Planned Maintenance & Adjustment Procedures

PMA 436
E235 EV 1

CLARK
333 West Vine Street
Lexington, KY
40507-1640

FOREWORD

PLANNED MAINTENANCE SECTION:

The Planned Maintenance Procedures located in the front of this book provide a basic step by step guide which should be followed in servicing the vehicle. Adjustment Procedures, specifications and other data including lubrication guides, are found in the rear of this book and are listed under GROUP and Section Numbers. Refer to the Index or the Product Identification Card.

ABOUT PLANNED MAINTENANCE:

Planned Maintenance is a program in which inspections, minor adjustments, lubrication, oil changes and replacement of filters are performed on a scheduled and systematic basis. A solid PM program should incorporate a method of record keeping which enables you to better determine PM schedules and enables you to track the maintenance costs per machine.

An effective PM program should incorporate two basic phases:

1. An inspection performed by the driver or maintenance man at the beginning of each shift. This is a quick visual check for obvious damage and leaks ... a check of engine oil and water levels, lights, instruments and warning devices.

2. The Planned Maintenance routine is based on 50 to 250 operating hours ... with the interval being determined by operating conditions.

Records will tell you how often PM should be done. If an operation is clean and not punishing, a PM interval can be extended. If an operation is extremely dirty and punishing, the PM interval may have to be reduced. Thus ... the PM interval can be tailored to answer the needs of your operation.

If the PM is religiously followed, needs for repair, major adjustment and component replacement will be discovered automatically and such work will be done only as needed. For instance, brake checks which are part of the PM will uncover the need for adjustments and/or repairs which may be required periodically. Who can say? The point is that this will be done only when needed and that's true for all systems and components. Thus, in this program we are able to eliminate 500, 1000 and 2000 hour inspections and the things normally covered in these inspections will be done only when the PM uncovers the need for repairs.

The objectives of PM are:

1. To reduce costly unscheduled downtime.
2. Reduce maintenance costs.
3. Increase vehicle productivity.
4. Above all, to increase personal safety of drivers and other personnel.

INSPECTION FORMS:

To insure that the daily inspection and PM are properly performed, we recommend the use of the inspection forms in GROUP 40. Such forms not only provide a guide for the inspections and procedures, but serve as a record in tracking maintenance requirements for each vehicle. Moreover, they will assist you in determining when to schedule a vehicle for major repairs which can be done without the disruptive effect of unscheduled downtime.

Inspection Forms may be purchased from your local CLARK Dealer.

SPECIAL NOTICE TO ALL
USERS OF THIS MANUAL.

IF ... in the process of using this manual for PM procedures, adjustments, references, etc ... you find that this manual can be improved in any way, put your ideas in writing and send them to:

CUSTOMER SERVICES ENGINEERING
CLARK EQUIPMENT COMPANY
BATTLE CREEK, MICHIGAN (49016)

We can't promise that your idea will be used, but it will be seriously considered. If you do submit any such ideas, please understand that Clark Equipment Company can use it without obligation.

Next, elevate carriage approximately one foot from the floor.

Fig. 17658

CHECK THE BRAKE LIMIT (DRIVE MOTOR SHUT-OFF SWITCH:

With truck in creep speed, press and release brake pedal. The truck should stop and start within the pedal free travel.

Fig. 20127

Check STEERING while in forward creep speed. Make a full turn to the left and then ...

Fig. 20128

... make a full turn to the right. Listen for unusual steering noise.

Fig. 20129

AIR CLEAN the battery compartment and the parking brake linkage.

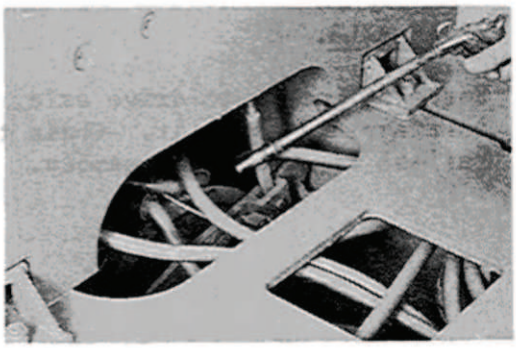


Fig. 17928

AIR CLEAN the CONTROL PANEL.

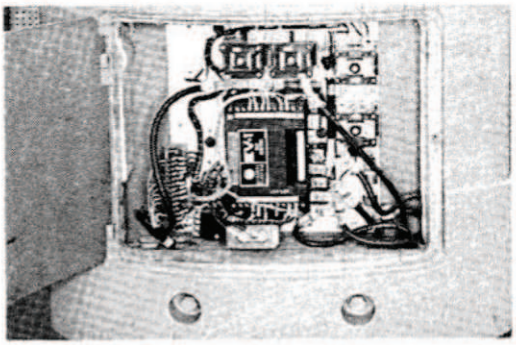


Fig. 20136

AIR CLEAN the STEER AXLE.

Fig. 17930

LUBRICATE the HYDRAULIC CONTROL LEVERS.

Fig. 17685

Check HYDRAULIC SUMP TANK FLUID LEVEL.

Check Condition of fluid. If contaminated, the sump tank and fluid filter should be serviced.

N O T E

Hydraulic sump tank fluid specifications are located in GROUP 40, Section 4.

I M P O R T A N T

BEFORE CHECKING FLUID LEVEL, THE UPRIGHT MUST BE VERTICAL, THE LIFT CARRIAGE FULLY DOWN, THE TRUCK SETTING ON A FLAT LEVEL FLOOR.

Remove fill cap.

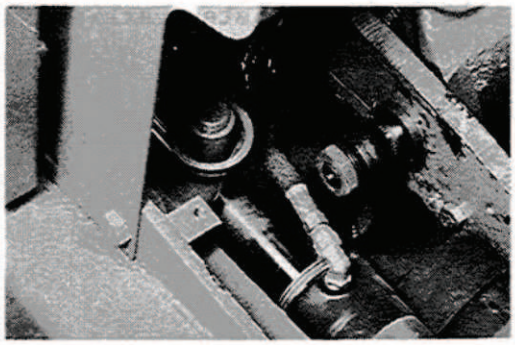


Fig. 17941

FLUID LEVEL should be to the bottom of the filler tube. If it is not, add fluid as required.

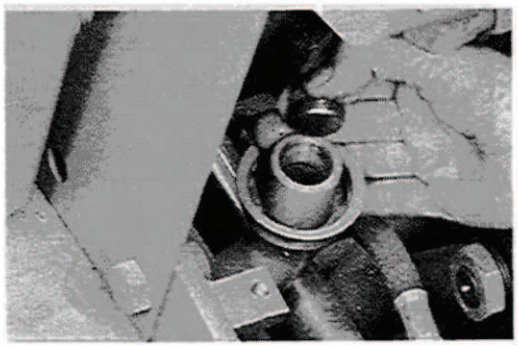


Fig. 17942

Check SUMP TANK BREATHER. Unscrew breather at connection and clean in a Stoddard type cleaning solvent. Allow breather to completely dry prior to installation.

N O T E

If cleaning solvent does not flow freely out the breather holes after cleaning, install a new breather.

I M P O R T A N T

HYDRAULIC SUMP FILTER AND FLUID CHANGE IS NOT PART OF THE P.M. AS IT IS A MAJOR REPAIR ITEM, REFER TO GROUP 29, SECTION 7 FOR SERVICE PROCEDURES. THE TRUCK SHOULD BE SCHEDULED FOR A HYDRAULIC SUMP FILTER AND FLUID CHANGE EVERY 2000 OPERATING HOURS OR ONCE A YEAR, WHICHEVER COMES FIRST.

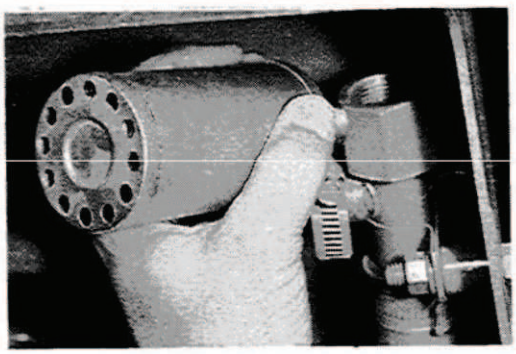


Fig. 17710

Set meter on Rx10,000 scale. Turn key switch to off position and check for grounds as follows:

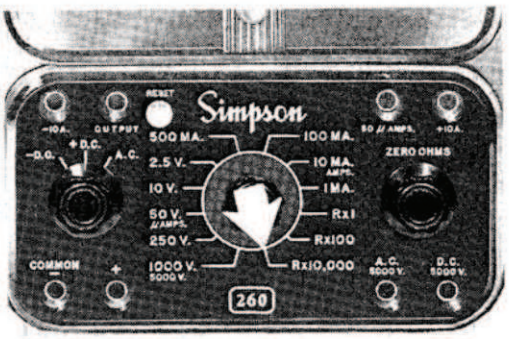


Fig. 17737

1. Connect RED lead to POSITIVE (+) of truck receptacle and connect BLACK (-) lead to the truck frame. Record resistance.

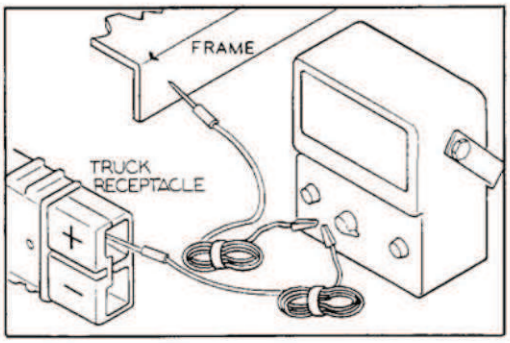


Fig. 14860

2. Connect RED lead to NEGATIVE (-) of truck receptacle and leave BLACK lead connected to truck frame.

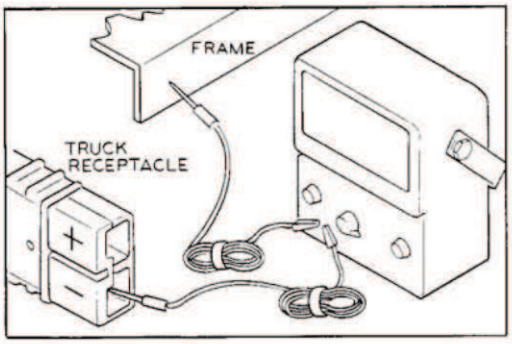


Fig. 14861

SPEED POTENTIOMETER TEST:

First, check accelerator travel. Press on the pedal ... there should be enough physical distance between CREEP SPEED and 1A (approximately 1-3/4 to 2-1/8 inches or 44.4 to 54.6 mm) to provide optimum speed control.

