, etc.) from the circuit which could be damaged by the test voltage. If a hi-pot tester is not available, then a Megger test at 1000 volts is a suitable second choice.

⚠ WARNING

Vacuum interrupters may emit x-ray radiation.

Can cause personal injury.

X-rays can be produced when a high voltage is placed across two circuit elements in a vacuum.

Keep personnel more than six (6) feet away from the contactor under test.

Do not exceed 10,000 volts RMS AC when performing dielectric tests across open contacts of the vacuum interrupter.

NOTE: Do not use DC high potential testers incorporating half-wave rectificaiton. These devices produce high peak voltages.

These high voltages will produce X-ray radiation. These devices also show erroneous readings of leakage current when testing vacuum circuit breakers.

Make sure that all current-carrying parts outside the contactor have adequate current-carrying capacity and are correctly insulated in accordance with the requirements of the National Electrical Code (NEC). All electrical connections should be made carefully per the wiring diagram furnished with the equipment. Tighten all lugs to recommended torque values. If crimp type terminals have been furnished, use only the crimping tools recommended by the manufacturer of the terminal.

Latched Contactors

An extension stud is required to extend 3.62" from the end of trip rod for a latched contactor used in bottom compartment.

All latched contactors shipped in bottom compartment have extension stud attached to the trip rod. For contactors shipped in middle or top compartments, or shipped separately, the extension studs are taped to the trip rod. If contactors are to be used in middle or top compartment, remove the stud and save for future possible use in bottom compartment. When contactors are shipped separately and are to be used in a bottom compartment, the extension stud must be assembled to the trip rod per **Figure 4.**

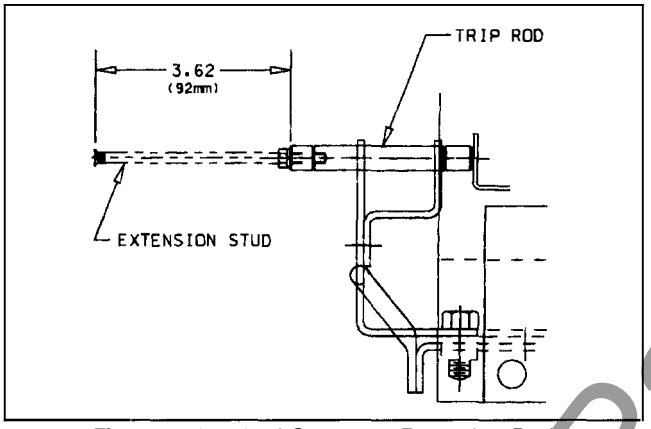


Figure 4: Latched Contactor Extension Rod

Pre-Energization Check

⚠ WARNING

Hazardous voltages.

Can cause serious injury, burn or damage.

Perform the following checks before energizing equipment.

1. Be sure all phase barriers are correctly installed.
2. Clean any excessive dust and dirt that may have accumulated if the contactor has been in storage.
3. Connect only test power and operate the contactor electrically several times. The contactor should pick up and seal cleanly at 85% to 110% of rated control voltage (See Operating Data, **Table 3**)
4. For latched type contactor, check that the latch correctly engages and trips when the close/trip signals are applied. Also, manually trip the contactor using the trip lever to verify proper operation.

The contactor may now be placed in service by connecting main incoming power. The contactor must be appropriately guarded or isolated before energizing the medium voltage circuit. Refer to Series 81000 Controller Instruction Manual MVC-9068 for additional information. For typical control circuit diagrams see **Figures 5, 6,** and **7**.

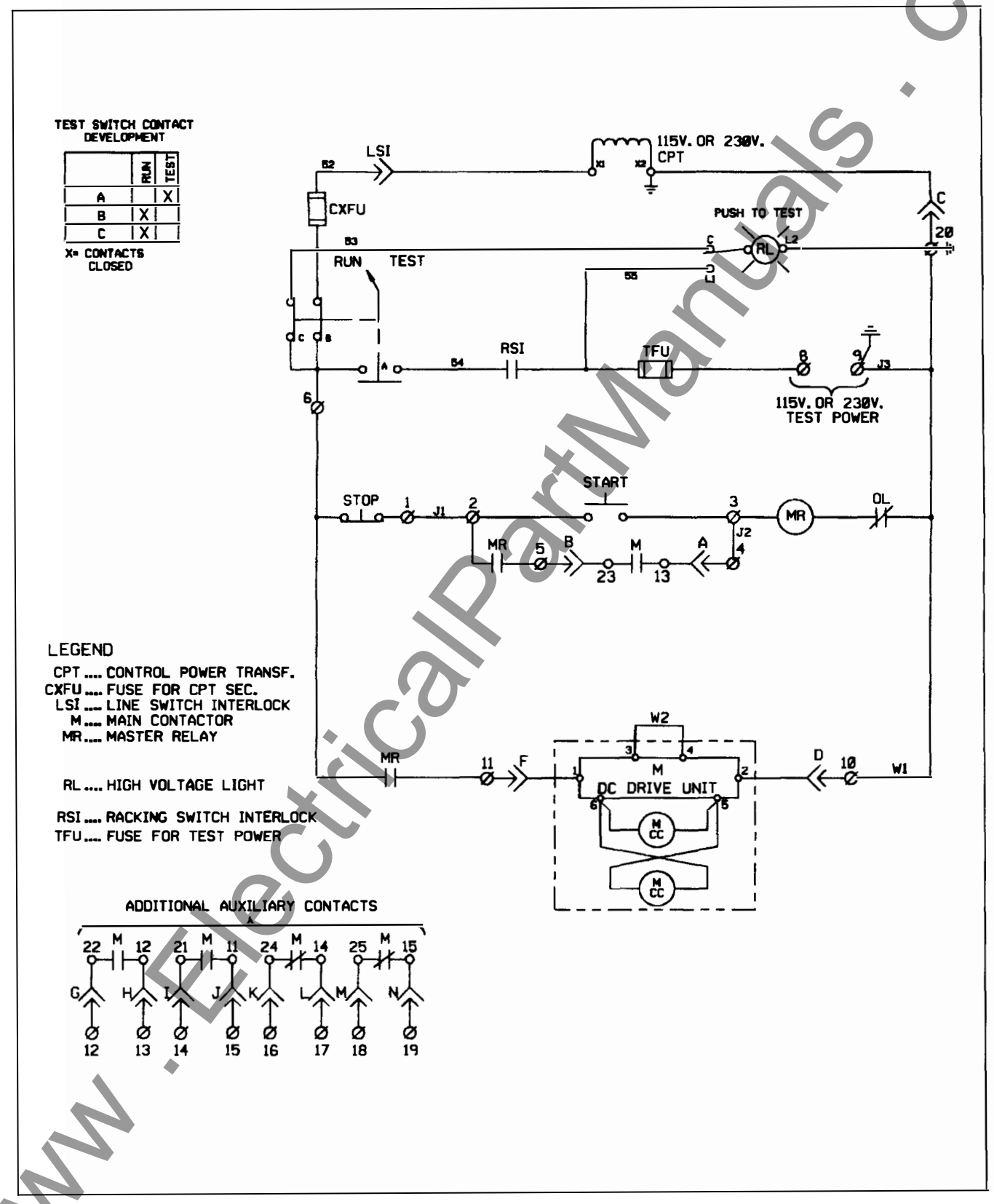


Figure 5: Series 81000 Controller with
Type 93H3 or 94H3 Magnetically-held Contactor

