Section 1.

Wiring Schematics and Diagrams

Standard Wiring Schematic 2
Standard Wiring Diagram 3
Optional Wiring Schematic 4
Optional Wiring Diagram 5
Lights Wiring Schematic 6
Lights Wiring Diagram 7
Strobe and Alarm Wiring Schematic 8
Strobe and Alarm Wiring Diagram 9

NOTE

Schematic and diagrams subject to change. Call your Clark dealer to make sure you have latest schematic or diagrams.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

THE PARTY POSSESSING THIS DOCUMENT ACKNOWLEDGES READING THIS RESTRICTIVE LEGEND, AND THAT THE DATA DISCLOSED THEREIN IS PROPRIETARY TO THE COMPANY AND WILL BE MAINTAINED IN CONFIDENCE BY THE RECIPIENT WHILE IN ITS POSSESSION, AND THEREAFTER, AND RETURNED TO THE COMPANY UPON REQUEST. INCLUDING ALL DERIVATIVE MATERIALS OR COPIES THEREOF, AND NOT DISCLOSED TO OTHERS WITHOUT THE PRIOR WRITTEN PERMISSION OF THE COMPANY

IN-24867

STEER CYLINDER

CROSSOVER RELIEF BLOCK

STEER CONTROL VALVE

OUTLET

INLET

STEER PUMP

RETURN FILTER

SUMP TANK

HIVIS STANDARD LIFT CYLINDERS

FLOW CONTROL

LOAD LOWERING VALVE

TILT CYLINDERS

MANUALLY CONTROLLED SPOOL VALVE

LIFT PUMP

BREATHER CAP

C1 C2 C3 MAIN SELECTOR VALVE C4 C5

1A 1B 3A 3B

2

FC2 FC3 RV1 RV2 FC4 FC5

AUXILIARY FUNCTION

AUXILIARY FUNCTION

NOTE
PLUG PORTS C6 & C7 FOR 2 HOSE & CABLE ADAPTATION

PLUG PORTS A & B FOR 4 HOSE ADAPTATION

PLUGS AND O RINGS INCLUDED WITH AUX VALVE PACKAGE

OPTIONAL AUX VALVE C6 C7

A B)(4

3C FC6 FC7

EC.9480

PREVIEW - YOUFIXTHIS.COM

DESIGN CONTROL	METRIC	DIM ARE IN MM UNITS ARE ISO METRIC EXCEPT AS NOTED
F		

UNPUBLISHED WORK. ALL RIGHTS RESERVED ©

DWN	HEITMAN	DATE	14MAR94
CHK	RJ COOK	DATE	14MAR94
APL	F940241	DATE	14MAR94

REV	ZONE	DESCRIPTION	CHG NOTICE	DATE	APPROVAL
A		RELEASED	F940241	14MAR94	RKH/RJC

MAT'L

HEAT TREAT

HARD

HYDRAULIC DIAGRAM

CLARK DIV

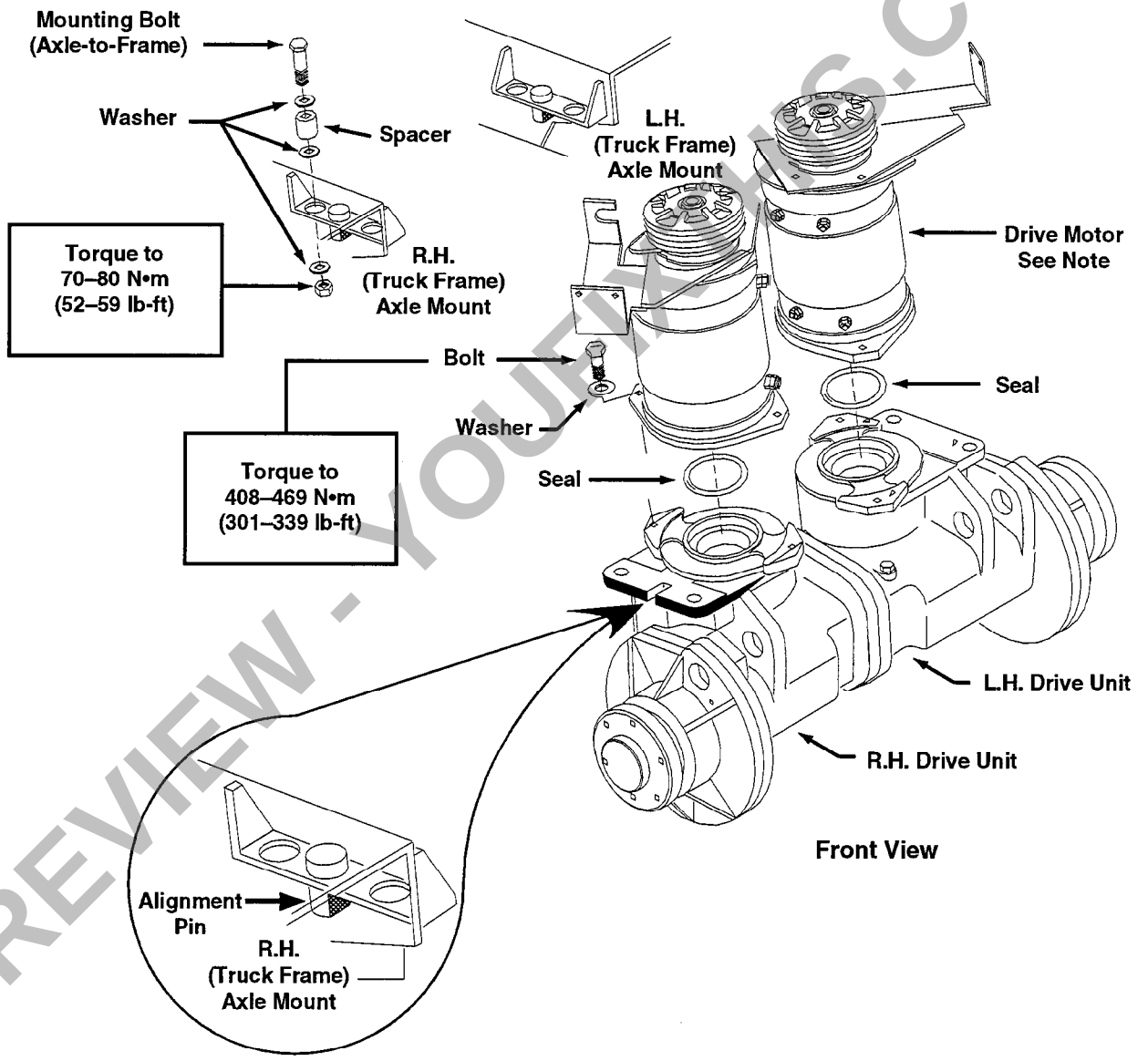
IN-24867

ESMII2/25

D 1 1 WT SHEET 1 OF 1

Download full manual at youfixthis.com

7. Connect drive motor power cables. Make sure cable ends are connected to correct motor terminals.
8. Connect hydraulic brake lines and bleed brakes.
9. Install upright and attach tilt cylinders to upright. Refer to Groups 32 and 34 for details.
10. Connect hydraulic lift cylinder line.
11. Install drive wheels and torque mounting bolts to 225–275 N•m (188–203 lb-ft).
12. Fill drive axle to correct level with specified fluid.
13. Install front and top compartment covers.
14. Remove blocks and lower truck to floor. Refer to truck jacking group for details.
15. Install battery.
16. Install forks. Connect battery and test drive axle operation.