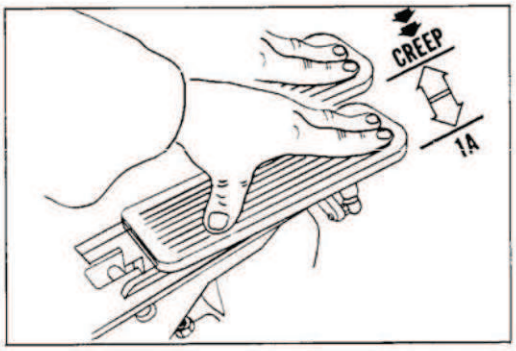


Fig. 17738

Connect the NEGATIVE (-) BLACK LEAD of the meter to the NEGATIVE POWER CABLE on the SCR control.

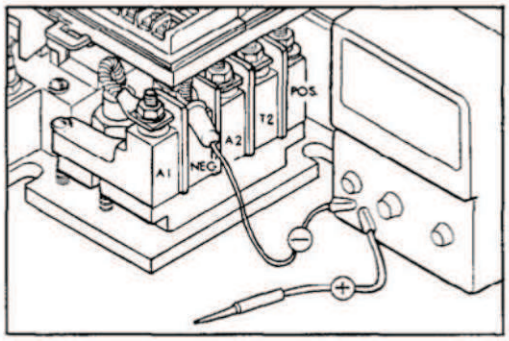


Fig. 19116

Touch the POSITIVE(+) RED LEAD of the meter to the T2 TERMINAL on the SCR control.

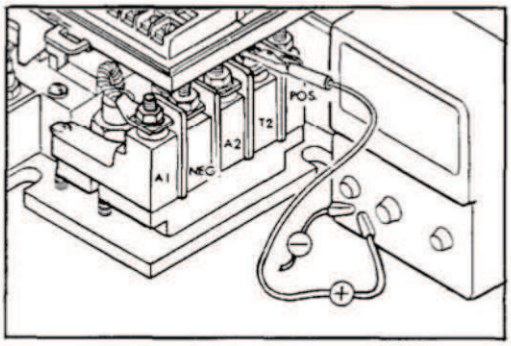


Fig. 19117

Turn meter dials to 50V and +DC positions.

Turn key switch on. Place F&R Lever into the forward position.

Fig. 17229

I M P O R T A N T

THE 10 Volt (+DC) SCALE MAY BE USED TO OBTAIN A MORE ACCURATE READING. HOWEVER, USE WITH CAUTION ... AS THIS SCALE MUST BE USED DURING THE CREEP SPEED MODE ONLY.

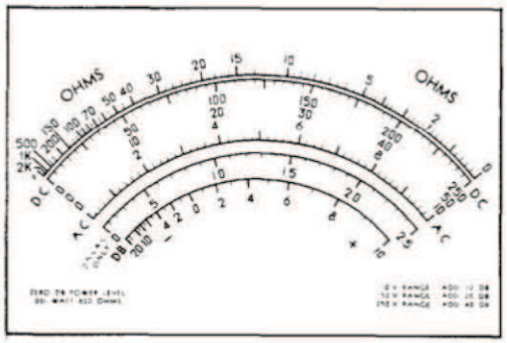


Fig. 17772

THIS CONCLUDES THE PERIODIC ELECTRICAL TEST PORTION OF THE ELECTRIC TRUCK P.M.

IF PERIODIC ELECTRICAL TESTS WERE NOT PERFORMED, REMOVE THE INSULATORS FROM THE CONTACTORS, RECONNECT WIRE #45, LOWER TRUCK, INSTALL SHEET METAL, CLOSE THE DOORS, INSTALL AND CONNECT THE TRUCK BATTERY.

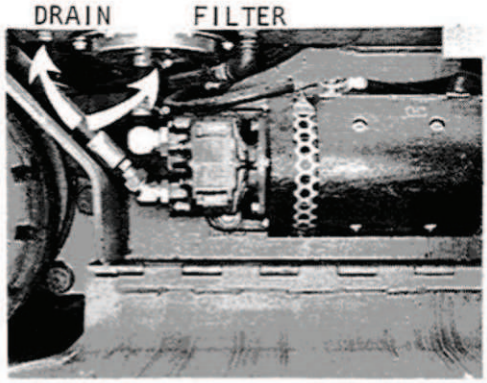
Refer to the CHART on the opposite page.

LUBRICATION CHART

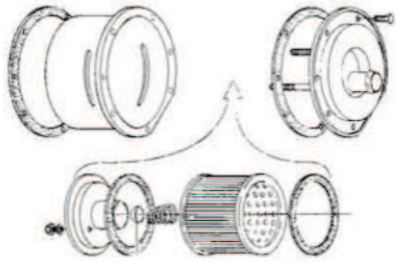
CHECK ...
Hydraulic Sump Tank Fluid Level. Fluid level should be to the bottom of the filler tube.

DRAIN ...
Hydraulic Fluid every 2,000 operating hours or once a year, whichever comes first. Refill with MS-226 hydraulic fluid.

DRAIN FILTER



REPLACE ...
Hydraulic Sump Tank Filter with a new one every 2,000 operating hours or once a year, whichever comes first.



CHECK ...
Drive Unit Fluid Level. Fluid should be even with the level plug opening. Check fluid for contamination.

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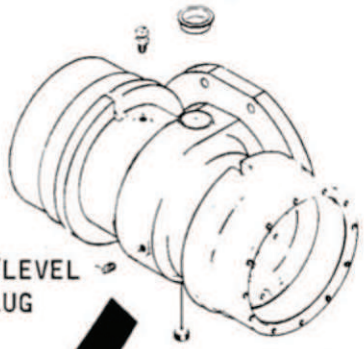
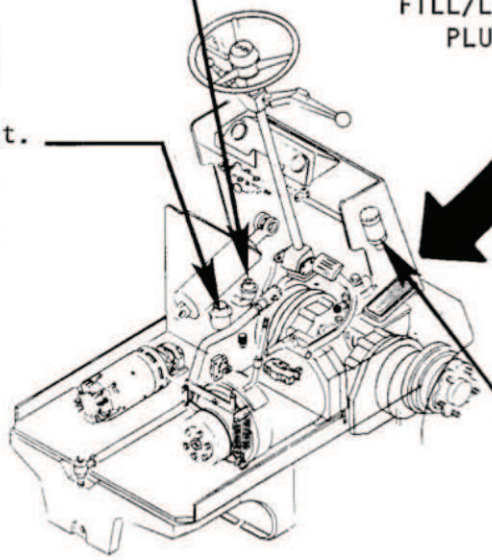
DRAIN ...
Drive Unit Fluid every 2,000 operating hours or once a year, whichever comes first.

INSPECTION/FILL COVER



FILL/LEVEL PLUG

DRAIN PLUG



CHECK ...
Sump Tank Breather for damage and contamination. Clean if dirty.

NOTE

FLUID SPECIFICATIONS: Refer to GROUP 40, Section 4, Pages 11 & 13.