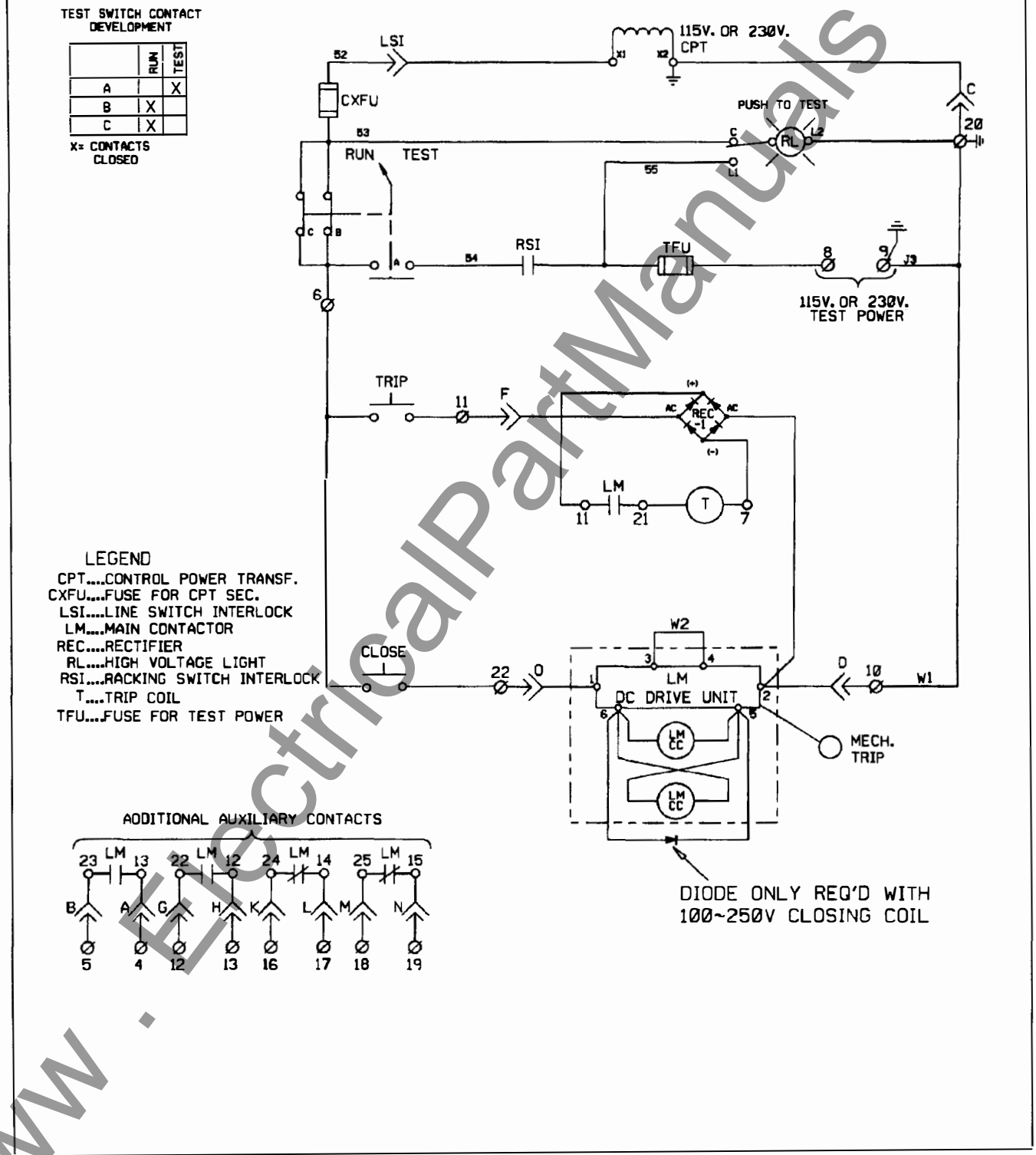


Figure 6: Series 81000 Controller with Type 93H3 or 94H3 Contactor with Mechanical Latch, and Electrical Trip from AC Source

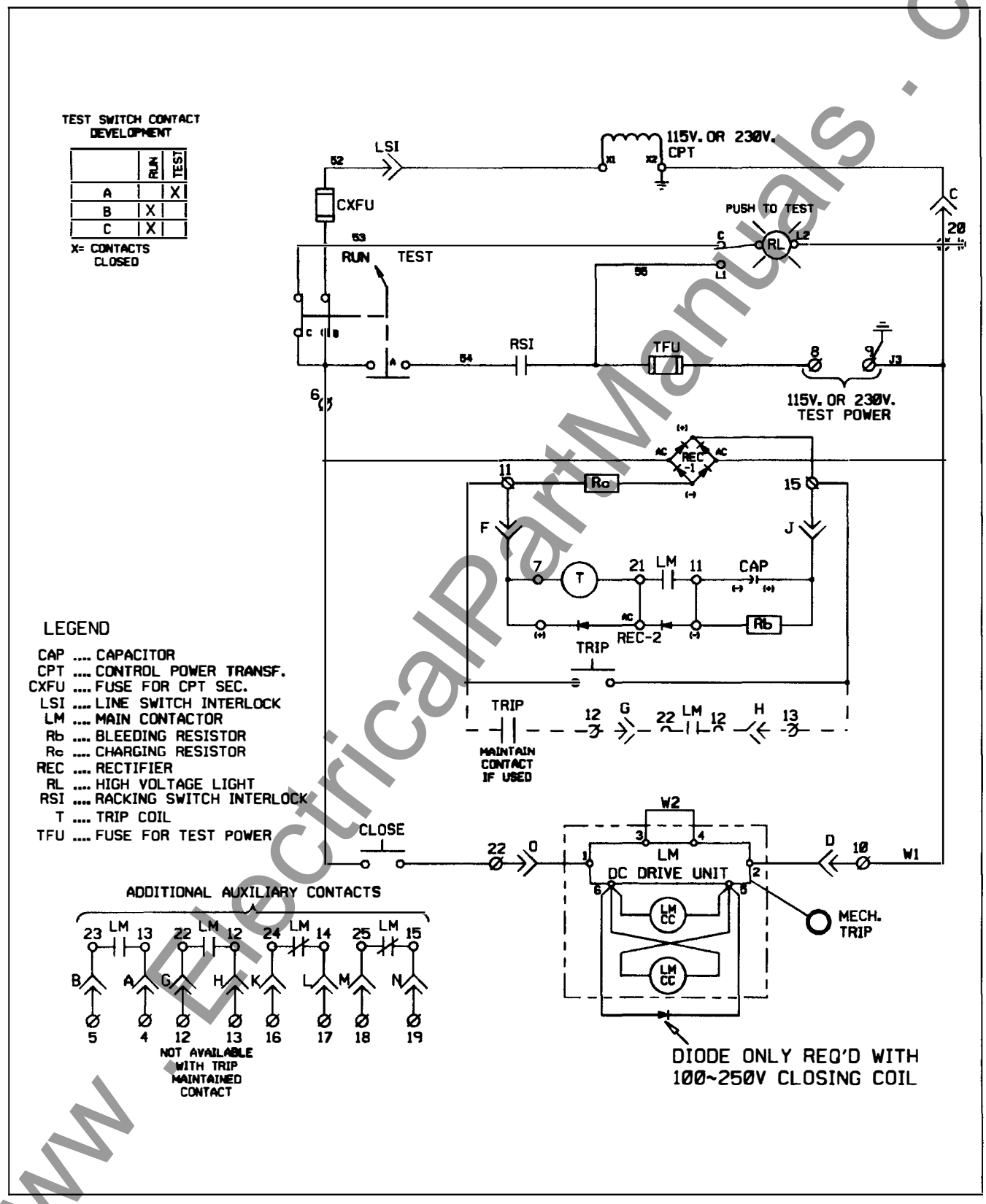
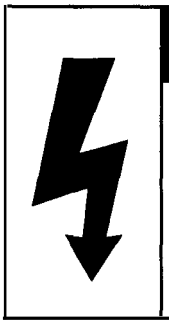


Figure 7: Series 81000 Controller with Type 93H3 or 94H3 Contactor with Mechanical Latch, and Electrical Trip from AC Capacitor Source



⚠ DANGER

Hazardous voltages.

Will cause electric shock, burn or electrocution.

Disconnect and lockout incoming power and control voltage sources before beginning work on this or any other electrical equipment.

Check all control circuit terminals with a voltmeter to make certain that the equipment is totally de-energized.

Use only approved high voltage test equipment to check voltage on power terminals. Do not attempt to measure high voltage with a volt-ohm meter.

It is recommended that a safety ground be connected to the power bus after the system has been de-energized, and prior to working on the equipment.

