

---

# Operation & Maintenance Instructions

Replaces O&M Manual Form MM33B

Dated: June 1, 1975.

---

**Models:**

20 SCR

**Serial No.s:**

13600 - 20,999

**MM#**

- 63

**Date:**

8/1/78

---

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below

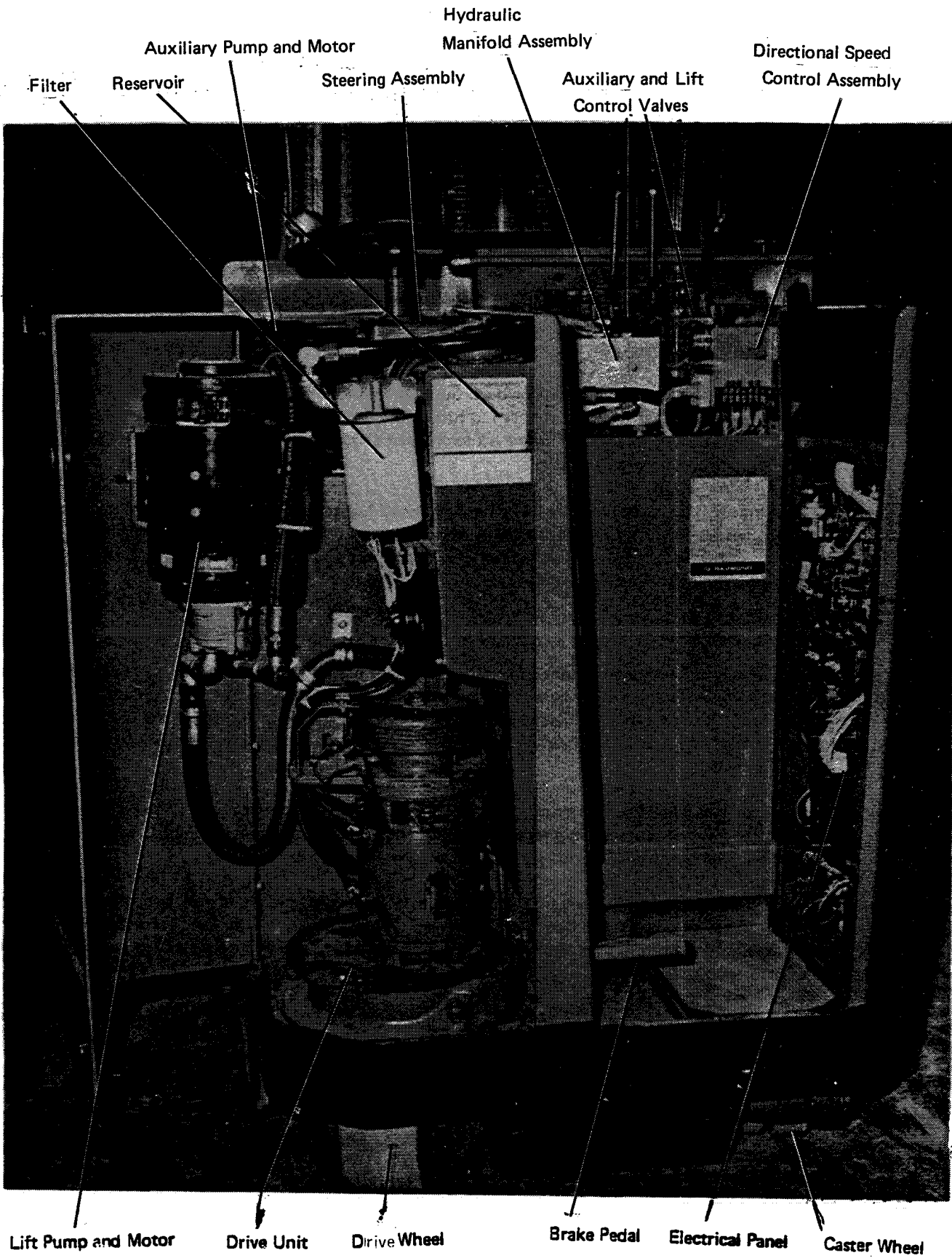


- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

**THE RAYMOND CORPORATION**

**MODEL 20 SCR  
SECTION II  
DESCRIPTION**



**Figure 2-1 Model 20 SCR With Door Open and Covers Removed**

# THE RAYMOND CORPORATION

## MODEL 20 SCR

### SECTION II

#### DESCRIPTION

2-51 (cont'd.)

- B. 3. Current Limit - this circuit is used to cut back on current to the drive motor circuit when the truck is overloaded or stalled, thus reducing the possibilities of damage to the drive motor and SCRs. The current limit circuit monitors motor current. If motor current is too high, the current limit increases current flow to the width circuit, turning the commutating SCR ON sooner, thus keeping the main SCR in the OFF state for a longer period. The current limit is adjustable.
4. Fixed Speed Limit - this circuit slows down the frequency of pulses to the main SCR when the carriage is elevated to actuate the limit switches. The Fixed Speed Limit is set at approximately  $\frac{1}{2}$  SCR speed, depending on application, and it cannot be adjusted.
5. Adjustable Speed Limit - this circuit also slows down the frequency of pulses to the main SCR when the carriage is elevated to actuate the limit switches. The Adjustment Speed Limit can be set from approximately  $\frac{1}{8}$  to  $\frac{1}{2}$  SCR speed.
6. Plugging Relay Circuit - this circuit allows the operator to control the force applied to the vehicle during plugging by his positioning of the directional/speed control pedal. The slowing and reversing of the truck is now proportional to the control pedal position. The current limit circuit is also held out maintaining a steady width pulse. The plugging circuit is adjustable.
- C. The Power Driver Circuit Card contains the power drivers for the three SCRs. Its main purpose is to amplify the signals received from the oscillator circuits and send them on to the gate lead of the respective SCRs. The power drive circuit assures a faster and more complete turning ON of the SCRs. The Power Driver Card can be identified as the smaller of the three cards located perpendicular to the AUX. and V.P.G. cards and having no adjustment screws.

#### note

a 5 amp fuse is contained in the control unit. the fuse is placed in the control unit to prevent high currents from damaging the internal circuitry of the control unit. the high currents could develop from transient voltages, shorts or grounds, etc., in other areas of the truck.