COLD STORAGE

GROUP 13

SECTION 25

PUMP MOTOR OPERATING SWITCH

ADJUSTMENT PROCEDURES

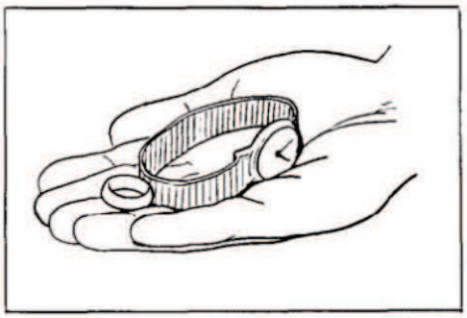


Fig. 12704

REMOVE ALL JEWELRY BEFORE EXAMINING ELECTRICAL COMPONENTS

GROUP
13

SECTION
27

ELECTRIC DRIVE MOTOR (BRAKE) CUT-OFF SWITCH CHECK & ADJUSTMENT PROCEDURES

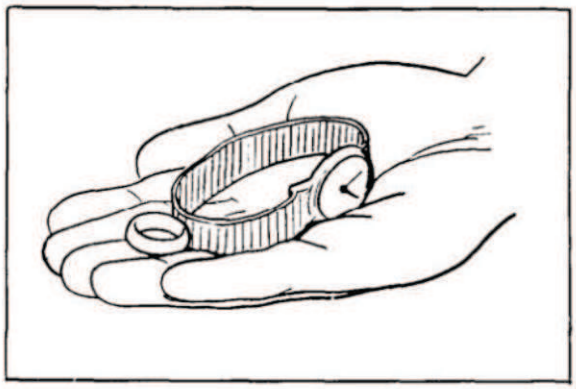


Fig. 12704

REMOVE ALL JEWELRY BEFORE EXAMINING ELECTRICAL COMPONENTS

GROUP
16

SECTION
27

GENERAL MOTOR MAINTENANCE

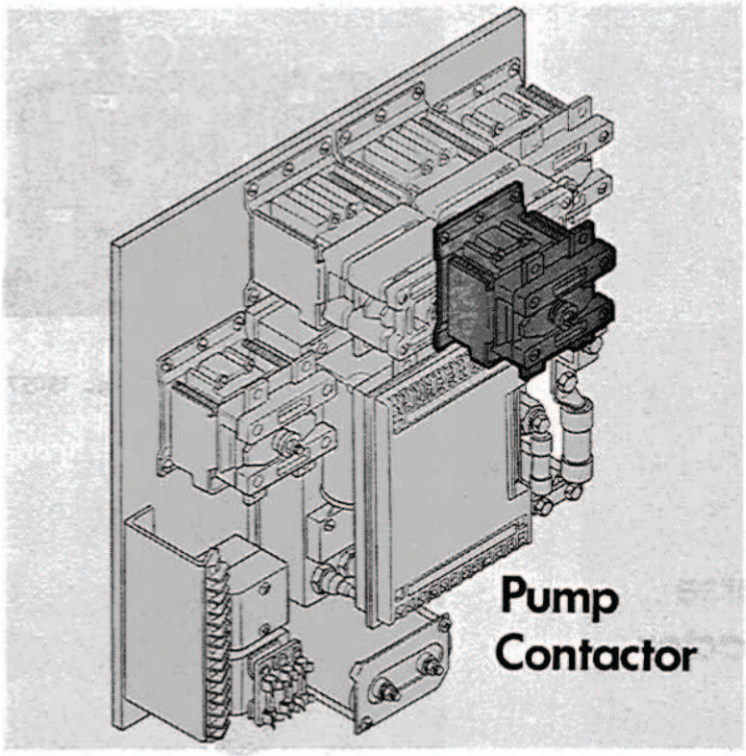


Fig. 19122

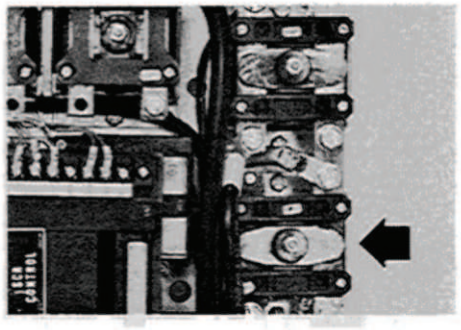


Fig. 19054

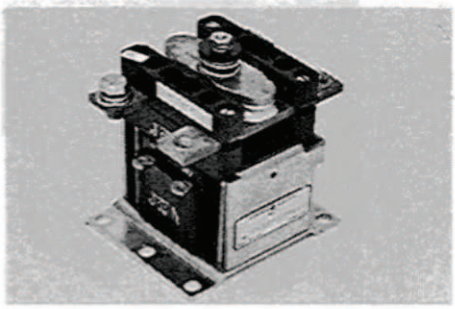


Fig. 19055

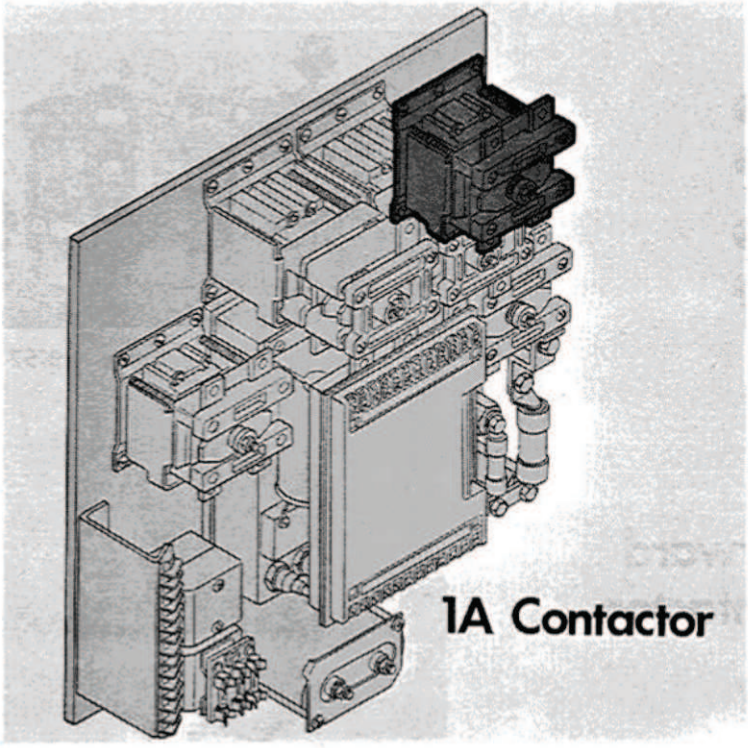


Fig. 19121

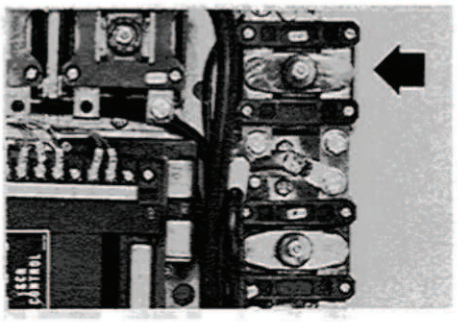


Fig. 19054

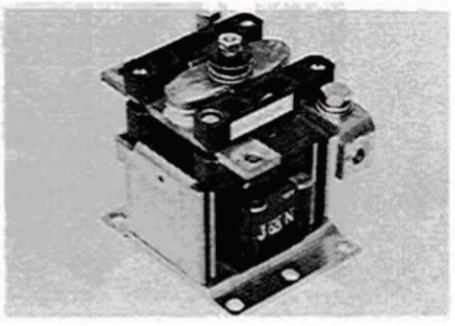


Fig. 19056

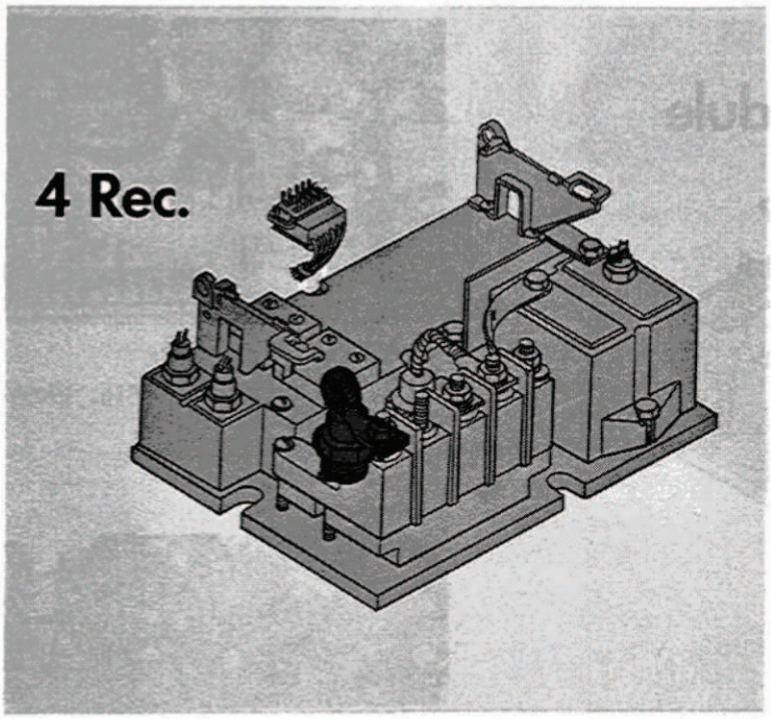


Fig. 19139

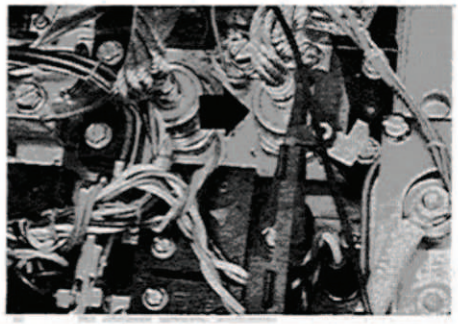