Follow the procedure outlined in the pre-energization check section of this manual before power is restored.

Safety

For the safety of maintenance personnel as well as others who might be exposed to hazards associated with maintenance activities, the safety related work practices of NFPA 70E, Parts II and III should always be followed when working on electrical equipment. Maintenance personnel should be trained in the safety practices, procedures and requirements that pertain to their respective job asignments. This manual should be reviewed and retained in a location readily accessible for reference during maintenance of this equipment.

The user must establish a periodic maintenance program to ensure trouble-free and safe operation. The frequency of inspection, periodic cleaning, and preventive maintenance schedule will depend upon the operation conditions. NFPA Publication 70B "Electrical Equipment Maintenance" may be used as a guide to establish such a program. **A preventive maintenance program is not intended to cover reconditioning or major repair, but should be designed to reveal, if possible, the need for such actions in time to prevent malfunctions during operation.**

Recommended Maintenance and Lubrication

Periodic maintenance and lubrication should include all the tasks shown in **Table 8**. Recomended procedures for each of the listed tasks are provided in this section of the manual.

⚠ WARNING

Failure to maintain the equipment will result in death, serious injury or product failure, and can prevent successful functioning of connected apparatus.

The instructions contained herein should be carefully reviewed, understood, and followed.

The maintenance tasks in **Table 8** must be performed regularly.

Table 8: Maintenance Tasks

- Blown fuse trip mechanism checks
- Vacuum contactor inspection
- Main contacts inspection
- Bearing check
- Closing coil check
- Latch mechanism check
- Auxiliary switch check
- Fuse clip inspection
- Check of terminals and joints
- Periodic cleaning
- Dielectric test

Maintenance of the vacuum contactor should only be performed with the contactor de-energized and withdrawn from the controller compartment. In the case where a vacuum interrupter must be replaced, control power is required to close the contactor during the "Operation Check" (see page 18).

The list of tasks in **Table 8** does not represent an exhaustive survey of maintenance steps necessary to ensure safe operation of the equipment. Particular applications may require further procedures. Should further information be desired or should particular problems arise which are not covered sufficiently for the Purchaser's purposes, the matter should be referred to the local Siemens sales office.

⚠ DANGER

The use of unauthorized parts in the repair of the equipment, or tampering by unqualified personnel will result in dangerous conditions.

Will cause death, serious injury or equipment damage.

Follow all safety instructions contained herein.

Blown Fuse Trip Mechanism

NOTE: Use of the trip mechanism with fuses other than Siemens type FM (for up to 5080 volts) or A720R (for up to 7200 volts) motor fuses can result in failure of the trip bar to operate.

After the trip mechanism has operated, or if any of the power fuses have been removed or replaced, the following checks and adjustments must be performed.

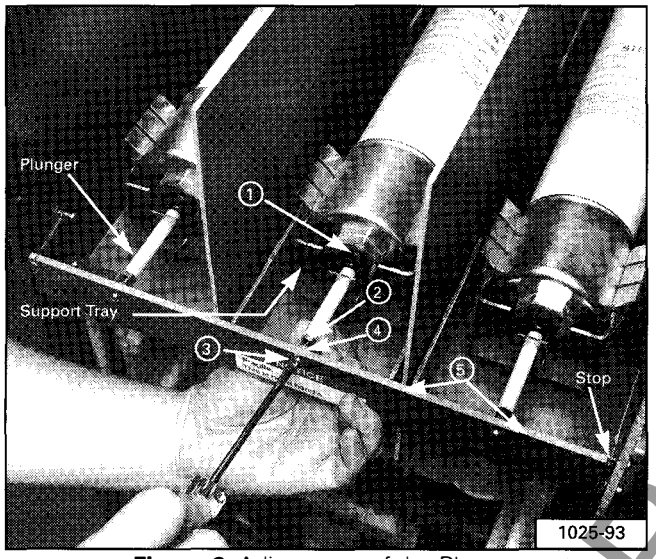


Figure 8. Adjustment of the Plunger

1. All fuses must be installed in clips with load side of fuse resting on support tray as shown in **Figure 8**. Plunger end of fuse must be facing forward, away from disconnect fingers on contactor.
2. With the trip bar in its normal spring return (deactivated position), the trip bar should rest against the stop screw on the right hand contactor side plate as shown in **Figure 8**. The trip bar must be held in this position while performing adjustments 3 and 4.
3. Adjust each of the three plunger assemblies shown in **Figure 8** to obtain a 1/16" (1.6mm) gap between the plunger (1) and the end of the corresponding fuse as follows: Insert a 1/16" (1.6mm) shim between the end of the fuse and the plunger (1). Loosen locknut (2) and turn adjusting screw (3) until there is no gap between stop nut (4) and trip bar (5). Retighten lock nut (2).
4. Referring to **Figure 9**, loosen the machine screw which threads into the pushrod and adjust outward (lengthen) until the micro-switch contacts just close. Then adjust outward one additional full turn and tighten the locknut.
5. Referring to **Figure 10**, insert a 3/16" (4.8mm) thick shim between one of the three plungers and the adjacent fuse, rotating the trip bar in the direction shown. The micro-switch contacts should open at this point. If they do not, loosen the locknut and adjust the machine screw to shorten dimension "A" slightly until the switch contacts open, then retighten the locknut.

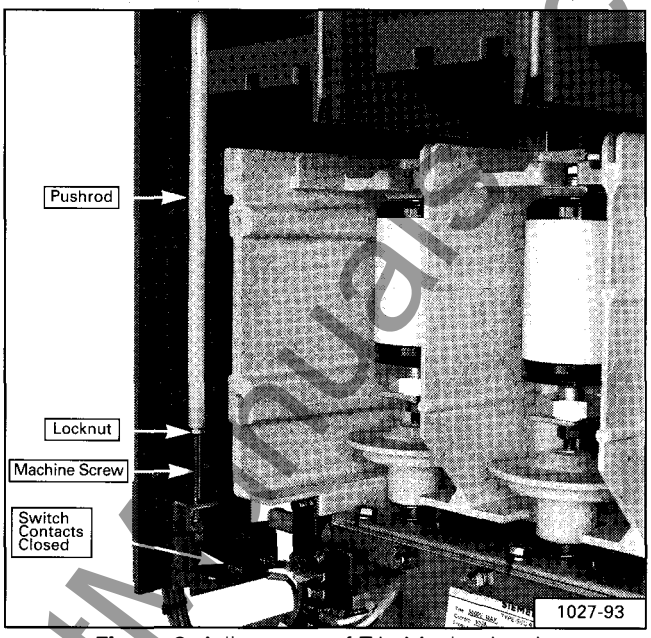


Figure 9. Adjustment of Trip Mechanism in Deactivated Position

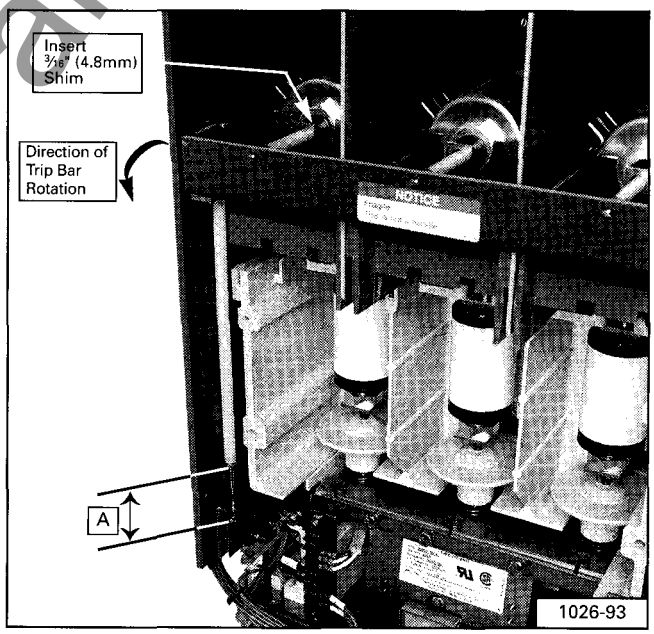


Figure 10. Operational Check of Trip Mechanism

Vacuum Contactor Inspection

The inspections listed in **Table 9** are recommended for the vacuum contactor, whether mounted on a drawout carriage or mounted in a fixed locaiton inside the controller enclosure.