- 2-52 The forward contactors and reverse contactors are included in a dual unit with two contacts actuated by each coil (forward or reverse). Each set of contactors is a double pole, single throw design with normally open tips, and it is physically impossible to close both forward and reverse contacts at the same time. Drive motor direction of rotation is determined by which set of contacts is actuated.
- 2-53 The 'M' High Speed contactor, 'P' Pump - Lift contactor, 'M' High Speed contactor, 'X' Auxiliary contactor, and 'PC' Power Cut-Off contactor (when used) all are single pole, single throw design with normally open tips.
- 2-54 The SCRs give the operator infinite control of the travel speed up to approximately 4.5 MPH. Controlling when and how quickly each SCR is turned ON and OFF determines the truck speed. The SCRs are a stud type of configuration, mounted in a heat sink which dissipates built up heat. The function of each SCR is as follows:
- A. The main SCR 1 directly controls the truck's speed. The more frequently SCR 1 is turned on and the longer it stays on increases the truck's speed.
- B. The charging SCR 3 turns on with SCR 1. The SCR 3's main purpose is to charge the capacitor C1 while SCR 1 is on.
- C. The commutating SCR 2 is turned on alternately with the other two. When SCR 2 turns on, it causes a no flow condition to SCR 1, turning SCR 1 off.
- 2-55 The rectifiers used on the Model 20 are also the stud type configuration and function as follows:

# **THE RAYMOND CORPORATION**

## **MODEL 20 SCR SECTION III OPERATING INSTRUCTIONS**

3-50 (cont'd.)

### **WARNING**

**WHEN YOU ARE EXITING AN AISLE MOVING SIDeways, ALWAYS STOP AND BLOW THE HORN BEFORE THE END OF THE LOAD ENTERS AN INTERSECTING AISLE.**

3-51 **PARKING THE TRUCK**

3-52 When not in use, the truck should be parked in an area reserved for parking. If the battery requires charging, the truck should be returned to the charging area. When leaving the truck unattended, the control should be neutralized, forks lowered, the battery disconnected from the truck receptacle, keyswitch turned OFF and the key removed.

### **WARNING**

**NEVER PARK ON A SLOPE OR GRADE.**

3-53 **SAFETY**

3-54 The Raymond Model 20 SCR truck incorporates many built-in safety features to protect both the truck and operator. The deadman pedal eliminates the possibility of a runaway truck. A pressure relief valve prevents the truck from lifting dangerous overloads. Also, pressure relief valves in the auxiliary system prevent damage to auxiliary parts. Built-in limit switches prevent the truck from traveling in high speed when the carriage is elevated above a certain height (usually 24"). The horn is a valuable aid in warning fellow workers of your presence.

3-55 Beyond this, the safe operation of the truck is up to the operator. The proficient operator becomes thoroughly familiar both with the truck's capabilities and limitations. He then applies the high degree of skill and judgement necessary for the competent use of the truck.

3-56 The following important safety rules and procedures outline the practices necessary for the operation of a lift truck.

- A. The truck should be operated slowly and in an open area until the operator becomes thoroughly familiar with the truck controls. Avoid making turns while the carriage is elevated.
- B. Always keep hands, feet and head inside the operator's compartment. Guards are provided for the protection of the operator if he stays within the confines of the operator's compartment.
- C. Except in cases of emergency, avoid abrupt stops or changes in direction. These can cause the truck to tip or the load to shift.
- D. When exiting an aisle while moving sideways with a "4D" truck, always stop and blow the horn before the end of the load enters an intersecting aisle.
- E. Never park the truck on a slope.
- F. Before operating the truck, always check the battery retainers. They must be in position and securely locked before the truck is moved.
- G. Never check the water level in an industrial storage battery with a match or lighter; use a flashlight. The gas the battery gives off is hydrogen, which is highly explosive.
- H. Passengers are not permitted to ride on industrial fork lift trucks.
- I. Always be alert when traveling, watch out for pedestrians, sound the horn and slow down for turns, and stop at all intersecting aisles. Watch out for objects projecting into the aisles. Maintain a safe distance from other vehicles. Always maintain a safe speed as conditions warrant.

# THE RAYMOND CORPORATION

MODEL 20 SCR

SECTION V

THEORY OF OPERATION

- 5-31 When the accelerating contactor in Figure 5-5 is closed, the resistor is "shorted" out of the circuit. The voltage drop across the motor now immediately rises to 12 volts. Since an increase in voltage across the motor increases RPM, the motor gains speed.
- 5-32 The circuit of Figure 5-5 demonstrates two disadvantages of the resistor controlled truck. The first is the loss of energy resulting from the use of resistors to obtain slow speed. The other disadvantage is that the truck is limited (in this example) to only two speeds. These speeds are fixed and constant.
- 5-33 In Figure 5-6, the resistor and acceleration contactor have been replaced by a switch. If this switch was closed and opened at a predetermined frequency, the speed of the motor could equal the slow speed of the resistor truck (Paragraph 5-45), but without any power loss. Furthermore, this circuit allows the speed of the motor to be varied by opening and closing the switch at a faster or slower rate. This can be demonstrated by using a battery and voltmeter. Connect the negative lead of a meter to the negative terminal of a battery as shown in Figure 5-7. Then using the positive lead as a probe, quickly connect and disconnect the meter to the positive battery terminal. The voltage reading on the meter will be less than 12 volts even though the battery voltage is 12 volts. The longer the interval between connections and disconnection, the higher the voltage reading. If in a one second time interval, the voltmeter was connected three times and the respective readings were 4, 8 and 12 volts, the average voltage for one second would be 8 volts. Likewise, if the three voltage readings were 8, 10 and 12 volts, the average voltage would be 10 volts.

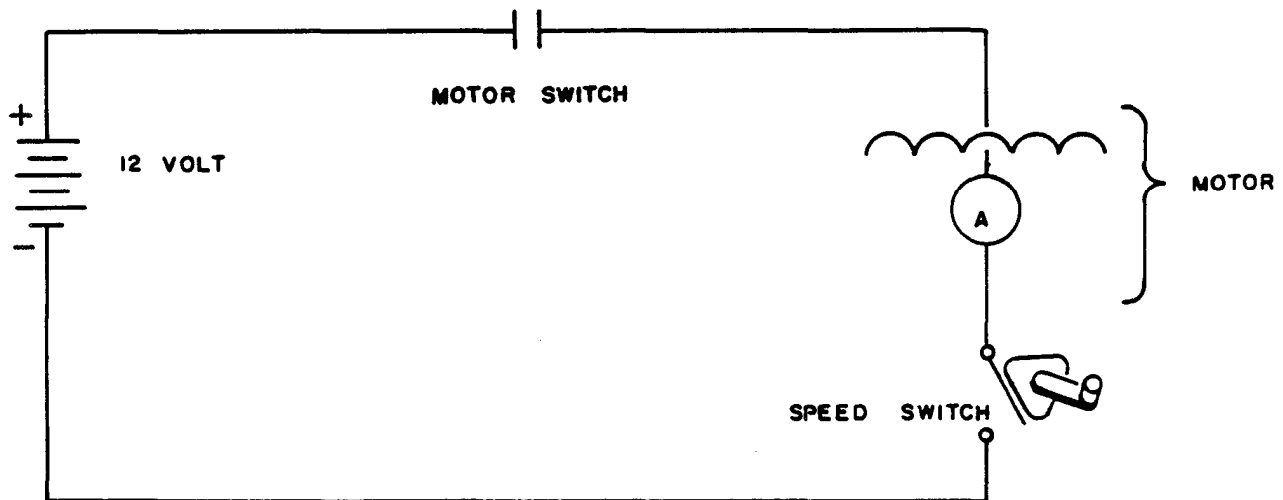


Figure 5-6 Circuit with Speed Switch

- 5-34 The previous example shows how the voltage of a circuit can be controlled by opening and closing a switch. Since the speed of a motor depends directly on voltage, it can also be seen how the speed of a motor could be varied. However drawback to this circuit is that a mechanical switch cannot withstand the arcing which occurs each time it is opened, and the switch cannot be opened and closed at a fast enough rate.