NOTE

Coat spline shaft of motors with Clark #1802307 Anti-Seize, before installation.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

STATUS CODE	DESCRIPTION	MEMORY RECALL	No
BLANK DISPLAY	No display on Dash Display or Handset.	CIRCUIT	Traction and Pump

SYMPTOM

Display screen on dash display or handset is blank.

POSSIBLE CAUSE

Positive or negative control volts missing.

- Insure that with key switch on, voltage is present be tween PZ7 and PZ3 (NEG), and voltage is present between TB4 and PZ3 (NEG).

Open circuit between logic card plug "Y" and Dash Display or Handset.

- Check for open circuit or loose connections between each wire going between logic card plug "Y" and Dash Display / Handset.

Defective Dash Display/Handset

- Replace Dash Display/Handset.

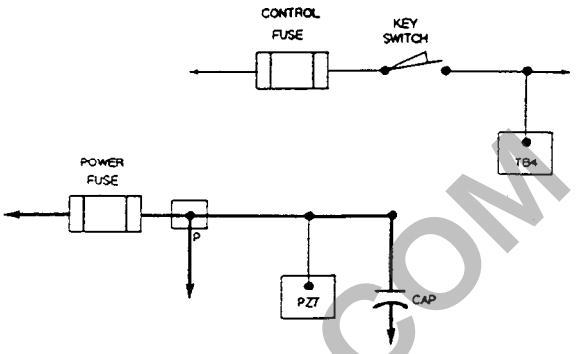


Figure 1.

STATUS INDICATION CRITERIA

This indicates a lack of input voltage to the logic card and/ or display unit.

STATUS CODE	DESCRIPTION	MEMORY RECALL	No
-01	No seat switch input.	CIRCUIT	Traction

SYMPTOM

Forward or reverse contactor will not pick up.

POSSIBLE CAUSE

Mis-adjusted or defective seat switch.

- Check seat switch to insure proper closure.

Open circuit between battery postive TB3.

- Check for loose connections or broken wire between seat switch and TB3 and between key switch and positive side of the seat switch and seat switch to TB4.

- On vehicles without seat switch, check for loose connections or broken wire from TB4 to TB3.

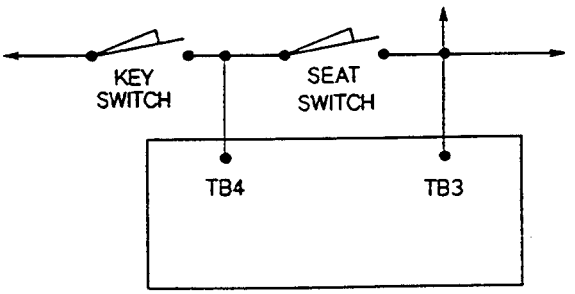


Figure 1.

STATUS INDICATION CRITERIA

This status code will be displayed when TB3 is less than 50% battery volts.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

⚠ CAUTION

To perform these service procedures, first:

- **Park truck on a hard, level and solid surface, such as a concrete floor with no gaps or breaks.**
- **Put upright in vertical position and fully lower the forks or attachment.**
- **Turn key switch OFF.**

⚠ WARNING

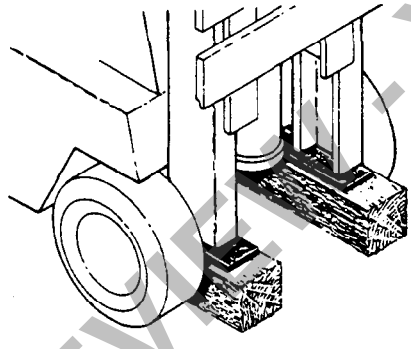
DEFECTIVE EQUIPMENT CAN CAUSE ACCIDENTS

All tools and lifting equipment must be in good condition, meet the load capacity requirements and have OSHA labels when required. Tools with defects can fail, causing severe injury or death.

Raising Drive Wheels

This procedure uses the upright as a lever to lift the drive wheels off the floor and prevent accidents due to inadvertent powering of the drive wheels.

1. Park the truck safely.
2. Turn key switch ON. **Tilt the upright fully back.**



3. Put a solid 100 x 100 mm (4 x 4 inch) hardwood block under the front section of each upright rail. Put a 3–6 mm (0.125–0.250 inch) thickness steel plate on top of each block.
4. **Tilt the upright fully forward.** This will raise the drive wheels off the floor. Release the tilt control pushbutton.
5. Turn key switch OFF.
6. Check for safe clearance between drive wheels, block and floor.
7. Check the stability of the truck. Be sure that the blocks are located securely under the upright rails before operating the drive motor or working on truck.
8. Lower the drive wheels to the floor by reversing the above procedure.
   - Turn key switch ON.
   - Tilt upright fully back.
   - Turn key switch OFF.
9. Remove the blocks and steel plates from under the upright rails.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Group 12 - BATTERY

Maximum Size and Rating

ESM12/15S	36V,	18 cell, 11 plate,	27.0 kWh,	775 amp-hr @ 6 hour rating
ESM 15	36V,	18 cell, 13 plate,	32.2 kWh,	930 amp-hr @ 6 hour rating
ESM 17	36V,	18 cell, 15 plate,	37.6 kWh,	1085 amp-hr @ 6 hour rating
ESM 20,22,25	36V,	18 cell, 17 plate,	43.0 kWh,	1240 amp-hr @ 6 hour rating

Fully Charged: 1.275 specific gravity (1.3010 Exide Load Hog)

Discharged: 1.120 specific gravity

Recommended Battery Fluid: Distilled water only

Battery Compartment Size

ESM-II	12/15S	15	17	20, 22, 25
Length	13.88 in.	16.13 in.	18.38 in.	20.75 in.
Width	38.80 in.	38.80 in.	38.80 in.	38.80 in.
Height	31.50 in.	31.50 in .	31.50 in .	31.50 in.