Fig. 19090

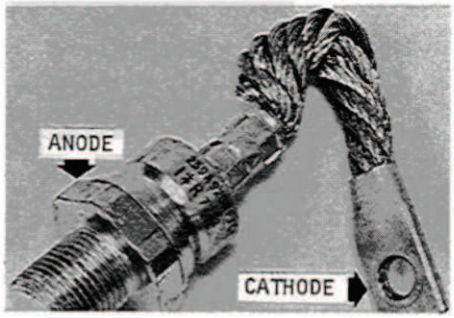


Fig. 19091

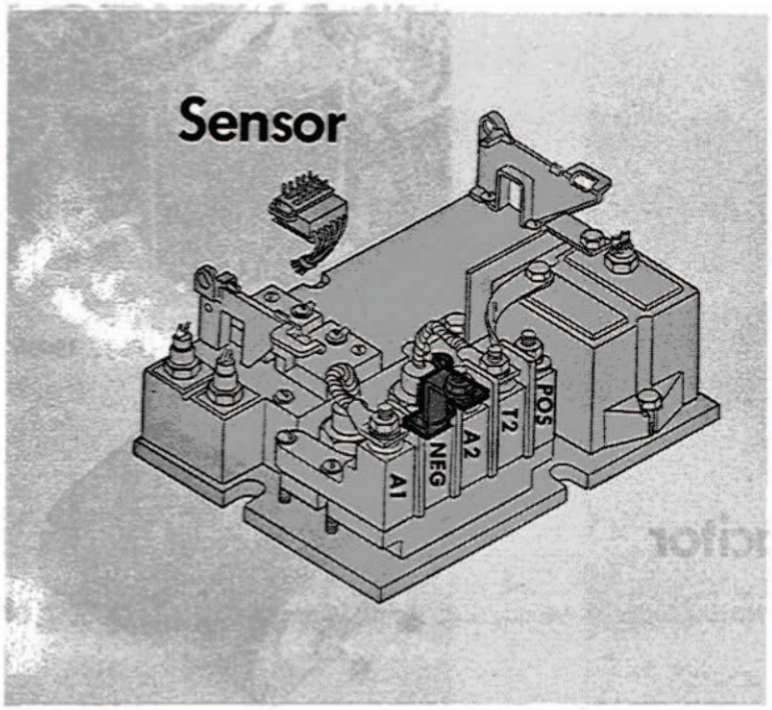


Fig. 19140

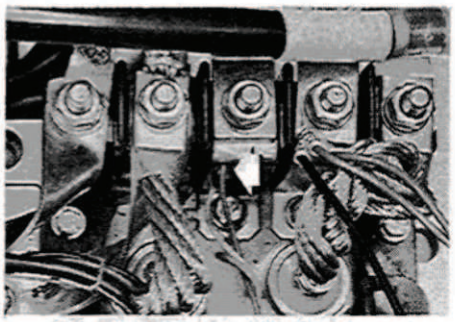


Fig. 19092

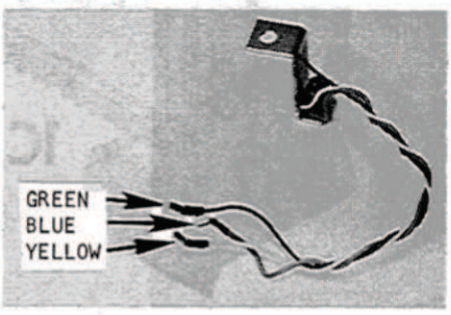
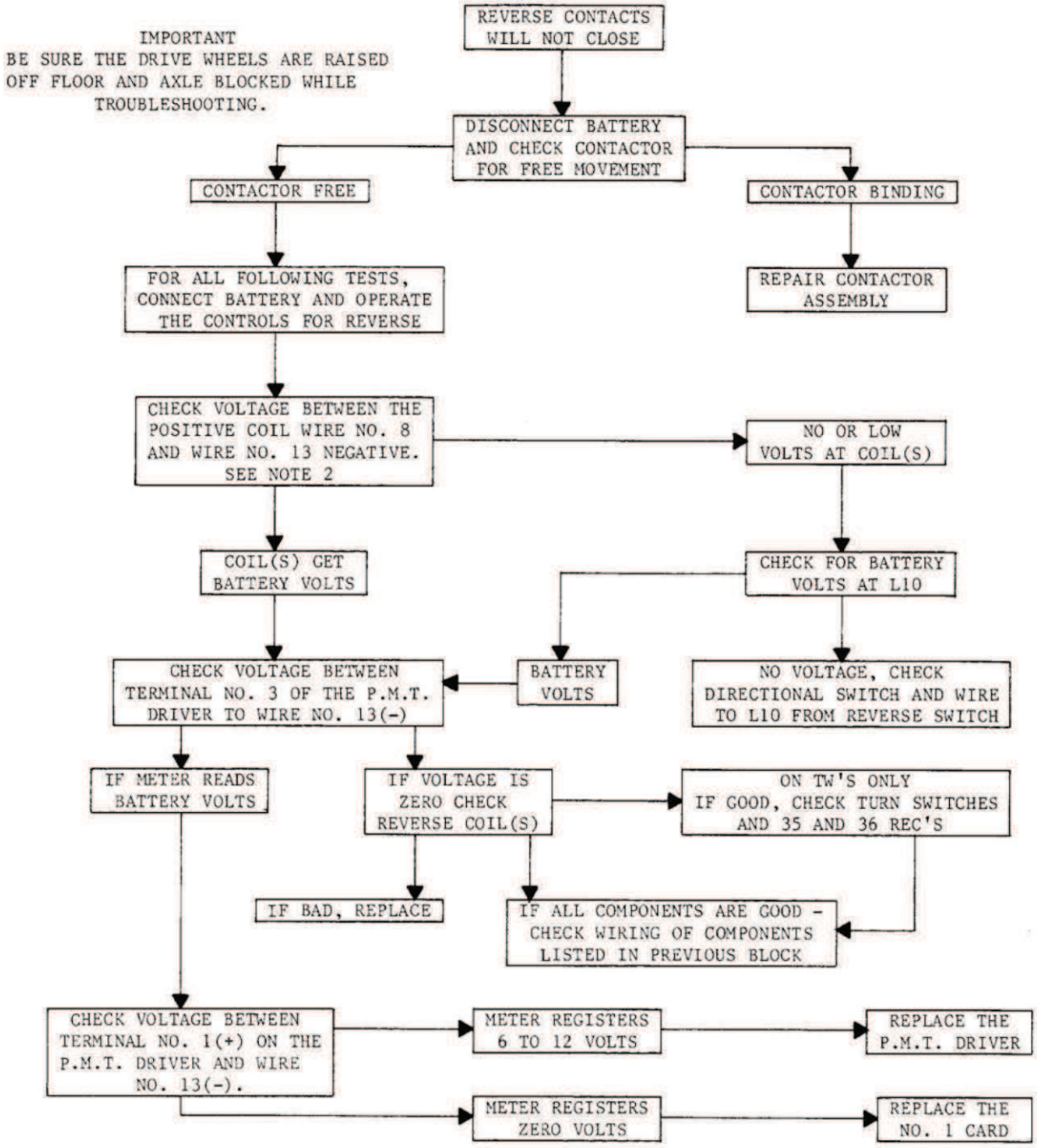


Fig. 19093

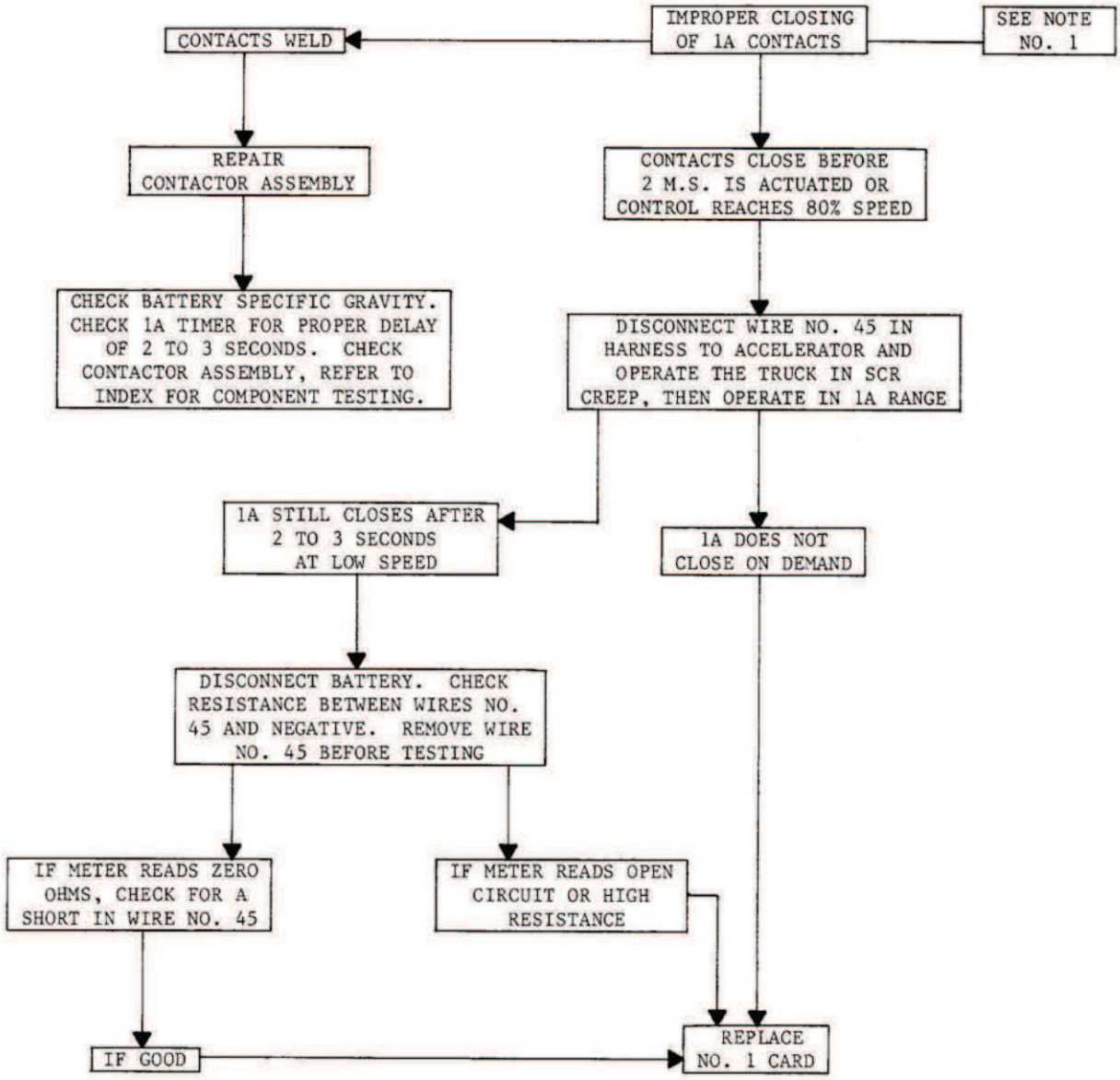
SYMPTOM NO. 2



NOTE NO. 1: ON TW MODEL TRUCKS CHECK BOTH RA AND RB COILS.
NOTE NO. 2: IF ONLY ONE CONTACTOR (TW) FAILS TO OPERATE, CHECK ONLY THAT UNIT WHILE TROUBLESHOOTING AND TURN STEER WHEELS TO STOP MOTOR THAT DOES OPERATE.

SYMPTOM NO. 9

IMPORTANT
BE SURE THE DRIVE WHEELS ARE RAISED OFF THE FLOOR AND THE AXLE IS BLOCKED WHILE TROUBLESHOOTING.



NOTE NO. 1: IF 1A CONTACTOR CLOSES WHEN KEY SWITCH IS TURNED ON, CHECK FOR SHORTED DRIVER. IF DRIVER IS O.K., REPLACE NO. 1 CARD. REFER TO INDEX FOR COMPONENT TESTING WITH V.O.M.