Table 9: Vacuum Contactor Inspection Checklist

Parts to be Inspected	Inspection Item	Cracks	Discoloration	Contamination	Rust	Wear	Loose Parts	Incomplete Operation	Vibrating Sound	Inspection Intervals
Main Circuit	Vacuum Interrupter			●	●	●			●	Visual Check Once A Year or Every 20,000 Operations
	Movable Conductor	●	●							
	Upper and Lower Terminals		●				●			
Mechanism Section	Molded Frame	●	●	●						
	Insulation Flange	●					●			
	Bearing					●	●			
Electro-magnet	Closing Coil		●							
	Armature and Core				●		●			
	Auxiliary Switch	●	●				●			
Latch Mechanism	Trip Coil		●							
	Roller	●				●	●	●		
Others	Bolts and Nuts						●			
	Vinyl Insulated Wire	●								

NOTE: The life expectancy of the electrical parts (vacuum interrupter, auxiliary switch) is 250,000 operations.

Main Contact Inspection

1. Check the upper and lower flanges and interrupter shaft to see if they are contaminated or rusted.

   If contaminated, use a clean cloth and rubbing alcohol to clean.

   If rusted, replace with a new interrupter.

   NOTE: Avoid touching the ceramic surface. Your skin oils may harm the silicone varnish.

2. Check the main contact wear in the vacuum interrupter, as shown in **figure 11**.

   If the wear gauge (a 4mm shim) can be inserted, there is sufficient contact material available for continued use.

   If the gauge cannot be inserted, replace the interrupter.

   NOTE: This check is made with the contacts closed.

⚠ DANGER

Hazardous voltages.

Will cause shock, burn or electrocution.

Dielectric testing should only be conducted by qualified personnel. Refer to test device instructions for safety instructions.

⚠ WARNING

Vacuum interrupters may emit X-radiation.

Can cause personal injury.

X-rays can be produced when a high voltage is placed across two circuit elements in a vacuum.

Keep personnel more than six (6) feet away from the contactor under test.

Do not exceed 10,000 volts RMS when performing dielectric tests across open contacts of the vacuum interrupter.

NOTE: Do not use DC high potential testers incorporating half-wave rectificaiton. These devices produce high peak voltages.

These high voltages will produce X-ray radiation. These devices also show erroneous readings of leakage current when testing vacuum circuit breakers.

3. Check vacuum in the vacuum interrupter.

   Apply 10kV AC between the upper and lower terminals for one minute. If there is no voltage breakdown, the vacuum interrupter is available for continued use. If there is voltage breakdown, replace with a new vacuum interrupter before continued use.

   NOTE: If there is a loss of vacuum, it can be confirmed by pushing down on the insulating flange below the vacuum interrupter. If the interrupter shaft can easily be moved, then the interrupter has lost vacuum.

4. Criteria for Contact Gap & Wipe (mm)

	Contact Gap	Wipe	Allowable Wear
Magnetically Held Type	4 + 0.2 - 0	2.5	2.0
Latched Type	4 + 0.2 - 0	2.3	1.8

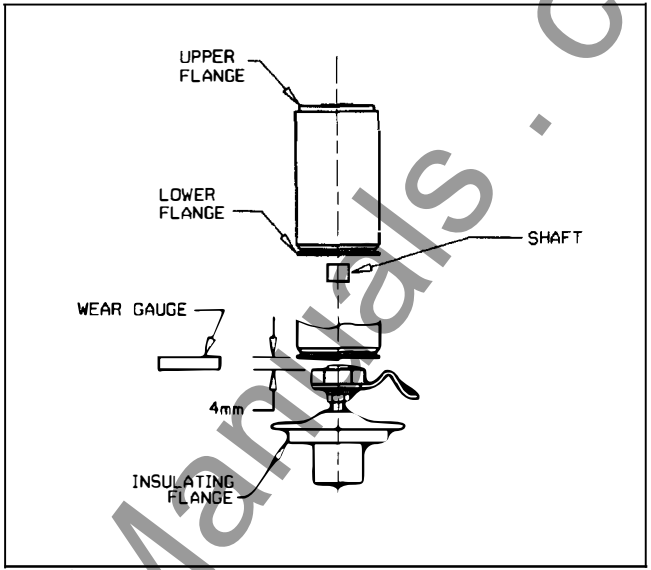


Figure 11. Vacuum Interrupter

Bearing

1. Check for loose mounting bolts. Tighten if loose. Torque M6 bolts to 48 in-lbs.

Closing Coil

1. Check for discoloration.

   Black color is normal, and the coil does not show signs of overheating. A brown color indicates that overheating has occurred, and replacement of the coil is necessary.

Latch Mechanism

1. Check that the holding latch reliably engages.

   NOTE: To manually close the latch, hold the central area of the rotating shaft with a wrench and operate.

2. Check condition of the roller. It should be smooth.
3. Lubricate the rotating parts with a molybdenum disulfide or gear lubricant.

Auxiliary Switch

1. Verify that there is remaining wipe (approximately 2.3-2.5mm).
2. Check for burned or worn contacts, and replace if damage is observed.
3. (Reference) Values for gap and wipe (mm)

	Contact Gap	Wipe
N.O. - Contact	4 ± 0.4	3 ± 0.3
N.C. - Contact	4 ± 0.4	3 ± 0.3
Delayed N.C. - Contact (for latched contactor only. Contacts 16-26)	2.5 ± 0.3	4.5 ± 0.5

Fuse Clip Inspection

1. Closely examine fuse clips. If there is any sign of overheating or looseness, check the spring pressure or tightness of clamps. Replace the fuse clips if the spring pressure compares unfavorably with that of other similar fuse clips. Make sure that fuses are completely inserted.

Terminals and Joints

1. If joints or terminations appear too badly discolored, corroded or pitted, or show evidence of having been subjected to high temperature, the parts should be disassembled and replaced or cleaned.
2. Examine all wire or cable connections for evidence of looseness or overheating. Re-torque if necessary. If major discoloration or cable damage is apparent, replace the damaged parts.

Periodic Cleaning

1. Accumulation of dust and foreign material such as coal dust, cement dust, or lamp black must be removed from the contactor and all surfaces must be wiped clean at regular intervals. Dirty, wet or contaminated parts should be replaced unless they can be cleaned effectively. Dust can collect moisture, causing voltage breakdown. Do not use compressed air as it will only redistribute contaminants on other surfaces, and may damage delicate parts.

Dielectric Test

1. Perform dielectric tests as discussed under "Electrical Connections" in the **Installation** section of this manual.

Recommended Torque

When making bolted assemblies, the following considerations should be generally followed. The recommended torque is determined by the size of hardware used. Refer to **Table 11**.

1. Metal-to-Metal – Apply standard torque as listed.
2. Metal-to-Insert molded in compound part – Apply approximately 2/3 of standard torque.
3. Compound-to-Insert molded in compound part – Apply approximately 1/2 of standard torque.
4. Compound-to-Compound – Apply approximately 1/2 of standard torque.

Vacuum Interrupter Replacement Procedure

When a vacuum interrupter has reached a specified life (250,000 operations) or when it is damaged, it is recommended that it be replaced in the following sequence:

Removing the Interrupter (refer to Figure 12)

1) Hold the insulating flange with one hand and loosen nut "A" (below the flexible conductor) with a wrench.
2) Turn the insulating flange clockwise by hand until it comes off the movable shaft of the vacuum interrupter.
3) With the vacuum interrupter held in one hand, loosen and remove bolt "B" (above the interrupter) with a wrench.
4) While pushing down on the insulating flange, pull the vacuum interrupter forward to remove it.
5) At this time the conductive collar can also be removed. Keep it for later use.