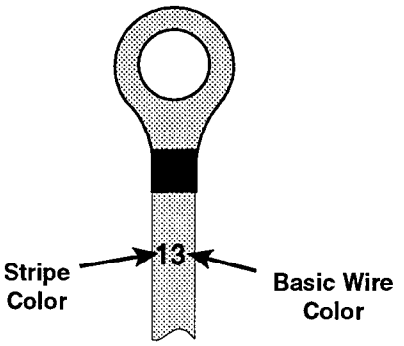
Wire Codes

Color Code

Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

Examples:

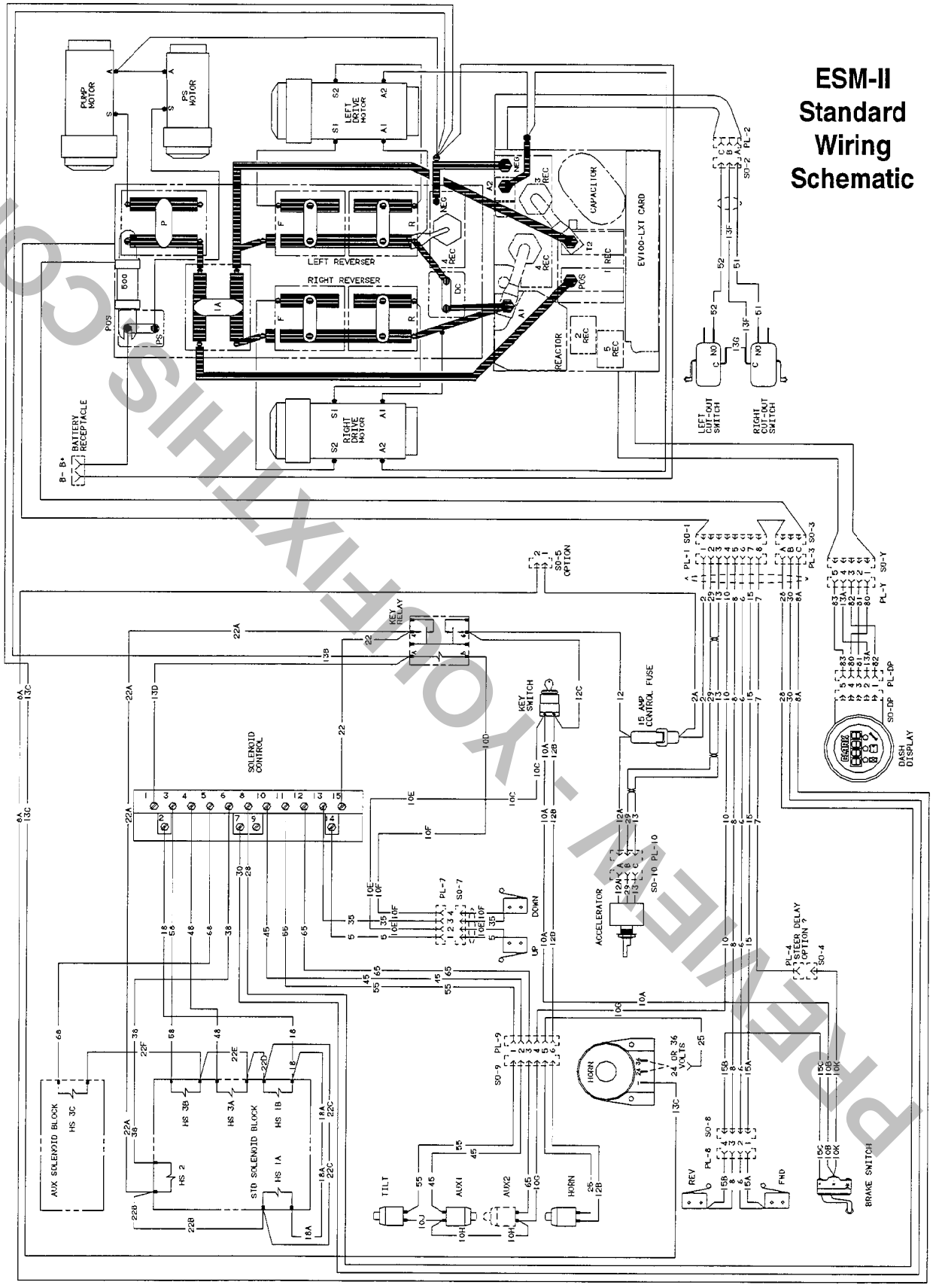
- Wire No. 13 is a brown stripe on an orange wire.
- Wire No. 33 is a solid orange wire.