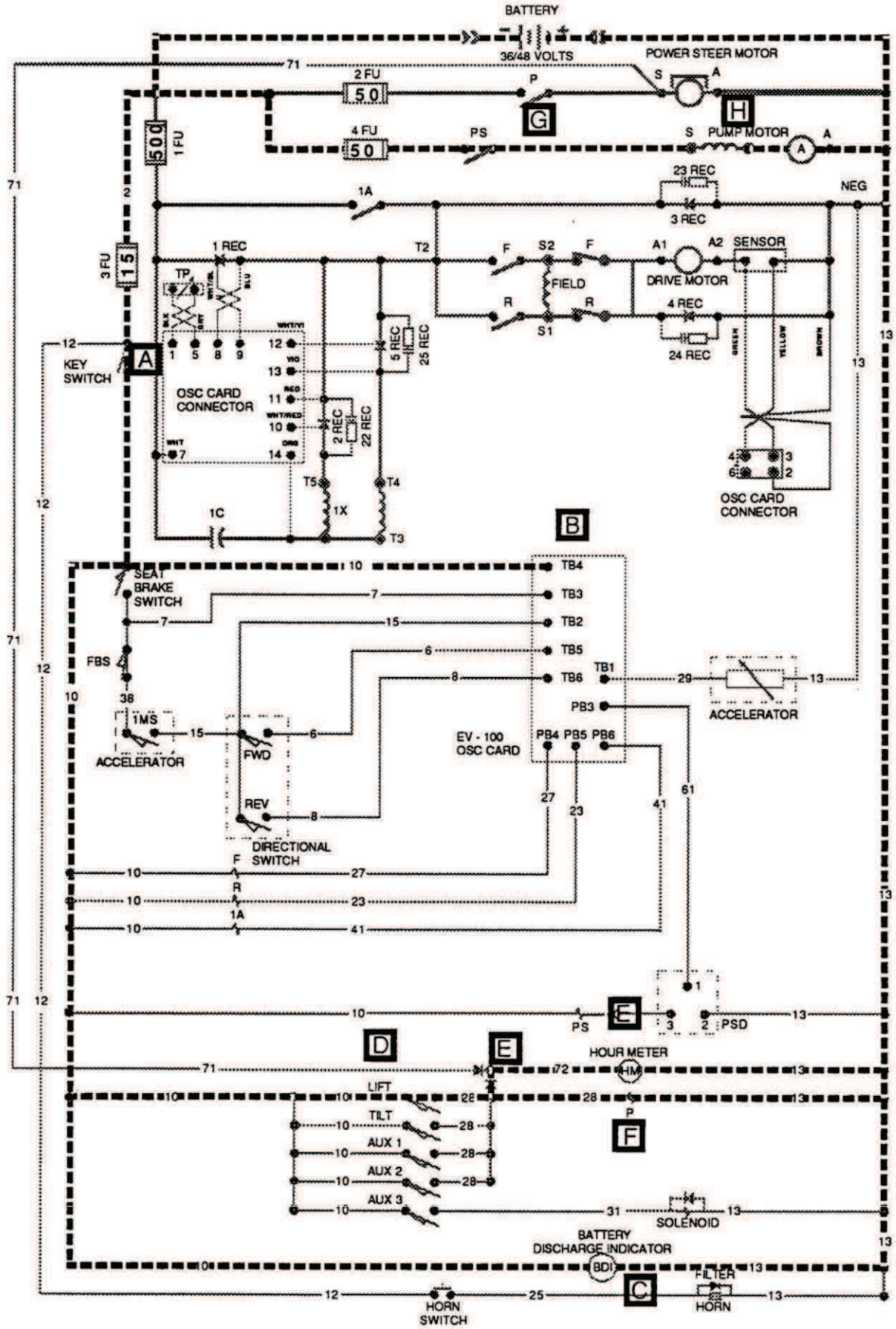
GROUP 19

SECTION 40

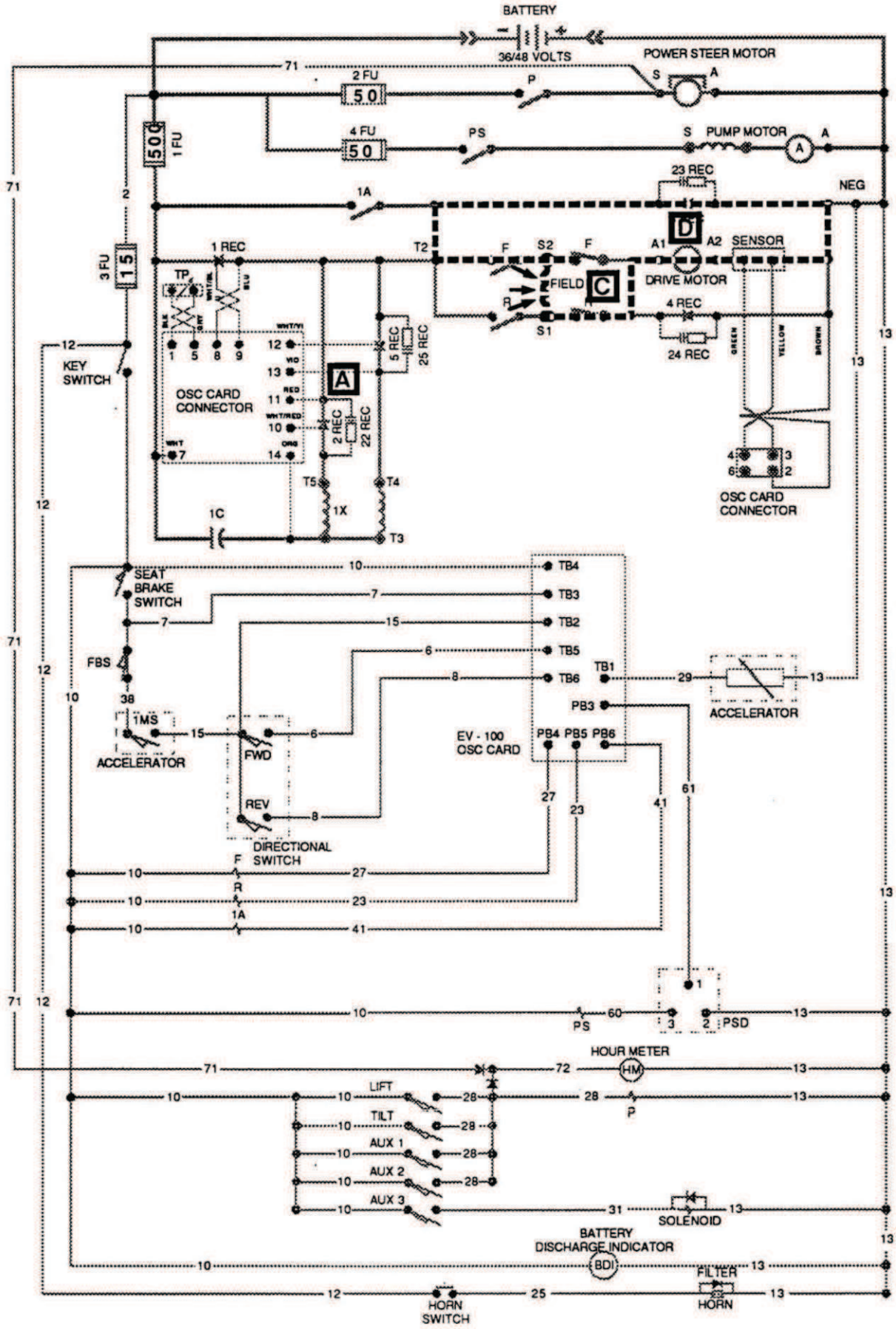
INITIAL ADJUSTMENT PROCEDURES

FOR EV-1 NUMBER ONE CARD

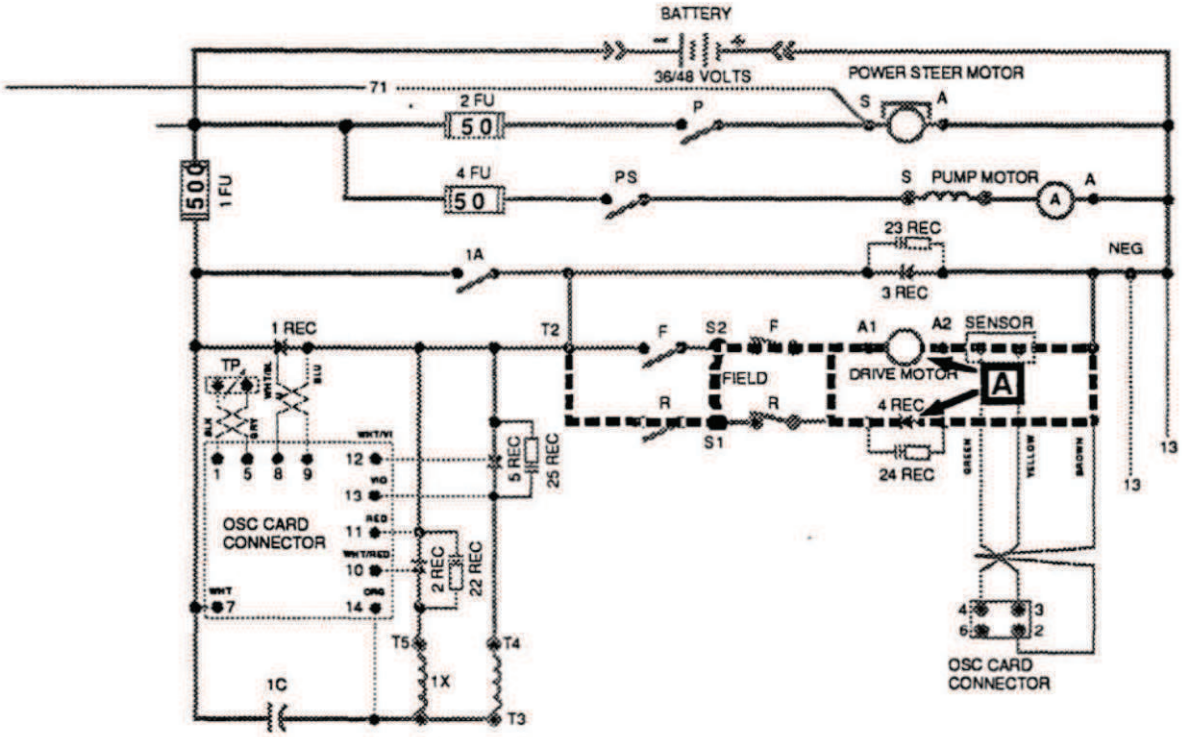
SERVICE REPLACEMENT



SM565 19 - 01 - 07

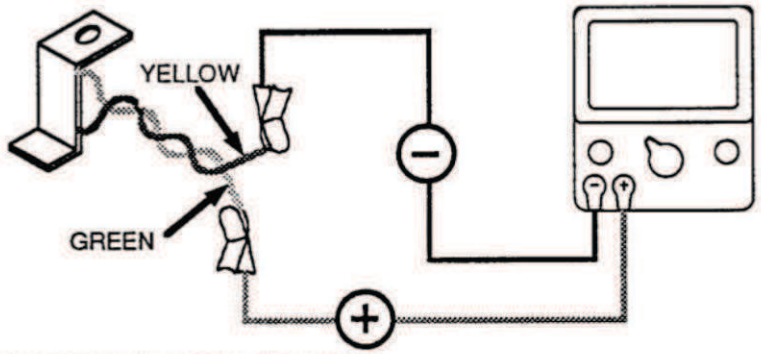


SM565 19 - 01 - 17



CHECKING COMPONENT WITH V. O. M (ONLY)