**THE RAYMOND CORPORATION**  
**MODEL 20 SCR**  
**SECTION V**  
**THEORY OF OPERATION**

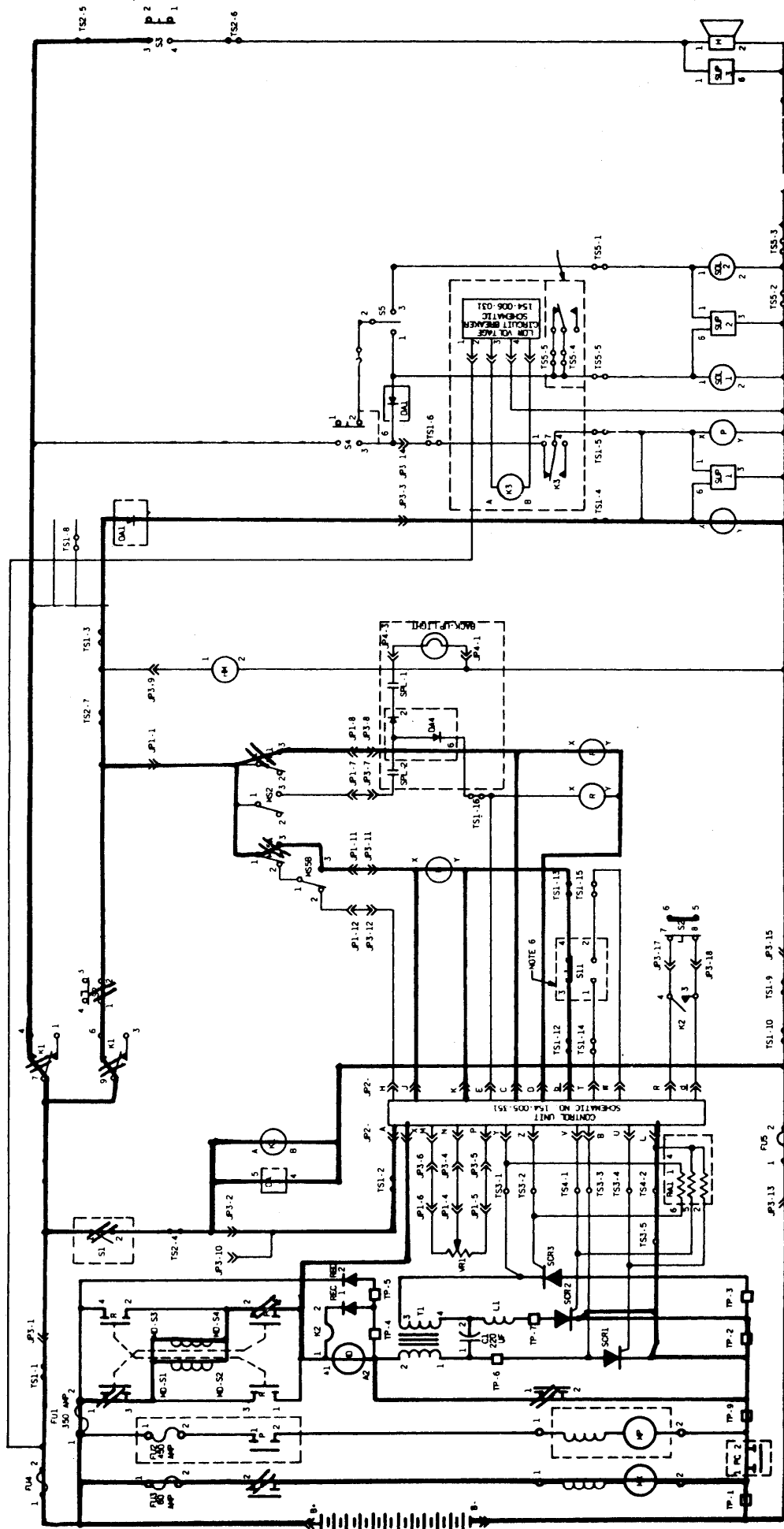


Figure 5-15 High Speed Switch Closed

# THE RAYMOND CORPORATION

MODEL 20 SCR

SECTION VI

MAINTENANCE

LEGEND FOR FIGURE 6-4:

Part Name and Item No.	Instructions	Lubricant	
		Applications Above 30° F.	Applications Below 30° F.
Reach Arms (1, 2 and 3, Fig. 6-4)	Lubricate the pressure fitting monthly or every 175 hours.	Texaco Regal AFB-2 grease MIL-G-18709A or equivalent.	
Load Wheels (4, Fig. 6-4)	Lubricate the pressure fittings monthly or every 175 hours.	Texaco Regal AFB-2 grease MIL-G-18709A or equivalent.	
Fork Bar (5, Fig. 6-4)	Clean and apply a light film of lubricant - monthly or 175 hours	Texaco Regal AFB-2 grease MIL-G-18709A or equivalent.	
Roller Bearings (6, Fig. 6-4)	Inspect monthly or every 175 hours for wear, binding or damage	No lubrication required.	
Nominal Lift Ram Guide Rod (7, Fig.6-4)	Clean and apply a light film of lubricant - monthly or every 175 hours	Texaco Regal AFB-2 grease MIL-G-18709A or equivalent.	
Uprights (8, Fig. 6-4)	Clean and apply a light film - monthly or every 175 hours.	Texaco Regal AFB-2 grease MIL-G-18709A or equivalent.	
Lift Chains (9, Fig. 6-4)	Clean and spray or brush on enough oil over the entire chain so it will penetrate between the leaf plates to the pin.	Texaco 10W-30W URSATEX MIL-L-46152 or equivalent.	
Full Free Lift Chain (10, Figure 6-4)	Clean and spray or brush on enough oil over the entire chain so it will penetrate between the leaf plates to the pin.	Texaco 10W-30W URSATEX MIL-L-46152 or equivalent.	