PREVIEW - YOUFIXTHIS.COM

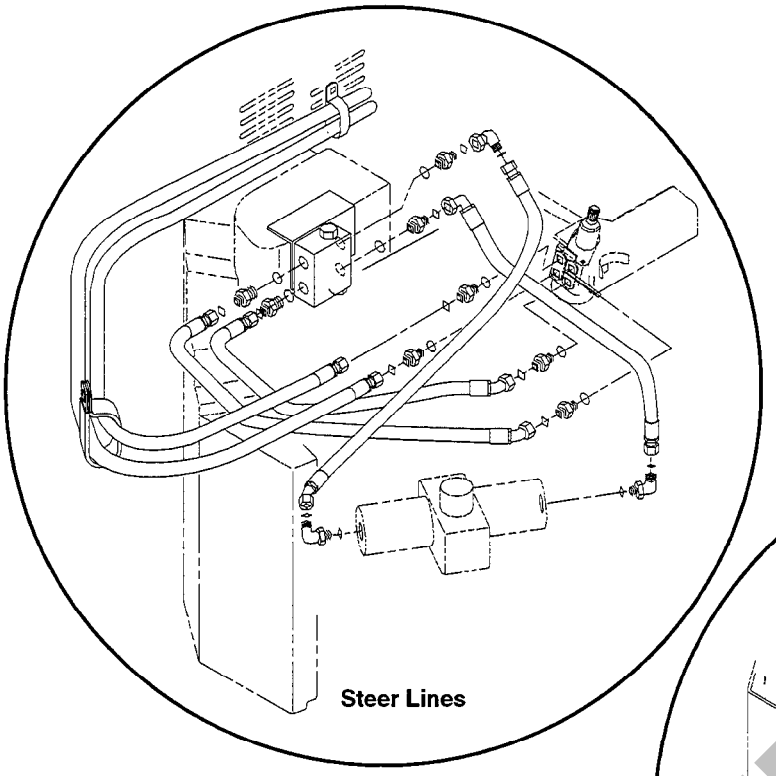
Download full manual at youfixthis.com

ESM-II Standard Wiring Schematic

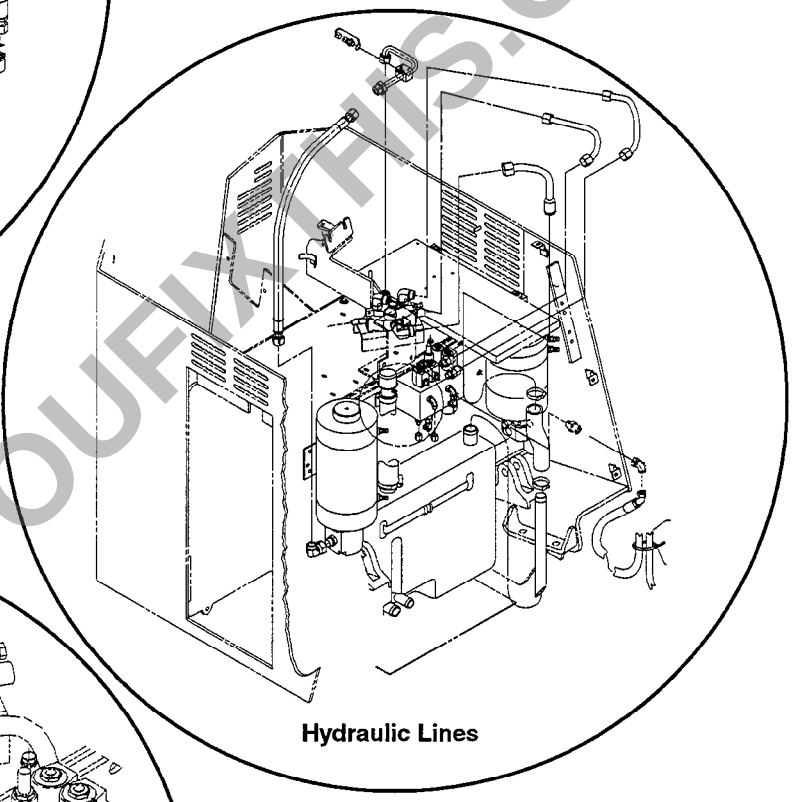


PREVIEW - YOUFIXTHIS.COM

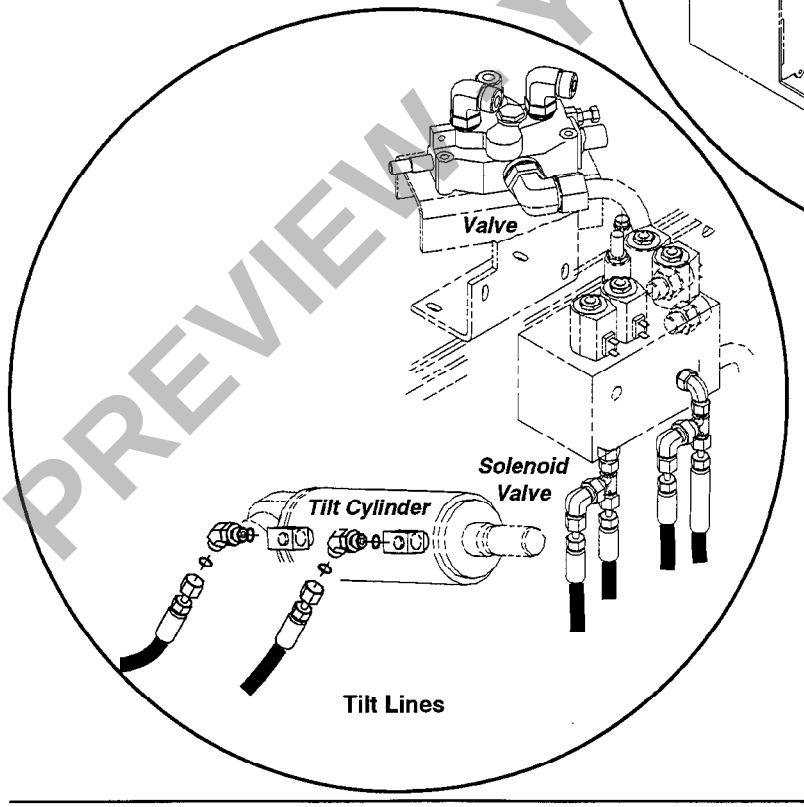
Download full manual at youfixthis.com



Steer Lines



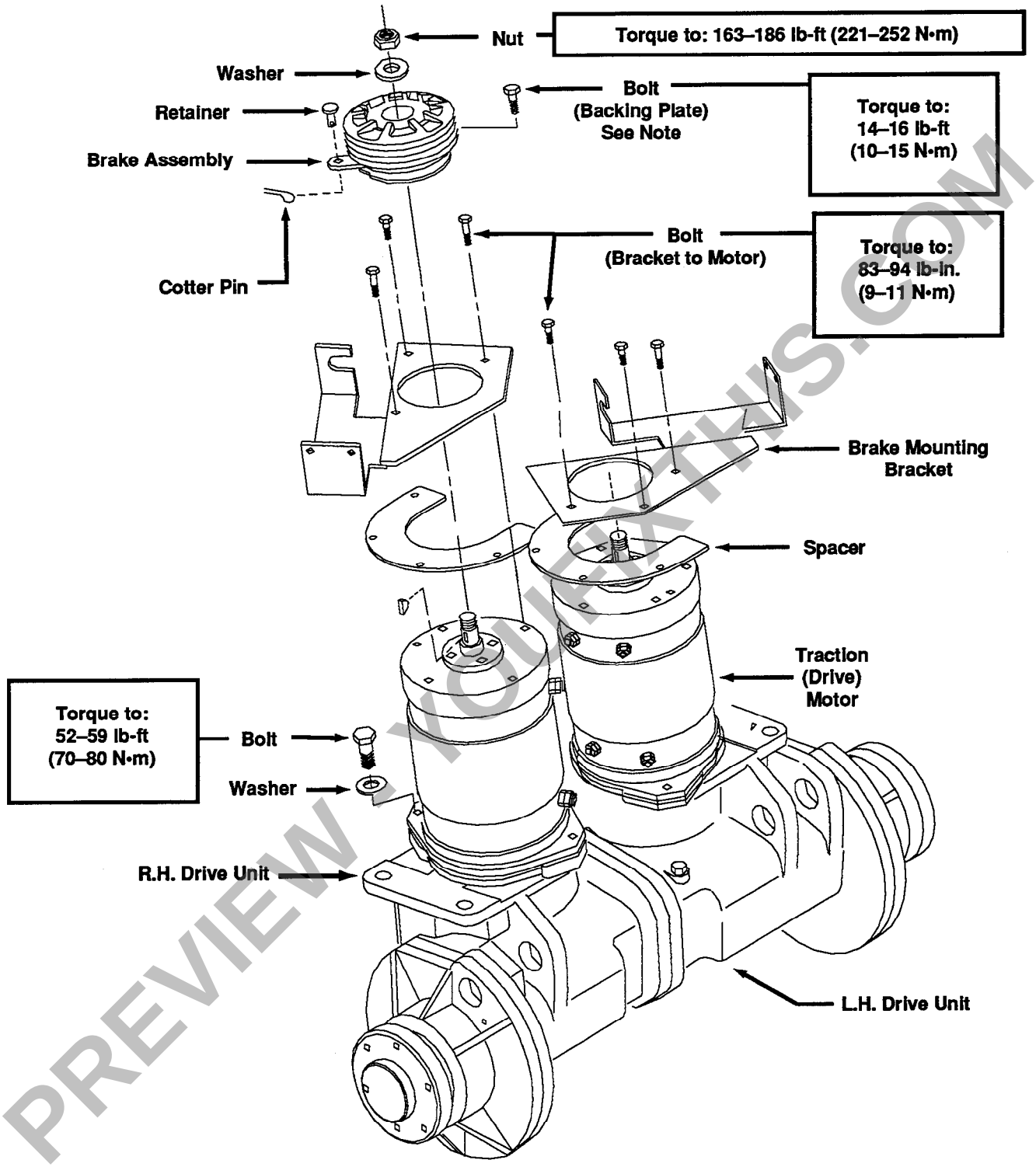
Hydraulic Lines



Tilt Lines

PREVIEW @ YOUFIXTHIS.COM

Download full manual at youfixthis.com



NOTE

Spray threads of nuts and bolts with "Primer T" five (5) minutes before applying Clark #1802300 General Purpose Threadlocker at time of installation.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