CHECKING SENSOR

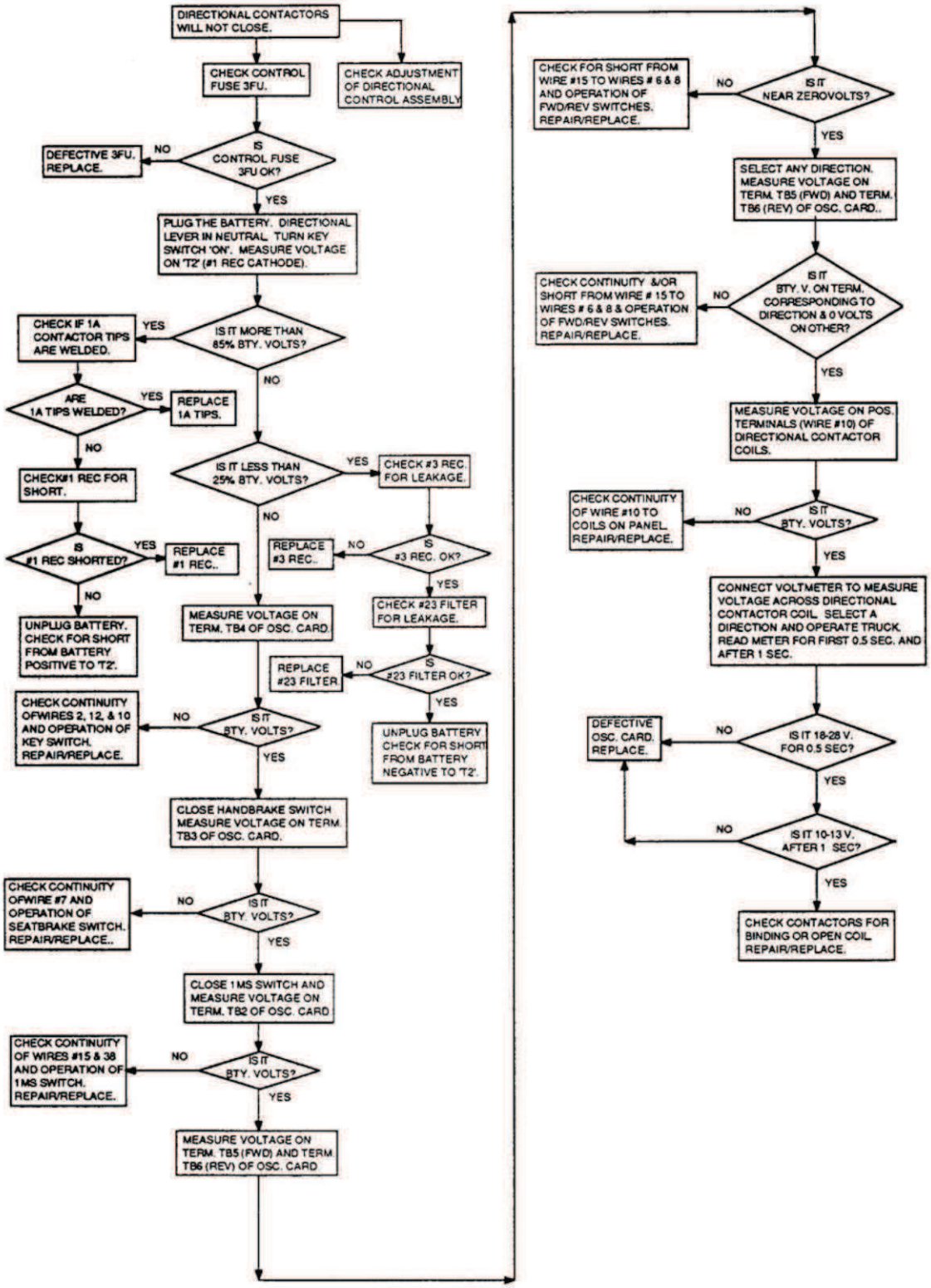


CALIBRATE METER ON R X 1 SCALE

1. CONNECT ONE METER LEAD TO THE GREEN SENSOR WIRE, CONNECT THE OTHER METER LEAD TO THE YELLOW SENSOR WIRE.

2. METER SHOULD READ "0" OHMS. REPLACE SENSOR IF READING IS NOT "0" OHMS. IF YELLOW OR GREEN WIRE HAS BEEN BROKEN OFF THE SENSOR DO NOT SOLDER BACK ON BUT REPLACE SENSOR.

SYMPTOM 1



Because of flyback current through #3 REC, motor current usually runs 2 to 3 times that of battery current. The current limit is set with C / L trimpot on card.

PLUGGING. or slowing down of truck is accomplished when reversing by providing a small amount of retarding torque for deceleration.

If truck is moving and directional lever is moved from that direction selection to opposite direction selection, motor field is reversed.

The plug signal is initiated by fact that directional switch has been shifted from one direction of selection to opposite direction.

The motor armature, driven by inertia of vehicle, acts as a generator. This generated current passes through #4 REC and sensor. The oscillator circuit regulates at a plug current limit level as set by PLUG trimpot on control card.

This controls pulse rate of #1 REC to regulate generated motor current and bring truck to a smooth controlled stop and then reversal.

The accelerator input will modulate plugging current. With accelerator at maximum depression, plugging trimpot will enable adjustment of plugging current limit from maximum to minimum current limit level. With accelerator at minimum depression, plugging current limit will be reduced to minimum.

RAMP START. This feature provides full SCR torque to restart a vehicle on an incline. The memory for this function is directional control switch. When stopping on an incline, directional switch must be left in its ORIGINAL position to allow control to assure full power when restarted. The accelerator will modulate ramp start current.

FULL POWER TRANSITION. This built-in feature provides smooth transition from SCR to 1A bypass. This is accomplished by SCR continuing to pulse until 1A contactor power tips close.

1A CONTROL. The contactor has two modes of control:

1). TIMED PICKUP. This feature works with accelerator. When accelerator is activated so that accelerator voltage is reduced to 0.4 volts or less, then 1A time is enabled. The time delay pickup of 1A is provided by a circuit in card. This allows truck to accelerate through SCR range until 1A picks up, even if accelerator is actuated immediately.

This time delay is adjustable by means of a 1A TIME trimpot on card.

2). If motor current is reduced during cutback to a point where 1A pickup would cause a severe torque increase, 1A timed pickup function will be disabled.

STATIC RETURN TO OFF. This built-in feature of control requires operator to return directional selection lever to neutral position whenever he leaves truck and then returns.

If seat brake switch or key switch is opened, control will shut off and cannot be restarted until directional lever is returned to neutral position. A time delay of 1.0 sec. is built into control for allowing momentary opening of seat brake switch, if a bump is encountered.

THERMAL PROTECTOR (TP). This temperature sensitive device is mounted on 1REC heatsink. If 1REC temperature begins to exceed design limits, thermal protector will lower maximum current limit and not allow 1REC to exceed its temperature limits.

Even at reduced current limit, truck will normally be able to reach sufficient speed for full 1A operation, thereby allowing panel to cool.

As panel cools, thermal protector will automatically return control to full power status.

1A THERMAL HOLD-OFF. This feature prevents 1A contactor from closing when truck is in severe thermal cutback to avoid torque "jumps". When control goes into severe cutback, "MUST PULSE TO TIME" will disable 1A timer.

MUST PULSE TO TIME. This feature prevents 1A timer from timing if oscillation pulse rate has not reached a particular level of operation.

LOW VOLTAGE. Batteries under load, particularly if undersized or more than 80 percent discharged, will produce low voltages at SCR control terminals.

Low battery volts may cause control not to operate correctly but PMT should open F or R contactor in event of a commutation failure.

Remove bearings and clean in a Stoddard type cleaning solvent. Slosh bearings up and down in solvent. Remove bearing and tap large side against a block of wood to dislodge solidified particles. Repeat this until the bearings are thoroughly clean.

Blow bearings dry with compressed, clean air. Direct air stream across bearing to avoid spinning.

Slowly rotate bearing by hand to facilitate drying. Dip bearings in gear oil and wrap in clean paper until they are to be reinstalled.

Clean the ring gear, pinion drive shaft, hub assembly, spindle and spindle support.

Inspect seal for cuts, scratches and nicks. If necessary to replace the seal, refer to your parts book.

Refer to GROUP 40, Section 4, Page 7 for lubrication specifications.

Repack each axle end (bearings, spindle, ring gear and pinion) with one pound of grease.

Check the axle end vent to be sure it is open and not clogged shut. Install bearings, seal and hub assembly, the washer, spindle nut and hub cap.