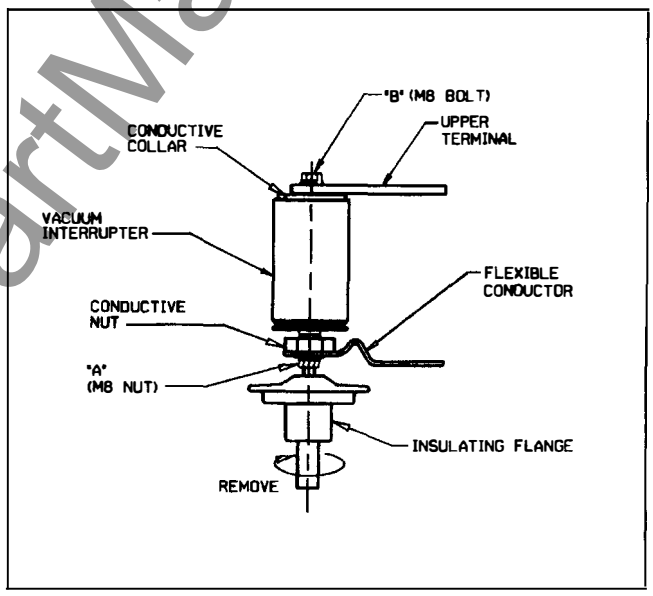


Figure 12. Vacuum Interrupter Removal

Table 11: Torque Recommendations

Thread Size	Standard Torque Metal-to-Metal (in.-lbs.)	2/3 Standard Torque Metal-to-Insert (in.-lbs.)	1/2 Standard Torque Compound-to-Insert (in.-lbs.)	1/2 Standard Torque Compound-to-Compound (in.-lbs.)
8-32	14-20	10-14	7-10	7-10
10-32	20-30	13-20	10-15	10-15
1/4-20	40-60	26-40	20-30	20-30
5/16-18	168-228	110-150	84-114	84-114
3/8-16	240-360	160-240	120-180	120-180
1/2-13	480-600	320-400	240-300	240-300

⚠ DANGER

Hazardous voltages.

Will cause shock, burn or electrocution.

Before replacing vacuum interrupters, remove the contactor from the controller compartment to ensure that all high voltage sources are disconnected.

Low voltage test power is required during the re-installation of new vacuum interrupters, so exercise caution.

Mounting the New Interrupter (Figure 13)

NOTE: Avoid touching the ceramic surface of the vacuum interrupter, as skin oils may harm the silicone varnish. Use clean gloves or cloths to handle the interrupter.

1) Remove the conductive nut from the vacuum interrupter being replaced and attach it to the new vacuum interrupter as shown in **Figure 13**.
2) Put the conductive collar on the upper part of the vacuum interrupter (stationary terminal) and assemble the vacuum interrupter.
3) Hold the vacuum interrupter with left hand (use glove or cloth) and fasten bolt "B" (see **Figure 12**) (torque to 120kg-cm or 102in-lb).
4) Push down the insulating flange and align the insulating flange stud with the movable shaft of the vacuum interrupter. Then, while turning the flange counter-clockwise, insert it. (Install the insulating flange with only 3 to 4 turns, then stop)

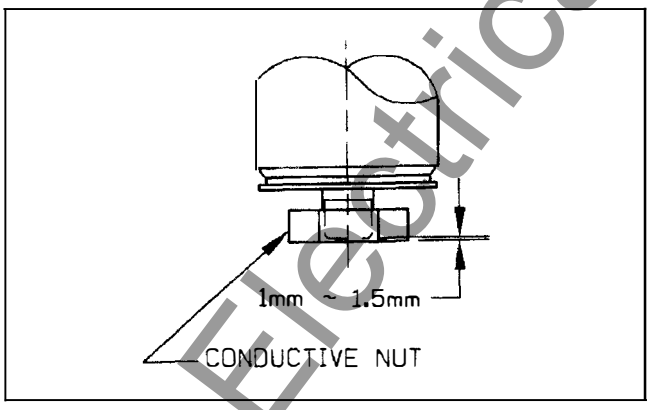


Figure 13. Installation of the Conductive Nut

Adjusting the Main Contact Gap of the Vacuum Interrupter

1) With the control circuit energized, close the vacuum contactor. Check that the armature is attracted to the coil cores.
2) As shown in **Figure 14**, turn the insulating flange until the gap is 46mm (1.81").
3) With the adjustment made, hold the insulating flange still with the left hand and fasten nut "A".

   Note: Arrange so that the movable conductor is straight and flat.

   Check that the conductive nut does not rotate.
4) Turn off the control circuit power supply.
5) Operate manually to confirm that the vacuum interrupters close simultaneously.

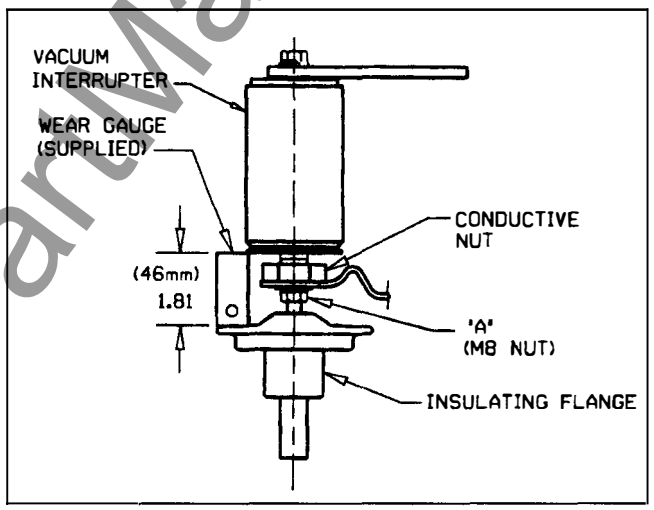
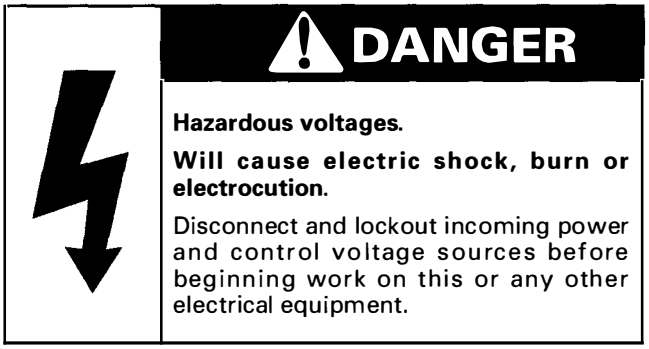


Figure 14. Mounting Vacuum Interrupter and Adjustment of Gap

Operation Check

In a no-load condition, switch the power until 20 operations are completed to confirm normal operation.

Maintenance After a Fault



Only qualified personnel should be involved in the inspection and repair procedure and all plant safety procedures must be observed.

Check all control circuit terminals with a voltmeter to make certain that the equipment is totally de-energized.

Use only approved high voltage test equipment to check voltage on power terminals. Do not attempt to measure high voltage with a volt-ohm meter.

It is recommended that a safety ground be connected to the power bus after the system has been de-energized, and prior to working on the equipment.

Follow the procedure outlined in the pre-energization check section of this manual before power is restored.

General
The excessive currents occurring during a fault may result in structure, component and/or conductor damage due to mechanical distortion, thermal damage, metal deposits, or smoke. After a fault, repair the cause of the fault, inspect all equipment per NEMA Standards Publication No. ICS2-302 and make any necessary repairs or replacements prior to placing the equipment into service again. Be sure that all replacements (if any) are of the proper rating and are suitable for the application. If in doubt, consult your Siemens representative.

Inspection
The following areas should be inspected after a fault has occurred.

Enclosures
External evidence of enclosure deformation usually is indicative of damage within. Extensive damage will require replacement of the enclosure parts and the enclosed equipment. Insure that door mounted equipment and safety interlocks function properly. Verify that hinge and latch integrity is maintained.

Terminals and Internal Conductors
Replace all damaged parts which show evidence of discoloration, melting or arcing damage. Special attention should be paid to the stab (disconnect) fingers.

Overload Relays
The complete overload relay must be replaced if burnout of the heater element has occurred. Any indication of an arc striking or burning the oveload relay also requires replacement of the relay.