STATUS CODE	DESCRIPTION	MEMORY RECALL	No
-02	Forward directional switch is closed on initial power up.	CIRCUIT	Traction

SYMPTOM

Forward contactor will not pick up static return to off (SRO) lock out.

POSSIBLE CAUSE

Forward directional switch closed on initial power up (closure of battery plug, key switch or seat switch).

- Return directional switch lever to neutral and then select a direction.

Forward directional switch is welded closed or mis-adjusted to be held closed.

- Replace or adjust directional switch to insure that it opens when directional switch is returned to neutral.

Short circuit between TB2 and TB5.

- Disconnect wire from TB5 and check for short circuit between TB2 and wire.

Defective card

- Disconnect wire at TB5; Measure voltage at TB5, should be less than 60% of battery volts.

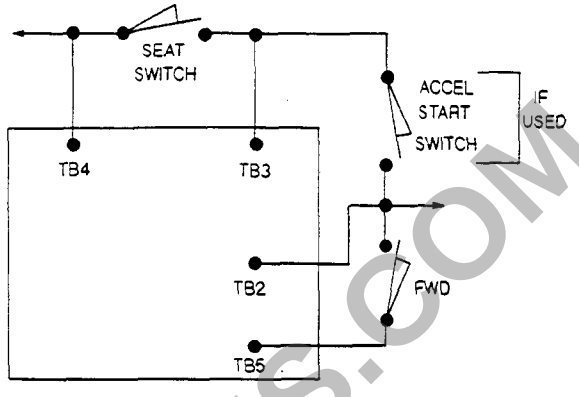


Figure 1.

STATUS INDICATION CRITERIA

This status code will be displayed when TB5 is greater than 60% battery volts at initial power up.

STATUS CODE	DESCRIPTION	MEMORY RECALL	No
-03	Reverse directional switch is closed on initial power up.	CIRCUIT	Traction

SYMPTOM

Reverse contactor will not pick up static return to off (SRO) lock out.

POSSIBLE CAUSE

Reverse directional switch closed on initial power up (closure of battery plug, key switch or seat switch).

- Return directional switch lever to neutral and then select a direction.

Reverse directional switch is welded closed or misaligned to be held closed.

- Replace or adjust directional switch to insure that it opens when directional switch is returned to neutral.

Short circuit between TB2 and TB6.

- Disconnect wire from TB6 and check for short circuit between TB2 and wire.

Defective card

- Disconnect wire at TB6; Measure voltage at TB6, should be less than 60% of battery volts.

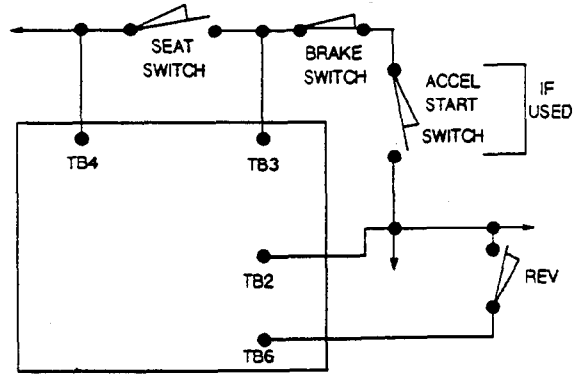


Figure 1.

STATUS INDICATION CRITERIA

This status code will be displayed when TB6 is greater than 60% battery volts at initial power up.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Blocking the Upright in Raised Position

This procedure is used to safely provide clearance for access from the front of truck to components on or near the drive axle.

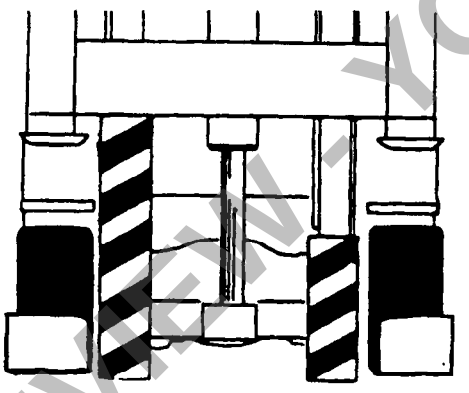
⚠ WARNING

Do not stand under the forks when blocks are put under the carriage and rails. The forks can fall and cause injury or death to personnel.

1. Park truck safely.
2. Put chocks in front of and behind drive wheels.
3. Put wooden support blocks conveniently near upright rails before raising the upright. Use two 100 x 100 mm (4 x 4 inch) hardwood blocks of approximate lengths shown.

NOTE

For STANDARD UPRIGHT, block may need length cut to suit. For TRIPLE STAGE UPRIGHT, the carriage may be blocked as shown.



4. Turn key switch ON and raise the upright carriage.
5. Hold the taller block against inner rail. Have another person operate the lift lever to lower the upright until carriage rests on block.
6. Hold the shorter block against the outer rail and lower the upright until inner rail rests on the block.

Raising Rear of Truck

Refer to Group 40, Specifications for truck weights.

The truck may be raised at the rear by jacking and blocking under the sides near the rear section of the frame.

1. Park truck safely. Put chocks at front and rear of drive wheels.

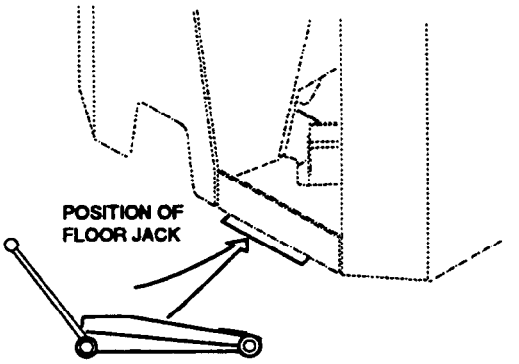
NOTE

When convenient, it is recommended to remove the battery from truck to reduce weight for both safer and easier jacking.