# THE RAYMOND CORPORATION

MODEL 20 SCR  
SECTION VI  
MAINTENANCE

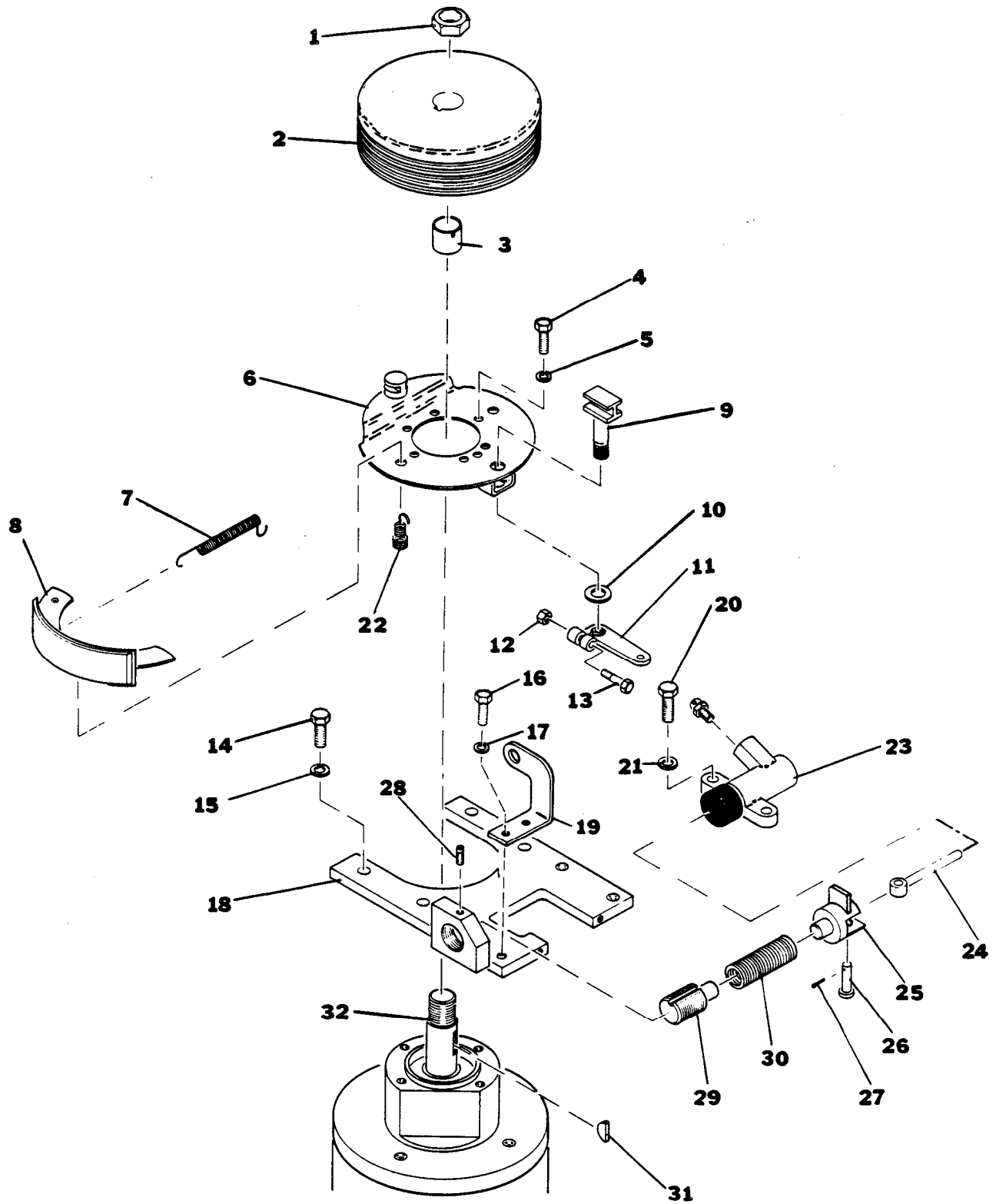


Figure 6-11 Exploded View of Brake Assembly  
6-16

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

# THE RAYMOND CORPORATION

## MODEL 20 SCR SECTION VI MAINTENANCE

### 6-45 LIFT AND AUXILIARY PUMPS

6-46 Although the lift and auxiliary pumps require no periodic maintenance, a scheduled maintenance program can extend pump life. This program should include inspection of the hydraulic oil for contamination, a hydraulic line leakage check, and periodic replacement of the oil and the oil filter. If a pump operates noisily, problems may be developing. A noisy pump can be caused by an air leak, a clogged pump intake line, a plugged reservoir air vent, air trapped in the pump or by an internal failure.

6-47 If a pump leaks or fails to perform properly, kits are available for repairing it. The kits include replacement seals, diaphragms, springs and check balls. Refer to the parts list for repair parts and an illustration. If the pump's gear or housing are worn, the pump should be replaced.

### 6-48 DELETE

#### note

when assembling the pump to the motor, lubricate the coupling with a thin coat of MOLYKOTE Type G lubricant.

### 6-49 LIFT/LOWER CONTROL VALVE

6-50 If the lift/lower control valve develops a leak and will not hold the lift cylinder, the o-rings, springs and poppets can be replaced. Refer to the parts catalog for the replacement parts which are available. When disassembling the valve, check the tightness of the plunger spool in the valve housing. The plunger and housing are lap fitted. If the housing is worn, the valve should be replaced.

### 6-51 MANIFOLD ASSEMBLY

6-52 The lift/lower solenoids SOL-1 and SOL-2 and the lift pressure relief valves should be checked for proper operation and adjustment. The manifolds ports should be checked for leaks, etc. Refer to the parts catalog for repair parts which are available.

### 6-53 Lift Pressure Relief Valve (See Figure 6-17)

6-54 The lift pressure relief valve (See Figure 6-17) is located on the lower left side of the manifold assembly. It should be checked periodically and adjusted if necessary since it prevents the truck from lifting more than its rated capacity.