If there is no visual indication of damage that would require replacement, contact operation must be verified by electrically or mechanically tripping and resetting the overload relay.

Fuse Holders
Replace fuse holders if the insulation mounts, barriers, or fuse clips show signs of damage, deterioration, heating, distortion or looseness.

Fuses
Always replace all three fuses in a three phase circuit even though only one or two are open circuited, since internal damage suffered by fuses not replaced could result in nuisance shut-down later.

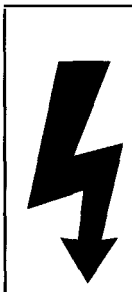
Perform the "Pre-Energization Check" procedures detailed in the **Installation** section of this manual before restoring the equipment to service.

Troubleshooting

In the event that operating problems are encountered, use the troubleshooting chart to isolate the cause of the malfunction and find the remedy. If the corrective action given in the chart fails to correct the difficulty, consult our Siemens representative.

The following information is required if it is necessary to contact Siemens relative to the equipment.

1. Siemens serial number (and part number, if available).
2. Nameplate data on contactor.
3. Duty cycle and any details of operation.
4. Length of time in service and approximate total number of operations.
5. Voltage, current and frequency.
6. Description of problem.
7. Any other pertinent information concerning the problem.



⚠ DANGER

Hazardous voltages.

Will cause shock, burn or electrocution.

Disconnect and lockout all power supplying this equipment except where low voltage control power is required prior to making these checks and exercise extreme caution at all times.

Table 12: Troubleshooting

Phenomenom							Possible Causes	Corrective Action
Will Not Close	Does Not Open (Latch Type)	Overheated Trip Coil	Abnormally Overheated Coil	Latch Is Not Engaged			Survey main circuit without voltage Remove all power before inspecting	If inspection and/or corrective action is difficult, inform Siemens immediately
●	●			●			Control power supply voltage is too low	Decrease the voltage drop to increase the voltage to 90% or more of the rating.
●	●	●	●	●			Difference in control voltage	Proper rating
●	●						Defective control circuit	Check connection diagram
●	●			●			Poor connection and/or loose screw	Ensure that the connection is tight
●	●						Bad control switch contact	Clean if contact resistance is too high. Replace if necessary.
●	●			●			Wrong terminal connection	Connect correctly
●				●			Blown power supply fuse	Remove cause of fault and replace
●	●						Disconnected coil	Determine cause and correct
●			●				Faulty drive unit	Check the coil current
●			●	●			Incorrect latch mechanism operation	Energize latch coil and inspect latch hook
●				●			Mechanism jammed	Lubricate corresponding portion or remove cause of jam
		●					Incorrect auxiliary adjustment	Adjust delayed N.C. Contact gap to 2.5mm ± 0.3mm when connected
	●						Faulty auxiliary contact	Clean or replace

Table 13: Type 93H35 or 94H35 (5kV) Contactor (Refer to **Figure 15**)

Item	Description	Part Number	Contactor Quantities	
			Drawout	Stationary
1	L.H. Side Rail	25-154-488-560	1	–
2	R.H. Side Rail	25-154-488-559	1	–
3	Contactor Mtg. Tray	25-154-488-563	1	–
4	L.H. Side Plate	25-154-488-558	1	–
5A	R.H. Side Plate	25-154-488-557	1 (93H3 only)	–
5B	R.H. Side Plate	25-154-488-598	1 (94H3 only)	–
6	Insulator Molding	25-407-783-005	2	–
7A	CPT Mounting Plate	25-154-488-566	1 (93H3 only)	–
7B	CPT Mounting Plate	25-154-488-595	1 (94H3 only)	–
8	CPT Fuse Block	25-306-331-002	1	–
9	Wheel	18-658-134-345	4	–
10	Wheel Shaft	25-154-301-034	3	–
11	Insulator Molding	25-407-783-001	1	–
12	Copper Spacer	25-131-570-001	6	–
13	Side Support	25-154-488-007	2	–
14	LSI Mounting Bracket	25-154-488-552	1	–
15	Wheel Shaft L.H. Front	25-154-488-051	1	–
16	Interphase Barrier	25-154-488-010	2	–
17	#8 GA - 5kV Cable	25-131-894-507	1	–
18	#8 GA - 5kV Cable	25-131-894-508	1	–
19	LSI Finger	25-135-753-001	1	–
20	LSI Support	25-154-301-073	1	–
21	Finger Assembly Rear	25-131-570-527	3	–
22	Finger Assembly Load	25-131-570-583	3	–
23	CPT Fuse Clip	25-127-244-001	4	–
24	Fuse Clip Assembly Line	25-135-186-517	1	–
25	Boot for Finger	25-154-488-055	6	–
26	Terminal Block Bracket	25-154-488-008	1	–
27A	Interlock Cable Assembly	25-213-200-801	1 (93H3 only)	–
27B	Interlock lever	25-213-200-504	1 (94H3 only)	–
28	Copper Bar A phase	25-154-488-004	1	–
29	Copper Bar B phase	25-154-488-005	1	–
30	Copper Bar C phase	25-154-488-006	1	–
31	Copper Bar A phase	25-154-488-001	1	–
32	Copper Bar B phase	25-154-488-002	1	–
33	Copper Bar C phase	25-154-488-003	1	–
34	Contactor Mtg. Angle LH	25-154-488-564	1	–
35	Contactor Mtg. Angle RH	25-154-488-565	1	–
36	Fuse Clip Inner	25-135-228-058	3	–
37	Fuse Clip Outer	25-135-228-059	3	–
38	Vacuum Interrupter	25-154-504-005	3	3
39	Closing Coil Assembly	25-154-504-006	1	1
40	Aux. Block (Std.)	25-154-504-007	1	1
41	Aux. Block (Latch)	25-154-504-008	1	1
42	Drive Unit Control Board	25-154-504-009	1	1
43	Flexible Shunt Lead	25-154-504-010	3	3
44	Cover Plate	25-154-488-128	1 (94H3 only)	–