2. Put a floor jack under the rear side of truck frame.

NOTE

If there is insufficient clearance under frame for the jack, the truck may first be driven onto thin platforms, such as 1 in. x 6 in. x 12 in. pieces of board (shims) to increase the truck frame under clearance.



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Group 16 - Motors

Drive Motor

36V, 6.64 in. diameter, series wound.

Weight:		24.5 kg (54 lb)
Open Rating (60 Min.):		34.8V, 1600 rpm, 4.0 hp, 117 amps
Brushes:	Dimension	L 35 mm (1.38 in.), W 32 mm (1.26 in), T 12.65 mm (0.498 in)
		No. per holder: 1
		No. per motor: 4
	Grade	CM880
	Worn Length	14.5 mm (0.57 in) on longest side.
	Brush Spring Tension (force per brush)	
	NEW:	935–1077 g (33–38 oz)
	WORN:	453 g (16 oz)

Hydraulic Pump Motor

36V, 7.15 in. diameter series wound.

	Weight:	42.2 kg (93 lb)
Open Rating (15% Time):		33.4V, 1050 rpm, 10.0 hp, 340 amps
Brushes:	Dimension	L 35 mm (1.38 in.), W 25.3 mm (0.997 in), T 13.9 mm (0.548 in)
		No. per holder: 2
		No. per motor: 8
	Grade	CM880
	Worn Length	14.5 mm (0.57 in) on longest side.
	Brush Spring Tension (force per brush)	
	NEW:	935–1077 g (33–38 oz)
	WORN:	453 g (16 oz)

Steer Pump Motor

36V 6.5 in. diameter, permanent magnet.

Weight:		19.3 kg (43 lb)
Enclosed Rating (Continuous):		36.0V, 1220 rpm, 0.9 hp, 27 amps
Brushes:	Dimension	L 28.7 mm (1.13 in.), W 20.6 mm (0.812 in), T 9.35 mm (0.368 in).
		No. per holder: 1
		No. per motor: 4
	Grade	CM880
	Worn Length	10.65 mm (0.420 in) on longest side.
	Brush Spring Tension (force per brush)	
	NEW:	782-870 g (27.6–30.7 oz)
	WORN:	326-357 g (11.5-12.6 oz)

Group 19 - Electrical Controls

GROUND TEST: Minimum Resistance

Resistance values may range from 20,000 to 30,000 ohms, without problems.

When below 20,000 ohms, further testing must be conducted to repair problem.

CURRENT DRAW VALUES: Warm Truck, 36-volt fully charged battery.

Drive Motor - 1A Freewheeling (less power steering motor idle current)

@ Battery: 26 amps each motor

Steer Pump Motor - Idle current @ Battery: 5–8 amps

SCR CURRENT LIMIT: Cold Truck

Drive Motor - 525–575 amps Motor Current (Both Motors)

(250–350 amps Battery Current)