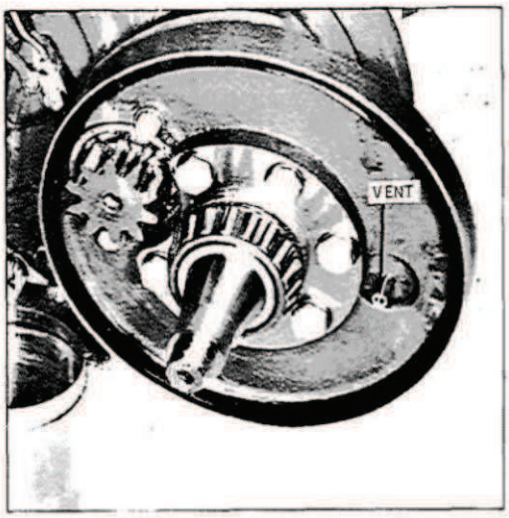


Fig. 6893

GROUP
23

SECTION
21

SEAT BRAKE & LINKAGE CHECK
AND ADJUSTMENT PROCEDURES

GROUP 25

SECTION 11

STEER LINKAGE CHECK AND ADJUSTMENT PROCEDURES (LOT 5040 AND ABOVE)

GROUP
29

SECTION
7

HYDRAULIC SUMP TANK

DRAIN, CLEAN AND REFILL

HYDRAULIC SUMP TANK FILTER

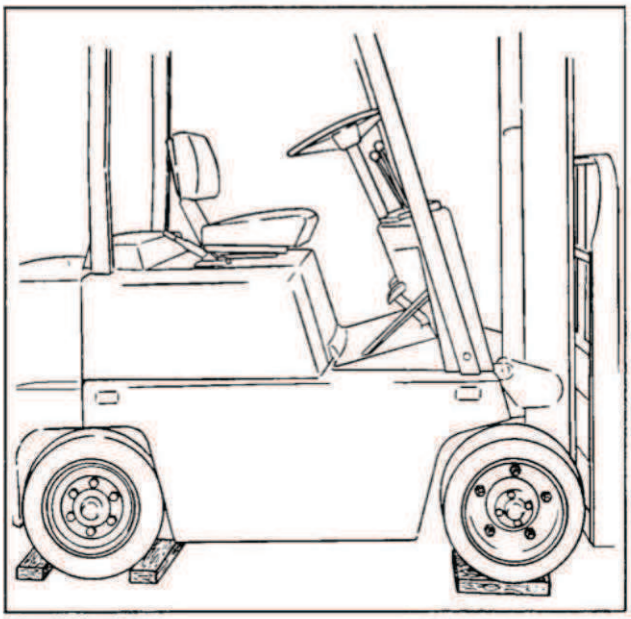


Fig. 9811. Drive Wheels on Blocking, Block Steer Wheels

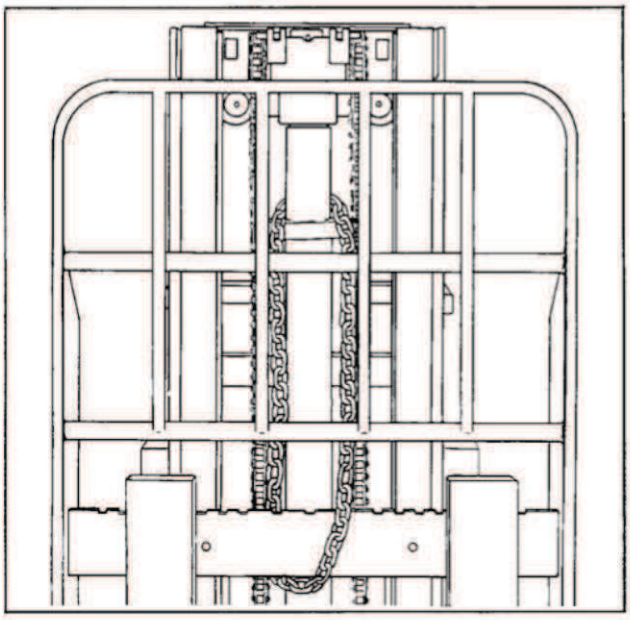


Fig. 9807. Support Carriage with Chain

WARNING

IF CARRIAGE IS TO BE LEFT ON MACHINE, SUPPORT CARRIAGE BY PLACING CHAIN THROUGH LOWER CARRIAGE BAR AND WRAPPING IT AROUND THE CYLINDER JUST ABOVE THE CYLINDER CHAIN ANCHOR BRACKET.

BE SURE TO BLOCK STEER WHEELS BEFORE WORKING ON UPRIGHT.

GROUP
34

SECTION
3

UPRIGHT LIFT CHAIN CHECK &

ADJUSTMENT PROCEDURE

In roller or rollerless chains, tight joints are caused by rust or inside plates moving outward on the bushing. Loosen chains with rust by lubricating heavily.

If tight joints, due to plate "walking" are found, it is recommended that chains be replaced, not repaired. This type of link plate displacement is accelerated by poor lubrication. Most roller and rollerless chains with tight joints have been found to have operated with little or no lubrication.

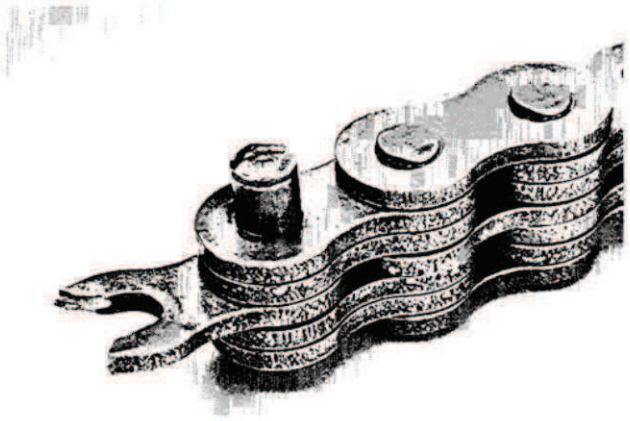
Tight joints in lift chains can be caused by:
1. Bent pins or plates
2. Rust in the joints
3. Peened plate edges

Lubricate chains that have rust, and replace chains with bent or peened components. Peening of plate edges may be caused by worn sheaves, very heavy loads, or the chains sliding past a guide on the upright. Such conditions must be corrected to prevent damage to replacement chains, also.

6. Raised or Turned Pins

Heavily loaded chains operating with little lubrication generate friction between pin and plates (pin and bushing in roller and rollerless chain). In some instances, the torque created in the joint can turn pins in the outside plates.

If chain is permitted to operate in this condition, the pins slowly work out of the chain, causing chain failure. Turned pins can be easily seen because the flats on the "V" heads are no longer aligned. See Fig. 23831. Chains with turned or raised pins must be replaced immediately. Do not repair the chain by pushing pins back into the chain.



Broken plate caused by overload.
Fig. 18378

Example of how tight joints prevent flexing of rollerless chain.
Fig. 18379

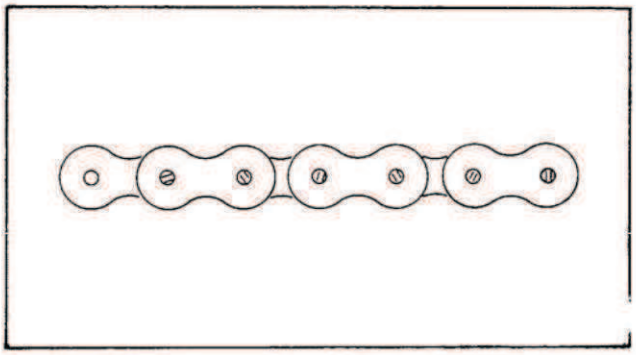


Fig. 23831

Maintenance procedures should be followed carefully.

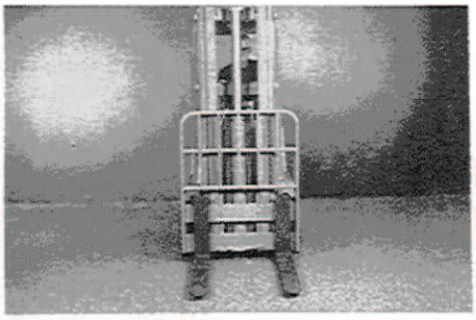


Fig. 16157

WORK SAFELY Keep hands and feet out from between moving parts unless parts are secured to prevent movement. Don't allow others to disrupt your work ... and especially keep all persons away from truck controls when you're making measurements or adjustments. Before beginning any service on the triple stage upright ...

WORK SAFELY

... the following operational checks should be made to determine if the upright is operating properly.

Any adjustments should be made prior to load testing, because equipment in unsatisfactory condition could fail under load and cause injury to personnel or damage to the truck.

OPERATIONAL CHECKS & ADJUSTMENTS

LATCH OPERATION

A two-piece latch, located on the top inner rail tie bar, is designed to prevent the inner rails from raising before the carriage is fully extended.

Then four inches off center in the other direction ...

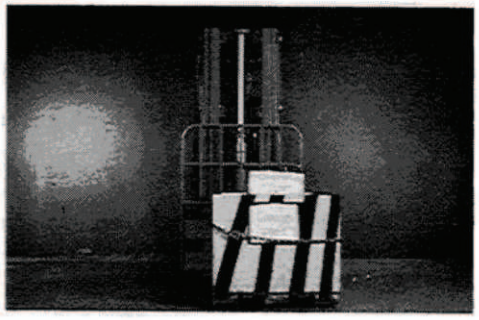


Fig. 16192

... and again raised to full extension. The offset has been exaggerated here for clarity purposes. In your tests, offset loading must not exceed 4 inches.

Experienced fork truck mechanics know that both too much clearance and ...

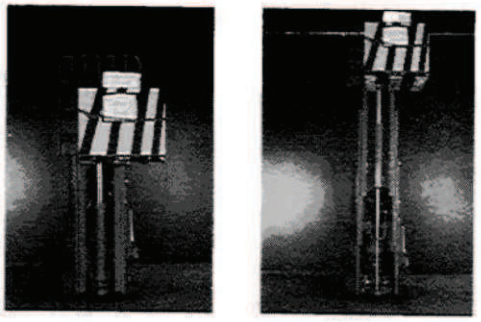


Fig. 16193

... too little clearance can be the cause of binding and uneven operation.

The design of the interlocking rails requires some lateral movement of the carriage within the inner rails.