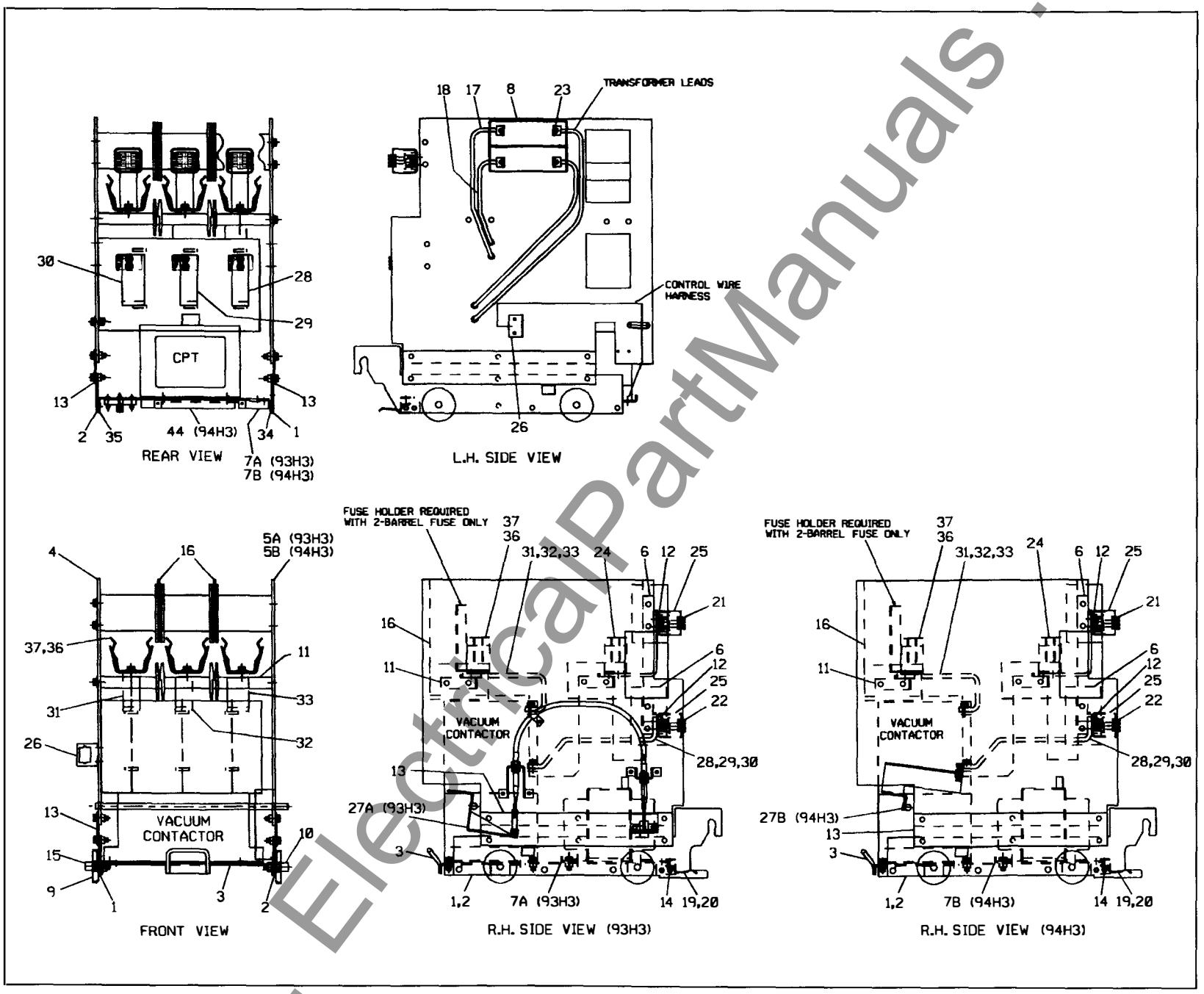


Figure 15. Type 93H35 or 94H35 Vacuum Contactor (5kV)

Table 14: Type 93H37 (7.2kV) Contactor 18R – 24R fuses (Refer to **Figure 16**)

Item	Description	Part Number	Contactor Quantities	
			Drawout	Stationary
1	L.H. Side Rail	25-154-488-560	1	–
2	R.H. Side Rail	25-154-488-559	1	–
3	Contactor Mtg. Tray	25-154-488-563	1	–
4	L.H. Side Plate	25-154-488-571	1	–
5A	R.H. Side Plate	25-154-488-572	1 (93H3 only)	–
5B	R.H. Side Plate	25-154-488-598	1 (94H3 only)	–
6	Insulator Molding	25-407-783-005	2	–
7A	CPT Mounting Plate	25-154-488-566	1 (93H3 only)	–
7B	CPT Mounting Plate	25-154-488-595	1 (94H3 only)	–
8	CPT Fuse Block Assembly	25-154-247-061	1	–
9	Wheel	18-658-134-345	4	–
10	Wheel Shaft	25-154-301-034	3	–
11	Insulator Molding	25-407-783-001	2	–
12	Copper Spacer	25-131-570-001	6	–
13	Side Support	25-154-488-007	2	–
14	LSI Mounting Bracket	25-154-488-552	1	–
15	Wheel Shaft L.H. Front	25-154-488-051	1	–
16	Interphase Barrier	25-154-488-081	2	–
17	#8 GA - 7.2kV Cable	25-154-288-503	1	–
18	#8 GA - 7.2kV Cable	25-154-288-504	1	–
19	LSI Finger	25-135-753-001	1	–
20	LSI Support	25-154-301-073	1	–
21	Finger Assembly Line	25-131-570-527	3	–
22	Finger Assembly Load	25-131-570-583	3	–
23	CPT Fuse Clip	25-127-244-001	4	–
24	Copper Bar	25-154-515-509	3	–
25	Boot for Finger	25-154-488-055	6	–
26	Terminal Block Bracket	25-154-488-008	1	–
27A	Interlock Cable Assembly	25-213-200-801	1 (93H3 only)	–
27B	Interlock Cable Assembly	25-213-200-504	1 (94H3 only)	–
28	Copper Bar A phase	25-154-488-568	1	–
29	Copper Bar B phase	25-154-488-569	1	–
30	Copper Bar C phase	25-154-488-570	1	–
31	Copper Bar A phase	25-154-515-506	1	–
32	Copper Bar B phase	25-154-515-507	1	–
33	Copper Bar C phase	25-154-515-508	1	–
34	Contactor Mtg. Angle LH	25-154-488-564	1	–
35	Contactor Mtg. Angle RH	25-154-488-565	1	–
36	Copper Bar	25-154-515-505	3	–
40	Vacuum Interrupter	25-154-504-005	3	3
41	Closing Coil Assembly	25-154-504-006	1	1
42	Aux. Block (Std.)	25-154-504-007	1	1
43	Aux. Block (Latch)	25-154-504-008	1	1
44	Drive Unit Control Board	25-154-504-009	1	1
45	Flexible Shunt Lead	25-154-504-010	3	3
46	Cover Plate	25-154-488-128	1 (94H3 only)	–

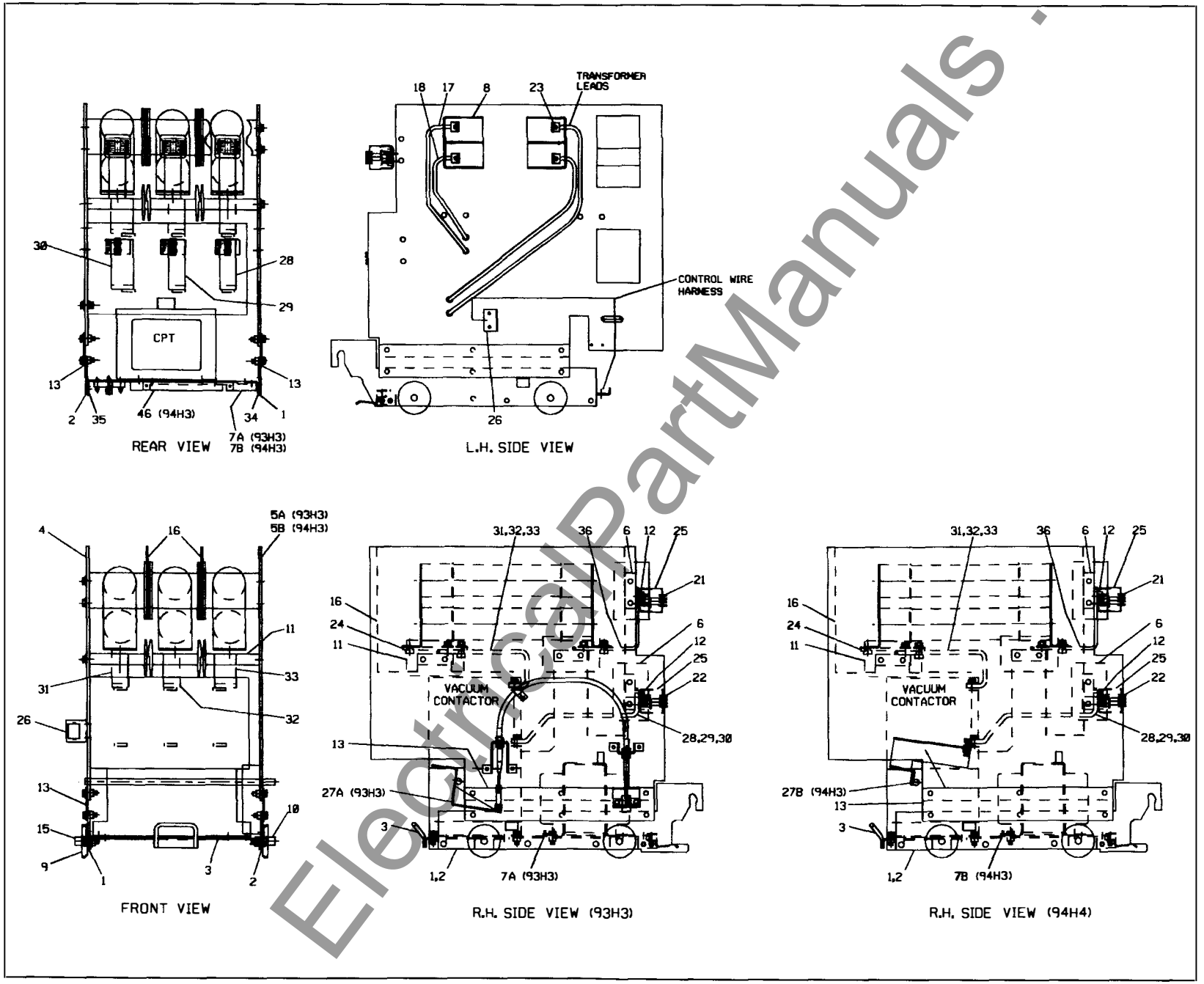


Figure 16. Type 93H37 or 94H37 Vacuum Contactor (7.2kV) with 18R-24R fuses

Table 15: Type 93H37 or 94H37 (7.2kV) Contactor 2R – 12R fuses (Refer to **Figure 17**)