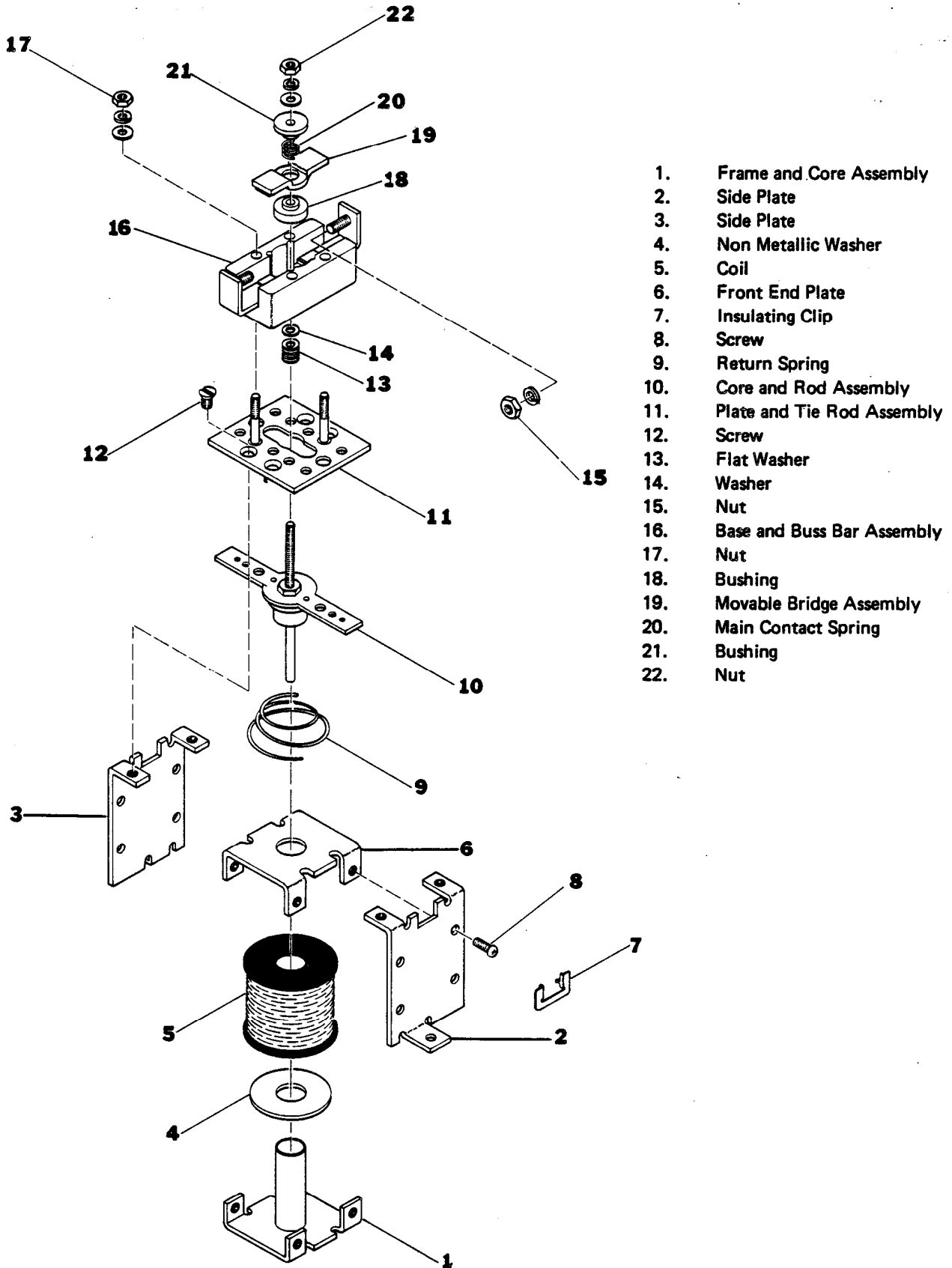
#### CAUTION

ALWAYS CHECK THE FUNCTIONING OF THE LIFT PRESSURE RELIEF VALVE WITH THE KEYSWITCH OFF AND THE BATTERY DISCONNECTED. IF THE TRUCK IS ON, OIL WILL SPRAY FROM THE PRESSURE PORT.

6-55 An accurate hydraulic pressure gauge rated at 3000 PSI is required. To obtain an accurate setting, adjust the lift pressure relief valve as follows: With the battery disconnected and the keyswitch OFF, unscrew the cap from the pressure port (See Figure 6-17) and screw on the pressure gauge. Reconnect the battery and turn the keyswitch ON. Unscrew the protective cap from the lift pressure relief valve. Inside is an adjustable 3/16" Allen-head screw which alters oil pressure when tightened or loosened. Loosen the lock nut located at the base of the lift pressure relief valve. Raise the rated load. Turn the Allen-head screw counterclockwise (out) until the load will not elevate in the last stage. Next, turn the Allen-head screw clockwise (in) until the rated load is elevating at maximum speed in the last stage. When this screw position has been found, check the relief valve pressure by directing the full lift flow through the relief valve. The mast must be elevated against the main frame stops. This pressure reading should be within 100 PSI higher than the maximum lift pressure required for elevating the load in the last stage. When this has been established, tighten the relief valve lock nut and screw on the protective cap. Unscrew the pressure gauge from the pressure port and screw on the pressure port cap.

# THE RAYMOND CORPORATION

MODEL 20 SCR  
SECTION VI  
MAINTENANCE



1. Frame and Core Assembly
2. Side Plate
3. Side Plate
4. Non Metallic Washer
5. Coil
6. Front End Plate
7. Insulating Clip
8. Screw
9. Return Spring
10. Core and Rod Assembly
11. Plate and Tie Rod Assembly
12. Screw
13. Flat Washer
14. Washer
15. Nut
16. Base and Buss Bar Assembly
17. Nut
18. Bushing
19. Movable Bridge Assembly
20. Main Contact Spring
21. Bushing
22. Nut