Fig. 16194

Adequate clearance between rollers and rails is necessary to insure smooth operation and minimum wear.

Fig. 16195

...add a 1/32nd inch thick shim ...

Fig. 16226

... between the contact point of the caliper and the inner rail. Then re-tighten the caliper and re-check the inside caliper setting. The shim will provide operating clearance for the carriage rollers within the inner rails.

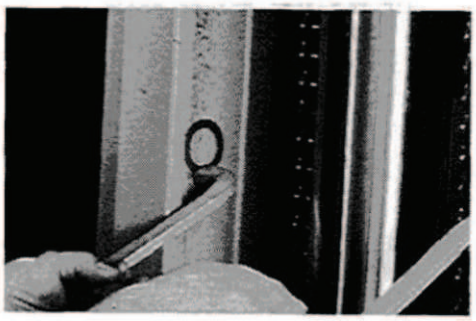


Fig. 16227

Now place the outside calipers so they contact the extreme points on the inside calipers. Adjust the outside caliper and tighten thumb screws when it's square ...

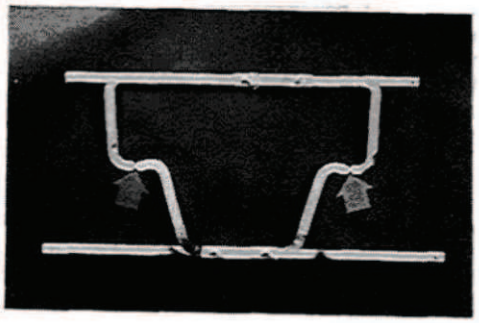


Fig. 16228

... and in contact with the inside calipers.

Fig. 16229

... and re-check for the 1/32nd inch inset.

Fig. 16266

The inset should be achieved on both sides.

Fig. 16267

The last step in adjusting the carriage rollers is to adjust the carriage side thrust rollers that operate on the inside of the inner rails.

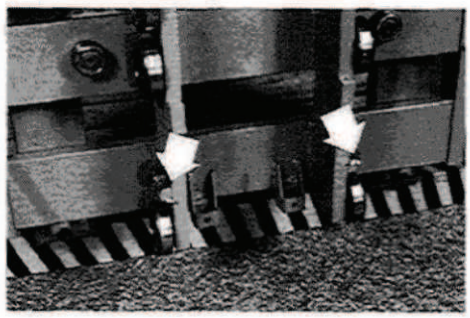


Fig. 16268

With the carpenter's square placed across the diameters of the lower and center carriage rollers ...

Fig. 16269

GROUP 34

SECTION 11

FULL FREE LIFT TRIPLE STAGE UPRIGHTS EQUIPPED WITH 6-ROLLER CARRIAGES USED ON TRUCKS RATED FROM 2,000 THROUGH 12,000LBS CAPACITY UPRIGHTS BEGINNING WITH 'M' DECK NUMBERS

Begin by measuring the clearance between the top roller set of the outer rails and the intermediate rails.

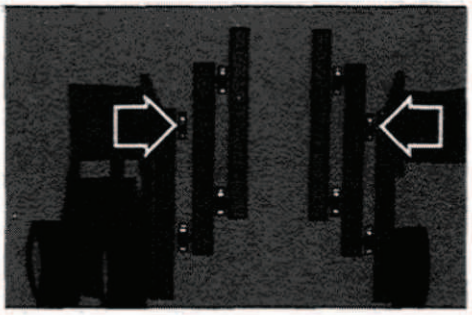


Fig. 16324

With the upright down, insert the pry bar between the outer and intermediate rail on the left and pry with moderate pressure to the right.

Fig. 16325

Hold the block flush with the flange of the intermediate rail and scribe a short line on the outer rail.

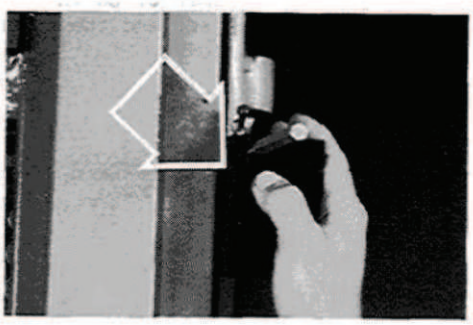


Fig. 16326

Then place the pry bar between the outer and intermediate rail on the right side and pry gently to the left, and then opposite the first scribe mark, make a second mark.

Fig. 16327

We're ready to disassemble the upright.

Fig. 16366

Always block the inner and intermediate rails when working on the upright. Don't put your hands or feet between parts that move unless they are secured to prevent movement. Keep all personnel away from truck controls during the service procedure. The key should be off at all times except when truck operation is indicated in the procedure.

CAUTION

BLOCK INNER AND INTERMEDIATE RAILS WHEN WORKING ON THE UPRIGHT.

WORK SAFELY

Start the truck and raise the lift cylinder until 4 x 4 posts can be placed under the inner and intermediate rails. A longer post is placed beneath the inner rail, since it extends higher than the intermediate rail.

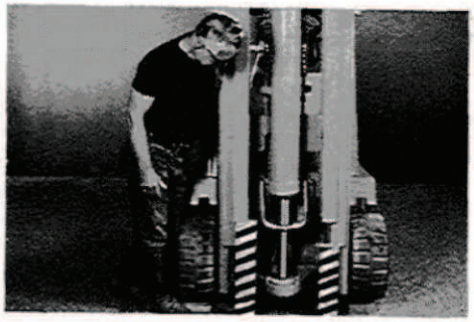


Fig. 16367

Lower the lift cylinder until the rails make solid contact with the posts, and the intermediate rail chains become slack. Turn off the truck.

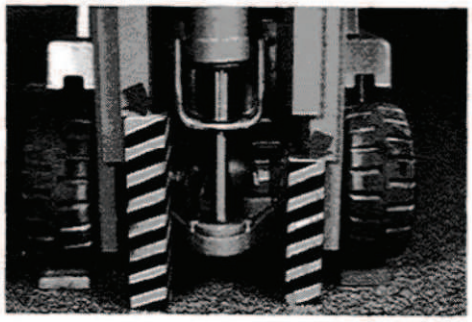


Fig. 16368

... lift cylinder until the posts can be removed.

Fig. 16406

Lower the lift cylinder until the intermediate rails rest on the floor. Then place a 4 x 4 beneath the inner rail and lower the inner rail onto the post. Turn off the truck. This is the condition of the upright.

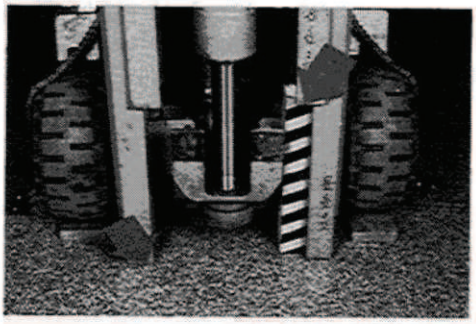


Fig. 16407

Intermediate rail chains are dropped neatly over the drive tires. We've used the inner rails to lower the intermediate rails to the floor.

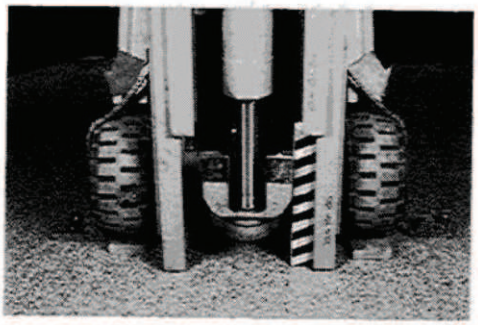


Fig. 16408

The roller sets at the bottom of the intermediate rails, and ...

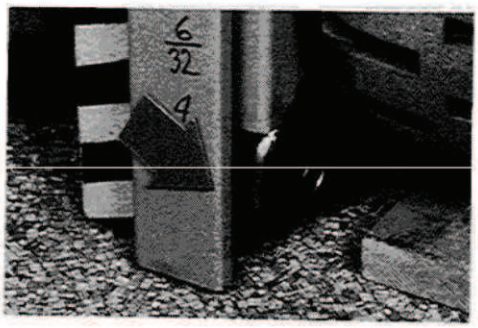


Fig. 16409

GROUP 40

SECTION 2

SUGGESTED EQUIPMENT

FOR

ELECTRIC TRUCK P.M.

LUBRICATION CHART KEY
LUBRICANT SPECIFICATIONS & RECOMMENDATIONS

POWER BRAKE

24. POWER BRAKE VACUUM CYLINDER LUBRICANT

FOR ... BENDIX HYDROVAC UNIT

CLARK PART NO. 377299 (2 oz tube)
CLARK PART NO. 377300 (quart can)

SPECIFICATION Bendix Vacuum Power Cylinder Oil or approved equivalent.

LUBRICATION

Apply after installation and periodic maintenance per instruction.

HYDRAULIC FLUID

25. HYDRAULIC FLUID

FOR ... MAIN HYDRAULIC SYSTEMS EXCEPT WHEN SPECIFIED DIFFERENTLY ON THE LUBRICATION CHART(S)

CLARK PART NUMBER 885385

SPECIFICATIONS Use only high quality hydraulic fluid with Zinc or equivalent Anti-Wear additive which meets the requirements of ASTM D-2882 pump wear test with 50 mg total weight loss maximum per CLARK Specification MS-68.

NORMAL APPLICATION

HYDRAULIC FLUID

26. HYDRAULIC FLUID
-COLD STORAGE OPERATION-

FOR ... MAIN HYDRAULIC SYSTEMS EXCEPT WHEN SPECIFIED DIFFERENTLY ON THE LUBRICATION CHART(S).

SPECIFICATIONS Use Hydraulic Fluid which meets MIL-H-5606A per CLARK Specifications MS-226.

A petroleum base hydraulic fluid with additives to improve viscosity index, oxidation resistance and anti-wear characteristics blended to form a stable product under storage and operational conditions between -65 and +160° F., meeting MIL-H-5606A* per CLARK Specifications MS-226.

*The restrictive cleanliness specifications of later revisions is not required.

COLD STORAGE OPERATION