Item	Description	Part Number	Contactor Quantities	
			Drawout	Stationary
1	L.H. Side Rail	25-154-488-560	1	–
2	R.H. Side Rail	25-154-488-559	1	–
3	Contactor Mtg. Tray	25-154-488-563	1	–
4	L.H. Side Plate	25-154-488-587	1	–
5A	R.H. Side Plate	25-154-488-557	1 (93H3 only)	–
5B	R.H. Side Plate	25-154-488-598	1 (94H3 only)	–
6	Insulator Molding	25-407-783-005	2	–
7A	CPT Mounting Plate	25-154-488-566	1 (93H3 only)	–
7B	CPT Mounting Plate	25-154-488-595	1 (94H3 only)	–
8	CPT Fuse Block	25-154-247-061	1	–
9	Wheel	18-658-134-345	4	–
10	Wheel Shaft	25-154-301-034	3	–
11	Insulator Molding	25-407-783-001	1	–
12	Copper Spacer	25-131-570-001	6	–
13	Side Support	25-154-488-007	2	–
14	LSI Mounting Bracket	25-154-488-552	1	–
15	Wheel Shaft L.H. Front	25-154-488-051	1	–
16	Interphase Barrier	25-154-488-010	2	–
17	#8 GA - 7.2kV Cable	25-154-288-503	1	–
18	#8 GA - 7.2kV Cable	25-154-288-504	1	–
19	LSI Finger	25-135-753-001	1	–
20	LSI Support	25-154-301-073	1	–
21	Finger Assembly Line	25-131-570-527	3	–
22	Finger Assembly Load	25-131-570-583	3	–
23	CPT Fuse Clip	25-127-244-001	4	–
24	Fuse Clip Assembly Rear	25-135-186-517	1	–
25	Boot for Finger	25-154-488-055	6	–
26	Terminal Block Bracket	25-154-488-008	1	–
27A	Interlock Cable Assembly	25-213-200-801	1 (93H3 only)	–
27B	Interlock Cable Assembly	25-213-200-504	1 (94H3 only)	–
28	Copper Bar A phase	25-154-488-568	1	–
29	Copper Bar B phase	25-154-488-569	1	–
30	Copper Bar C phase	25-154-488-570	1	–
31	Copper Bar A phase	25-154-488-001	1	–
32	Copper Bar B phase	25-154-488-002	1	–
33	Copper Bar C phase	25-154-488-003	1	–
34	Contactor Mtg. Angle LH	25-154-488-564	1	–
35	Contactor Mtg. Angle RH	25-154-488-565	1	–
37	Fuse Clip Inner	25-135-228-058	3	–
38	Fuse Clip Outer	25-135-228-059	3	–
40	Vacuum Interrupter	25-154-504-005	3	3
41	Closing Coil Assembly	25-154-554-006	1	1
42	Aux. Block (Std.)	25-154-504-007	1	1
43	Aux. Block (Latch)	25-154-504-008	1	1
44	Drive Unit Control Board	25-154-504-009	1	1
45	Flexible Shunt Lead	25-154-504-010	3	3
46	Cover Plate	25-154-488-128	1 (94H3 only)	–

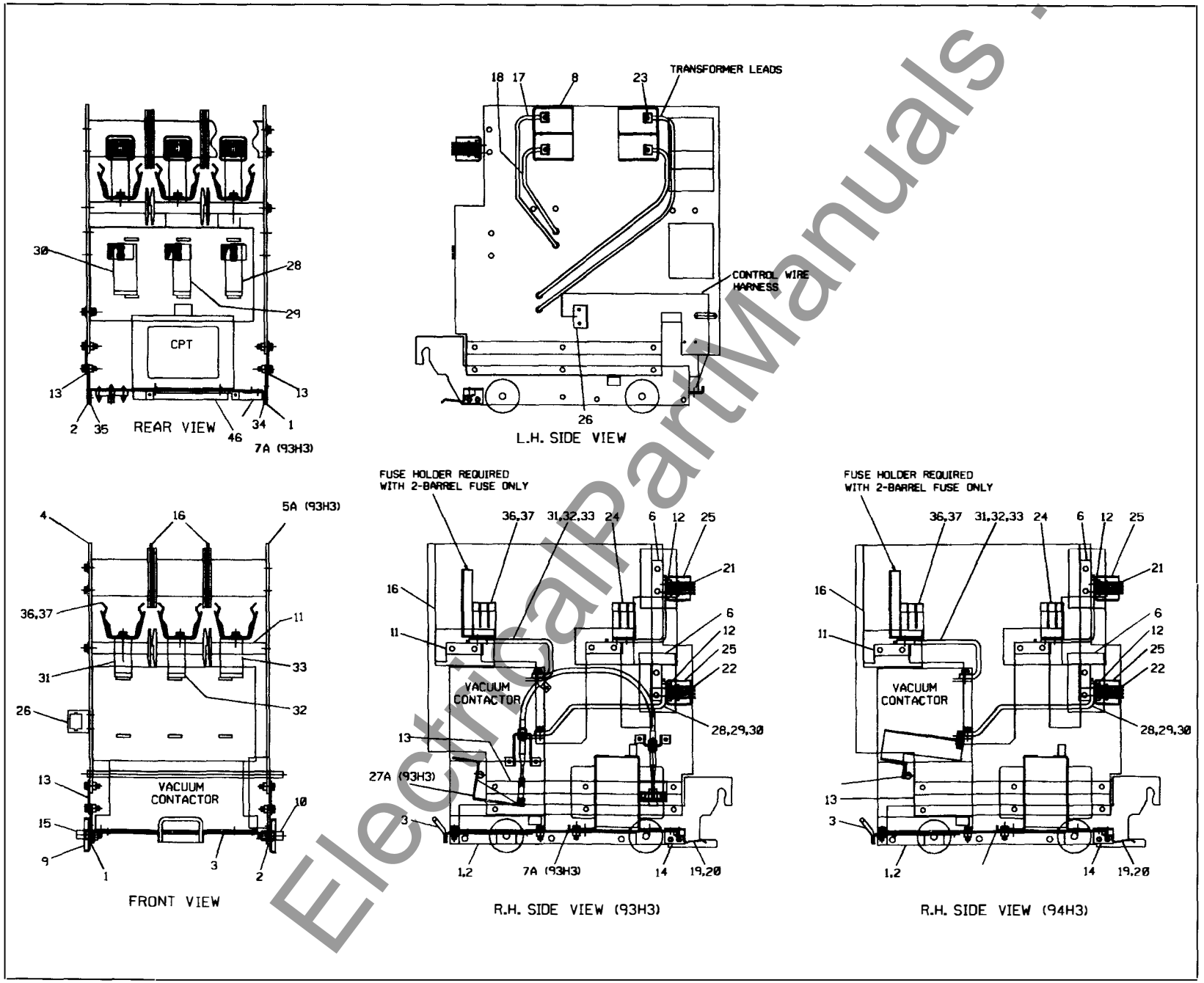


Figure 17. Type 93H37 or 94H37 Vacuum Contactor (7.2kV) with 2R-12R fuses

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