CREEP SPEED: 1.6–3.6 volts @ motor

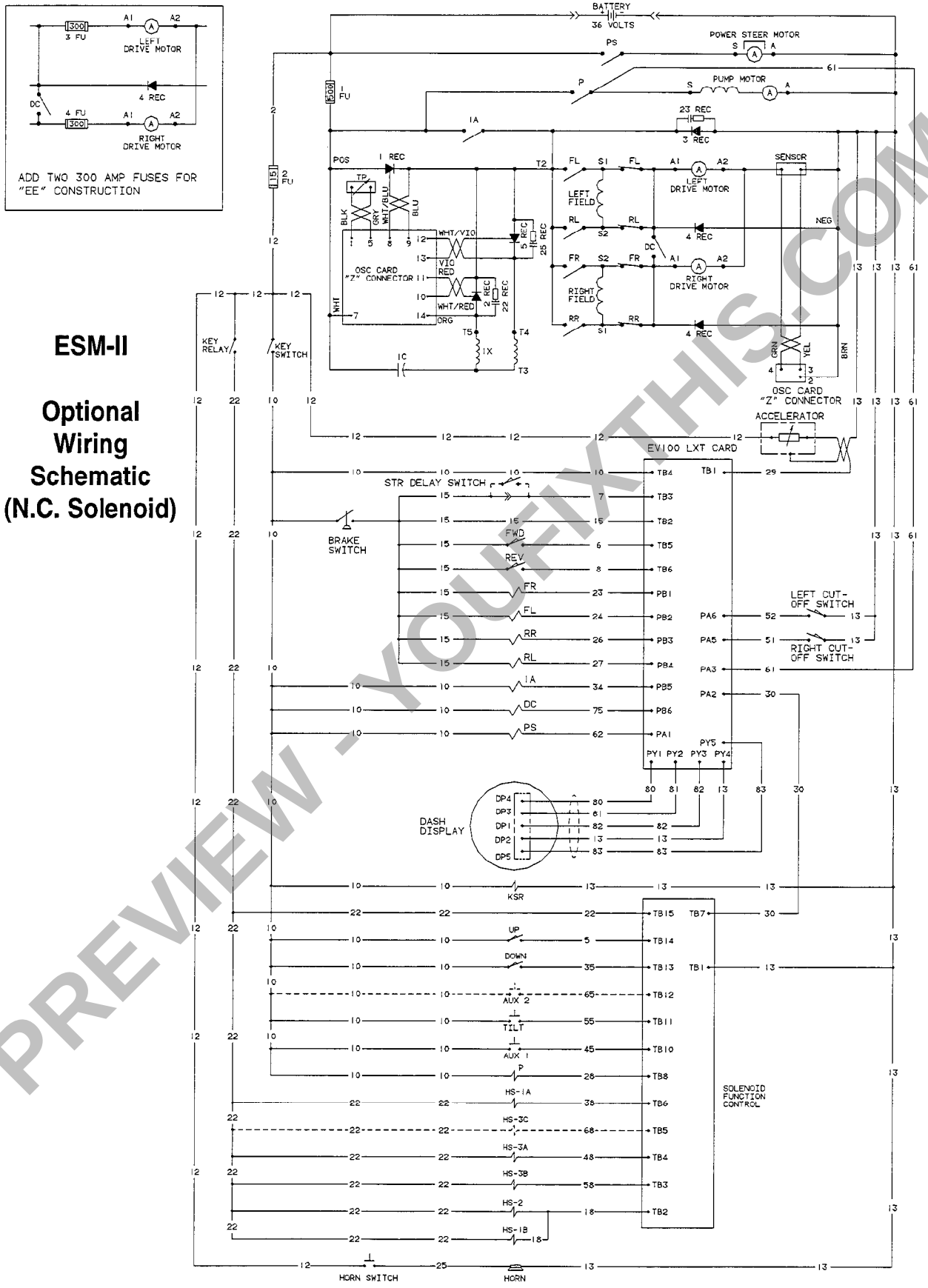
1A PICKUP TIME DELAY: 1.5 seconds

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

ESM-II

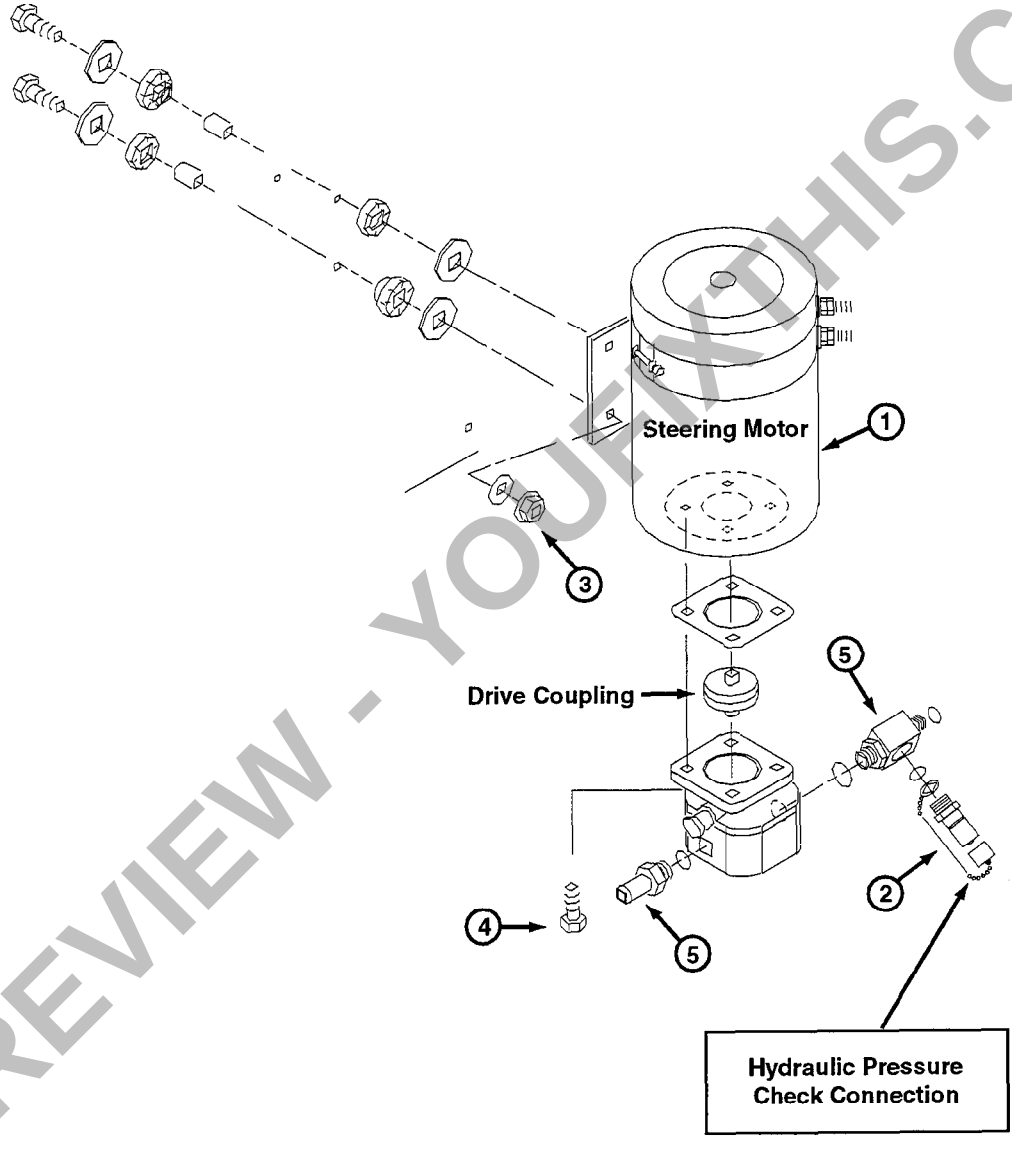
Optional Wiring Schematic (N.C. Solenoid)



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Steering Pump Motors Installation Specifications



1. Coat pump shaft **splines** with grease per Clark Spec MS107D.
2. Torque to 8–9 N•m (70–80 lb-in.)
3. Torque to 8–10 N•m (71–88 lb-in.)
4. Torque to 19.3–21.5 N•m (170–191 lb-in.)
5. Torque to 49–53 N•m (36–39 lb-ft)

PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com

STATUS CODE -04	DESCRIPTION	MEMORY RECALL	Yes
	Start switch input low after initial start up	CIRCUIT	Traction

SYMPTOM

Forward or reverse contactor will not pick-up.

POSSIBLE CAUSE

Forward or reverse directional switch closed on initial start up.

- Depress accelerator to close start switch. Status code will change to 03 if reverse directional switch or to 02 if forward directional switch is closed. If either of these codes appear, return directional switch to neutral and then select the desired direction.

Excessive leakage from TB2 to battery negative.

- Check voltage at TB2 with key and seat switches closed and directional switch in neutral. Voltage should be greater than 60% of battery voltage.
- If less than 60% battery voltage. Remove wire and measure ohmic value from wire to SCR negative. Value should be less than 22k ohms.

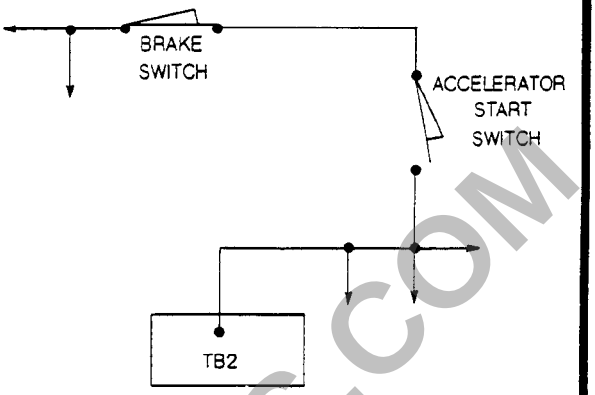


Figure 1.

STATUS INDICATION CRITERIA

This status code is displayed when TB2 voltage is less than 60% of battery volts at initial start-up (seat switch closure).

STATUS CODE -05	DESCRIPTION	MEMORY RECALL	No
	Start switch or brake switch fails to close.	CIRCUIT	Traction

SYMPTOM

Forward or reverse contactor will not pick up.

POSSIBLE CAUSE

Defective brake switch circuit.

- Check brake switch to insure closure with brake pedal released.
- Check for open circuit or loose connections in wiring from brake switch to seat switch and TB3, and from brake switch to start switch.

Defective start switch circuit.

- Check start switch to insure closure when accelerator is depressed.
- Check for open circuit or loose connections in wiring from brake switch to start switch and from TB2 to start switch.