Figure 6-20 "X" Contactor  
6-36

# THE RAYMOND CORPORATION

MODEL 20 SCR  
SECTION VI  
MAINTENANCE

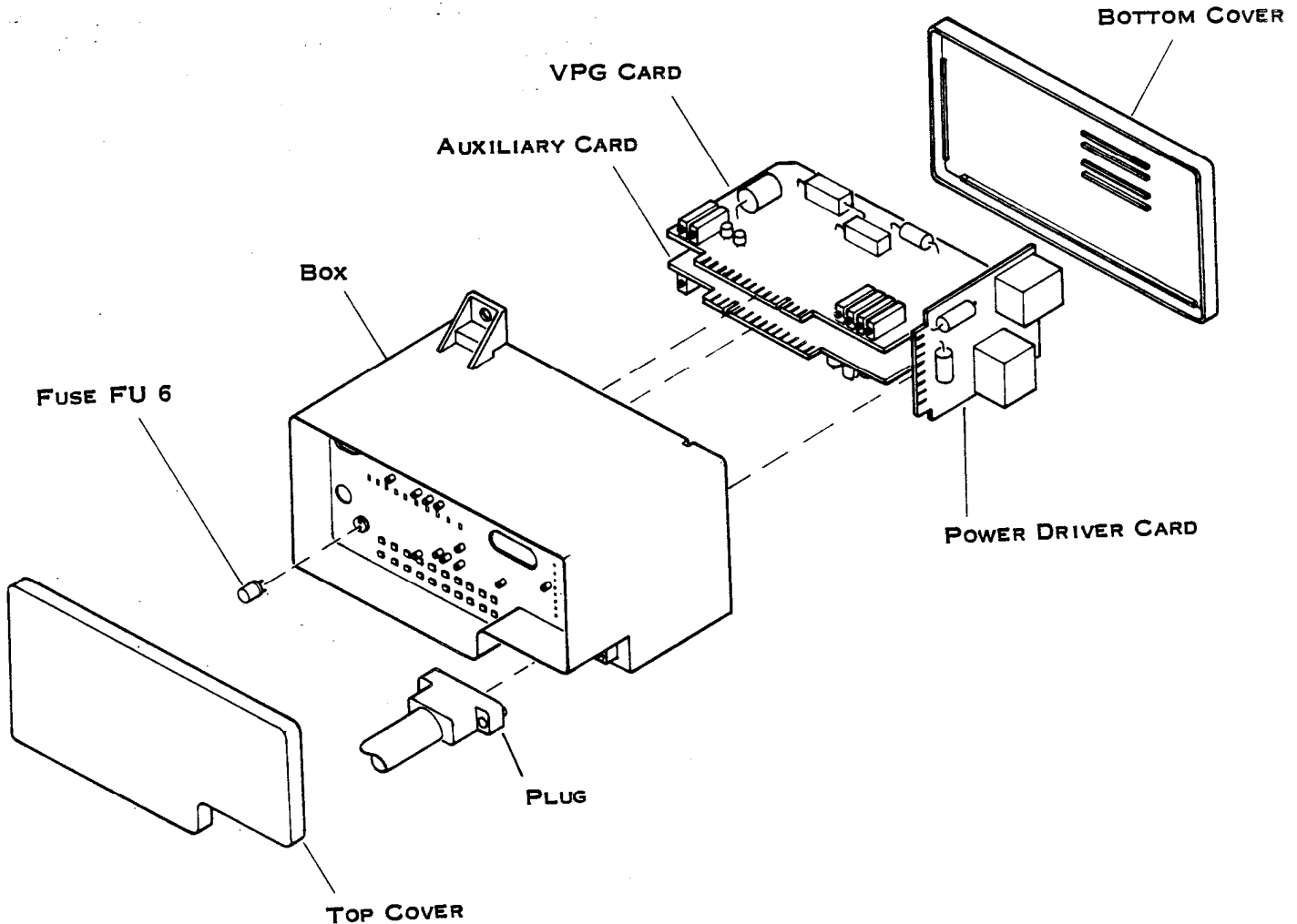


Figure 6-27 Exploded View of Control Unit

- 6-128 If the voltmeter gives no reading and the appropriate directional contactor is not energized, check wiring, directional switches MS1 and MS2 and the F and R contactor coils. If the voltmeter continues to read 24 volts but the F and R contactors remain de-energized, check for a shorted main SCR 1, or a welded M contactor. If these test good, replace the control unit or auxiliary circuit card.
- 6-129 "M" Time Delay Circuit - (auxiliary circuit card)
- 6-130 To check for proper operation of the "M" time delay, connect the positive lead of the voltmeter to T.P. 12 and the negative lead to T.P. 2. With the key switch ON, close the deadman switch and move the directional/speed control handle to full forward or reverse direction. As the directional/speed control handle is moved from neutral into the M range, the truck will peak out in the SCR range. When this has happened, it will take approximately 2.5 seconds until the M contactor energizes. The voltmeter will decrease from 24 volts to approximately 0 volts when the M contactor tips close.
- 6-131 If the voltmeter gives no reading and the M contactor is not energized, check wiring, M speed switches MS5A and MS and the M contactor coil. If the voltmeter continues to read 24 volts but the M contactor remains de-energized, check for proper operation of limit switch S11. If the switch tests good, replace the control unit or auxiliary circuit card.

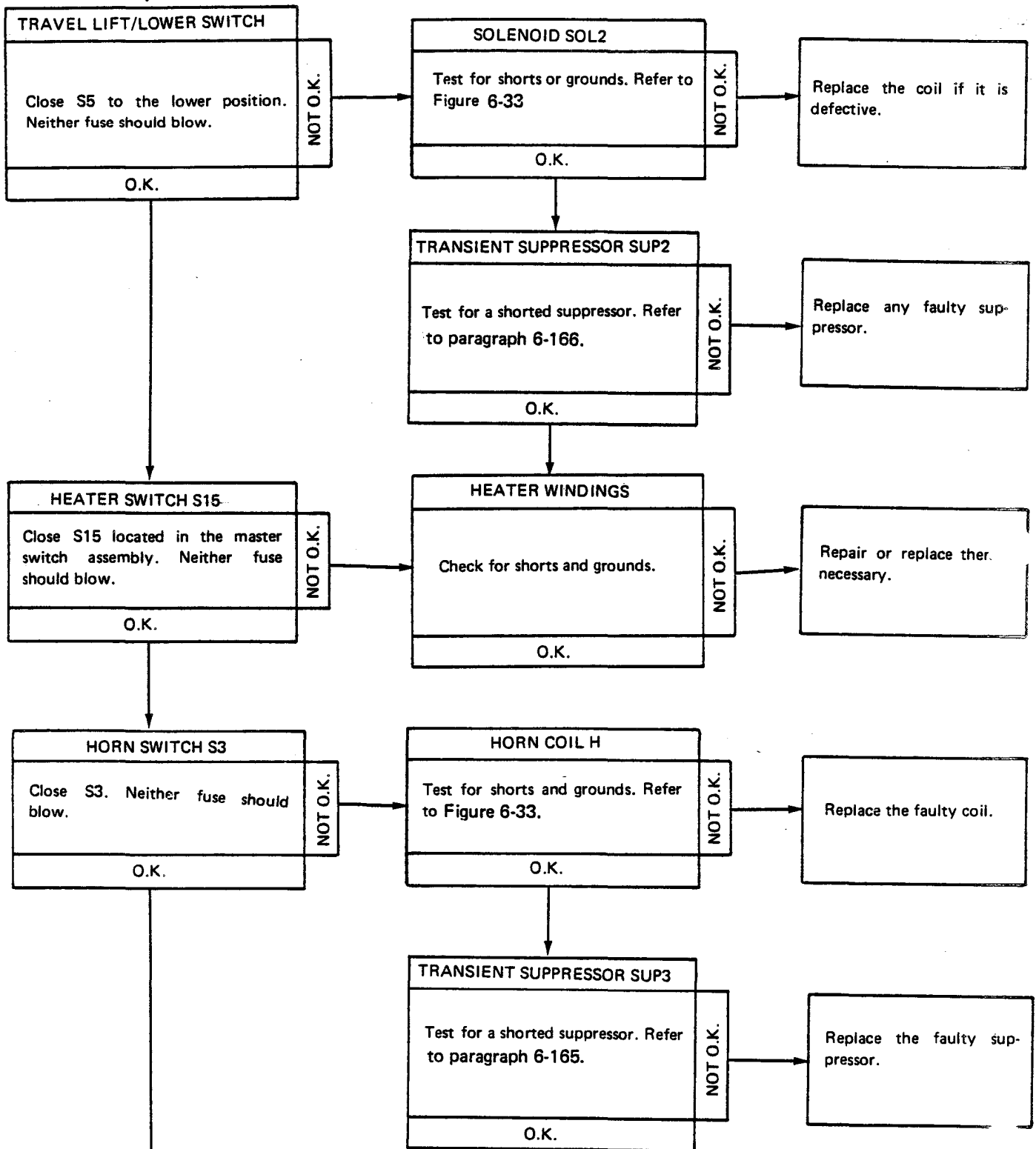


# THE RAYMOND CORPORATION

## MODEL 20 SCR SECTION VII TROUBLESHOOTING

TRAVEL LIFT/LOWER SWITCH (Cont'd.)

7-1 THE TRUCK IS COMPLETELY INOPERATIVE (cont'd.)



Continued on page 7-7.

# THE RAYMOND CORPORATION

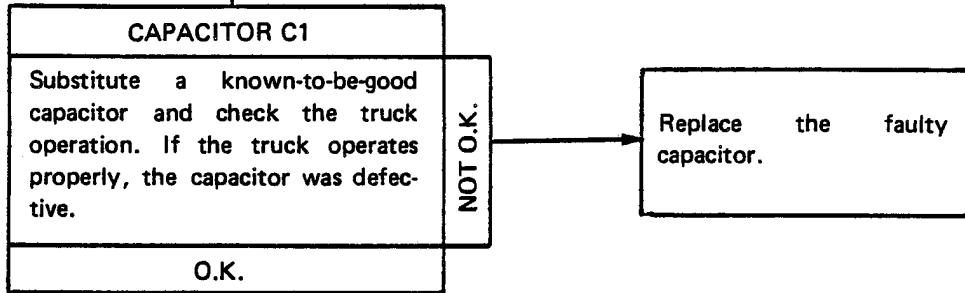
## MODEL 20 SCR SECTION VII TROUBLESHOOTING

### 7-4 TRUCK HAS NO TRAVEL - ALL OTHER CIRCUIT FUNCTION (cont'd.)

#### B. Control Circuit Problems (cont'd.)

2. The Forward or Reverse Contactors are Activated, then Drop Out - The M Contactor Is Not Activated (cont'd.)

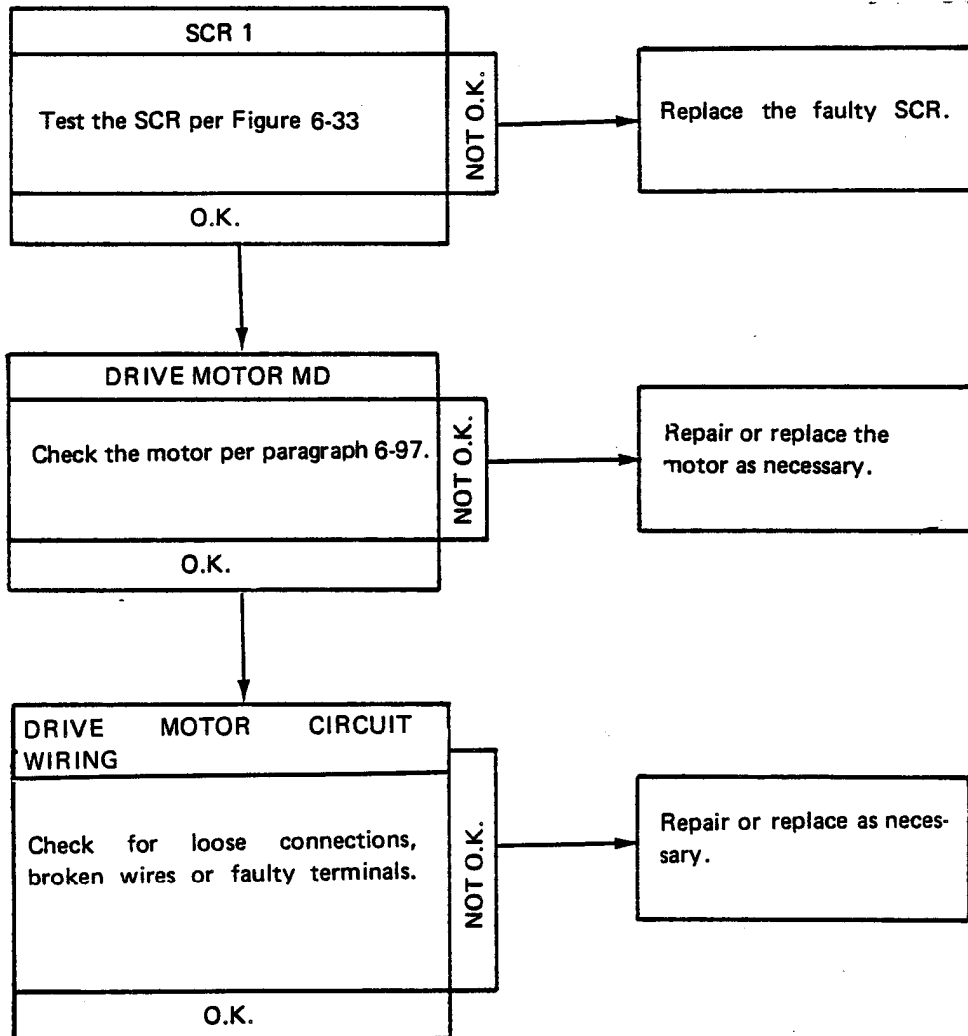
#### TRANSFORMER T1 SECONDARY WINDING (Cont'd.)