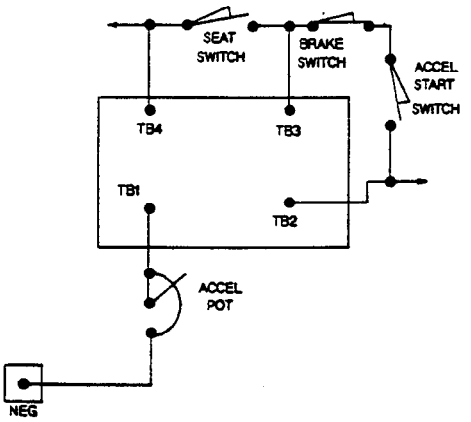


Figure 1.

STATUS INDICATION CRITERIA

This status code is when TB1 is less than 2.5 volts and TB2 is less than 60% battery volts.

PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com

3. Raise the truck only as high as necessary to perform the maintenance work.
4. Put blocks at both sides of the truck, fully under the main frame side structure. Put an equal amount of blocks under each side of the truck to provide a level working position. Individual pieces of blocking with minimum length equal to the width of the truck are recommended.
5. Lower the truck onto the blocks and remove the jack. Check truck stability before performing any maintenance work.
6. When maintenance work is completed, lower the rear of truck to the floor by reversing the above procedure:
   - Put jack under frame and raise truck.
   - Carefully remove blocks and lower truck.
   - Remove jack.
   - Remove chocks from drive wheels.

Raising Truck with a Hoist

When suitable equipment is available, the truck may be raised by means of a hoist and wheel cradles placed under the wheels.

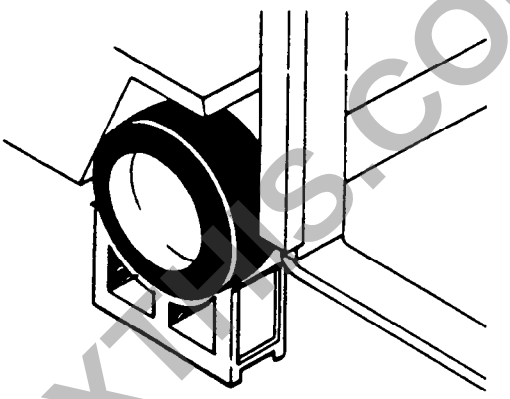
IMPORTANT

Lift only the front or the rear of the truck at one time. Watch truck for signs of lateral instability. If may tip sideways. Support or guide the side of the truck or overhead guard to prevent tipping.

Refer to Group 40, Specifications for truck weights.

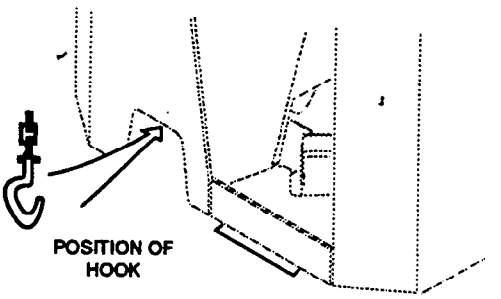
Lifting Front of Truck

1. Remove battery.
2. Chock steer wheel.
3. Raise front of truck using two chains hooked into the upright tie bar. Lift truck up and place wheel cradles under the drive wheels. Lower drive wheels onto the cradles



Lifting Rear of Truck

1. Remove battery.
2. Put chocks at drive wheels.
3. Remove forks.
4. Raise rear of truck using hoist and chain hooked at the location shown.



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

POWER STEERING TIME DELAY:
24 seconds

FUSES:

Fuse	Rating	Function
1FU	500 amp	Drive, Pump Motors
2FU	15 amp	Control

CONTACTORS:

Function	Rating	Coil Resistance
1A	150 amps	19.55 ohms
For. and Rev.	150 amps	19.55 ohms
Steering	100 amps	49 ohms
DC	100 amps	29 ohms
Pump	150 amps	20 ohms

Group 20 - Drive Axle

Recommended Oil Specifications:

90 Weight Engine Oil

Oil Capacity, Each: 6.5 L (5.72 qts.)

Overall Ratio: 22.85:1 Reduction

Group 22 - Wheels and Tires

Drive Tire Size:

Cushion - 18x7x12.12 (ESM 12, 15S, 15)
18x8x12.12 (ESM 17, 20)
18x9x12.12 (ESM 22, 25)

Pneumatic - 18x7x8 16 ply (ESM 12, 15S, 15)
18x9x8 16 ply (ESM 17, 20)
Tire Pressure: 970 kPa (140 psi)

Steer Tire Size: 9x5 Dual Poly

Group 23 - Brakes

Brake System: Spring Applied, Hydraulic Released

Recommended Brake Fluid:

Heavy-duty hydraulic brake fluid.

Refer to Lubrication Chart in Group 01.

Master Cylinder: 0.75 in. diameter

Group 25/26 - Steering System

Power Steering System Relief Pressure Setting:

6894.8 kPa (1000 psi)

Recommended Power Steering Fluid:

Uses main hydraulic sump oil supply.

Steer Handwheel Turns:

Lock to Lock: 4.75 turns

Group 29/30 - Hydraulic System

Recommended Hydraulic Fluid:

Normal Temperature- Clark Specification MS-68 Hydraulic Oil with anti-wear additives.

Cold Storage- Clark Specification MS-226 Hydraulic Oil with anti-wear additives

Sump Tank Capacity:

3.35 gal (14.93 L)

Lift Relief Pressure settings:

ESM 12, 15S, 15, 17:

20,340–21,029 kPa (2950–3050 psi)

ESM 20, 22, 25:

21,718–22,408 kPa (3150–3250 psi)

Cascade Uprights Only (55D and 60D):

17,582–17,926 kPa (2550–2600 psi)

Tilt and Aux Relief Pressure settings:

ESM 12,15S,15,17: 13,790 kPa (2000 psi)

ESM 20,22,25: 15,858 kPa (2300 psi)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

CONTENTS

Group SA – Safe Maintenance

Group PS – Periodic Service

Group 12 – Battery

Group 13 – Electrical Control Handle

Group 16 – Electrical Motors

Group 17 – Electrical Schematics

Group 19 – Electrical Controls

Group 20 – Drive Axle

Group 22 – Wheels and Tires

Group 23 – Brake System

Group 25 – Steering Gear

Group 26 – Steering Axle

Group 29 – Hydraulic Pump, Sump and Filters

Group 30 – Hydraulic Control Valves

Group 31 – Hydraulic Supply System

Group 32 – Cylinders

Group 33 – Selector Solenoid Valve

Group 34 – Upright

Group 40 – Specifications

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

PREVIEW ONLY

You're viewing 18 of 445 pages

The full manual includes:

- All 445 pages, complete
- Searchable PDF (find any keyword)
- No watermarks
- Instant download
- Print-ready quality

GET FULL MANUAL NOW

Clark ESM-II 12, ESM-II 15, ESM-II 15S, ESM-II 17, ESM-II 20, ESM-II 22, ESM-II 25, ESM-II 12 thru 25 Service Manual

Scan or click anywhere
youfixthis.com

Click anywhere on this page to get the full manual