### 7-4 THE TRUCK HAS NO TRAVEL - ALL OTHER CIRCUITS FUNCTION (cont'd.)

#### B. Control Circuit Problems (cont'd.)

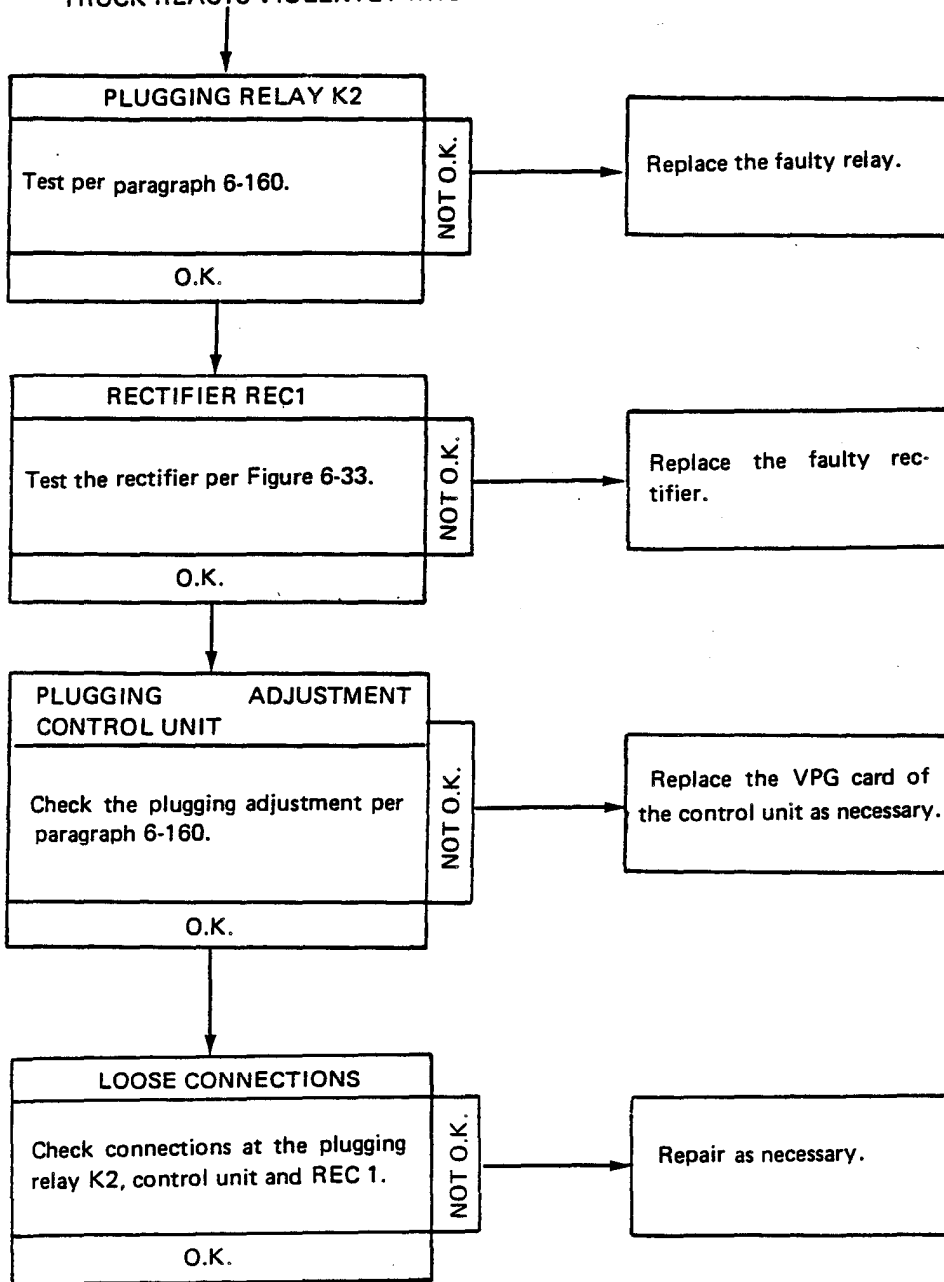
3. Forward or Reverse Contactors are Actuated but M is Not Activated



# THE RAYMOND CORPORATION

## MODEL 20 SCR SECTION VII TROUBLESHOOTING

7-11 TRUCK REACTS VIOLENTLY WHEN PLUGGED



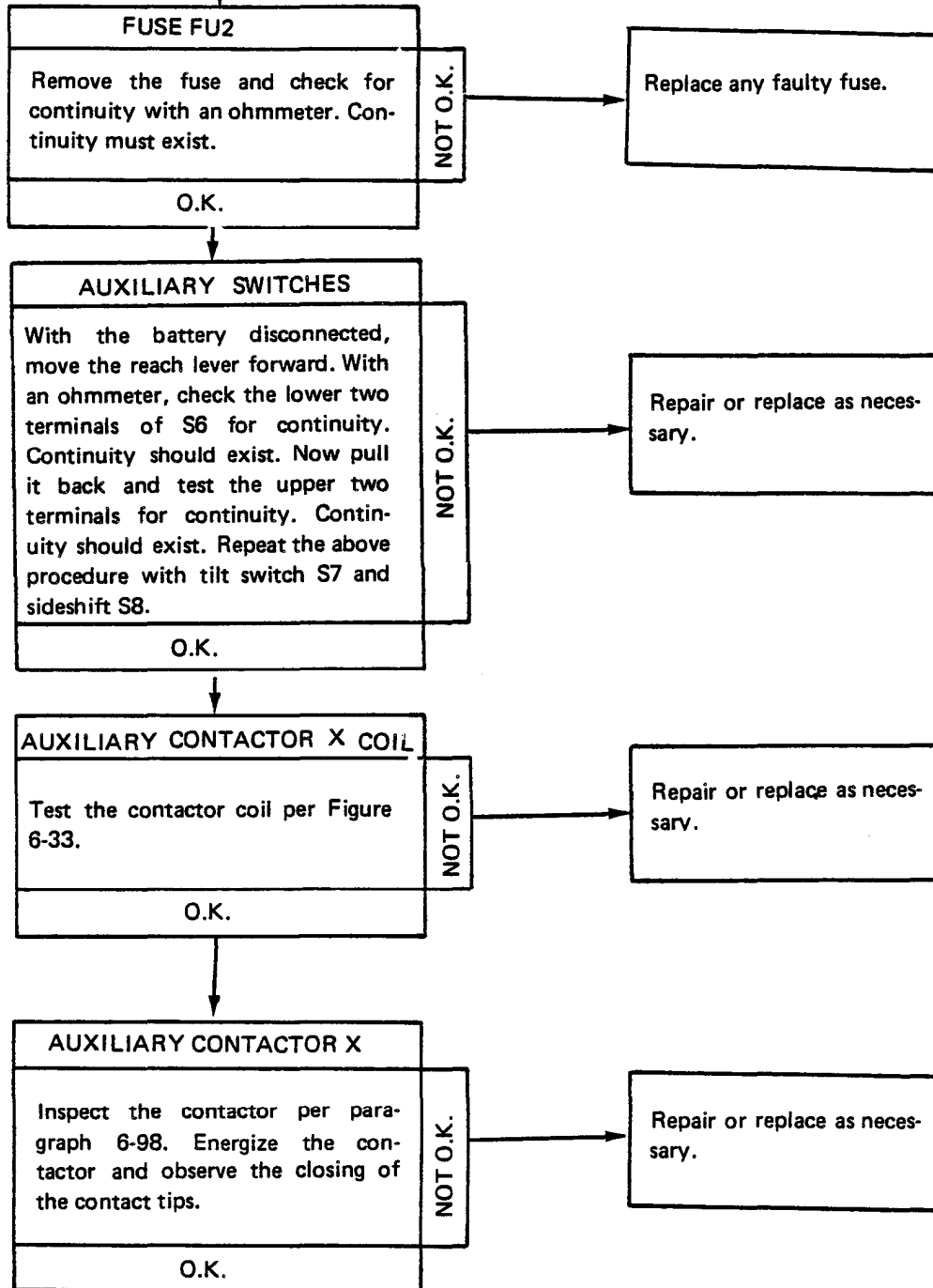
# THE RAYMOND CORPORATION

## MODEL 20 SCR SECTION VII TROUBLESHOOTING

note

the auxiliary system may consist of several options. power steering, reach, tilt, sideshift, clamp and "4D" are available.

### 7-15 A. AUXILIARY SYSTEM PROBLEMS Improper Operation of the Auxiliary System



Continued on page 7-37.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL