JLG

SERVICE AND MAINTENANCE MANUAL

WORLD HEADQUARTERS

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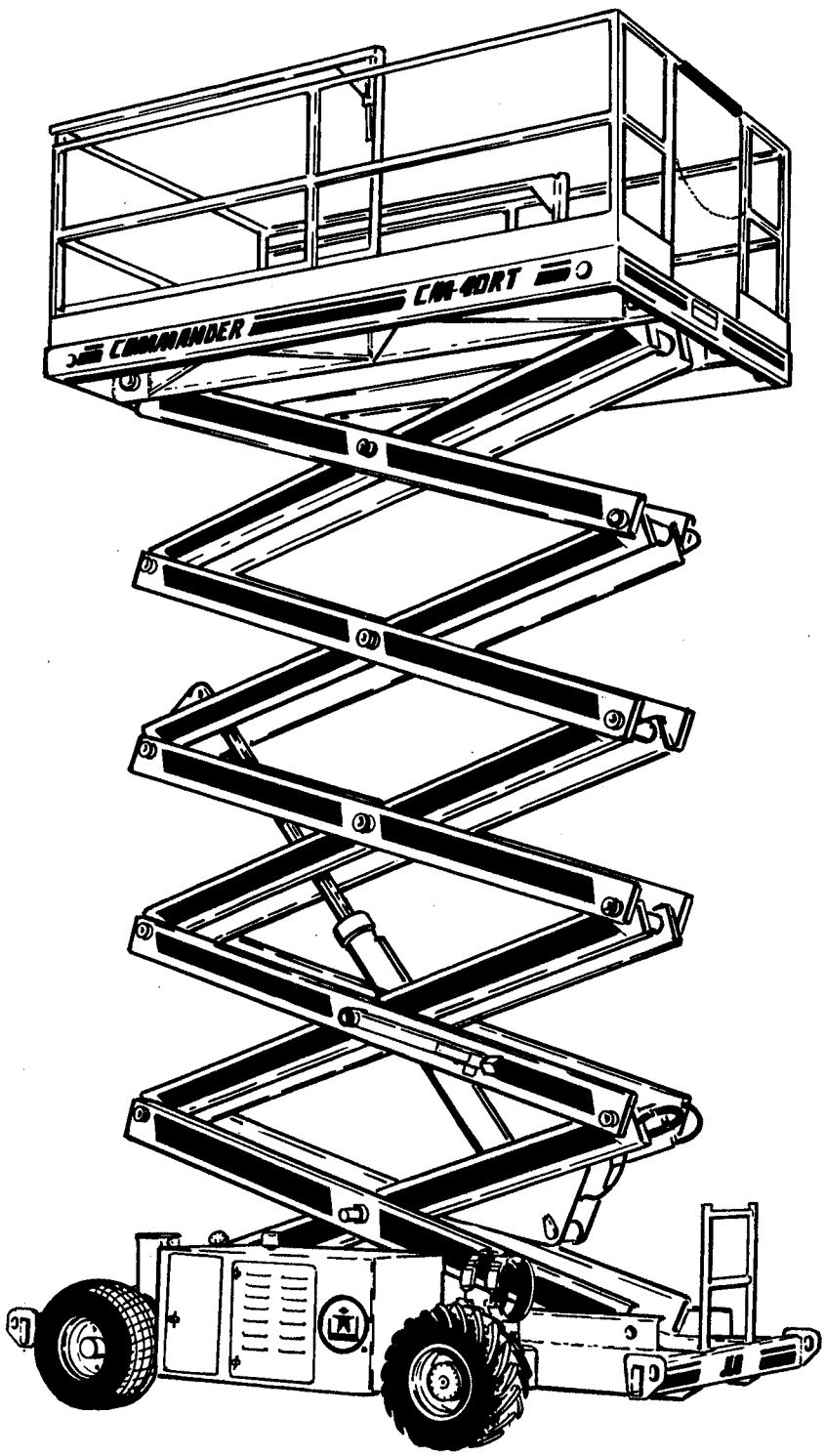

MODELS

CM-25RT
CM-33RT
CM-40RT

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A. GENERAL.

1. This section contains the general safety precautions which must be observed during maintenance of the aerial platform. It is of utmost importance that maintenance personnel pay strict attention to these warnings and precautions to avoid possible injury to themselves or others or damage to the equipment. A maintenance program must be established by a qualified person and must be followed to ensure that the machine is safe to operate.

WARNING

MODIFICATION OF THE MACHINE WITHOUT CERTIFICATION BY A RESPONSIBLE AUTHORITY THAT THE MACHINE IS AT LEAST AS SAFE AS ORIGINALLY MANUFACTURED IS A SAFETY VIOLATION.

2. The specific precautions to be observed during machine maintenance are inserted at the appropriate point in the manual. These precautions are, for the most part, those that apply when servicing hydraulic and larger machine component parts.

3. Your safety. and that of others, is the first consideration when engaging in the maintenance of equipment. Always be conscious of weight.

   Never attempt to move heavy parts without the aid of a mechanical device. Do not allow heavy objects to rest in an unstable position. When raising a portion of the equipment, ensure that adequate support is provided.

WARNING

SINCE THE MACHINE MANUFACTURER HAS NO DIRECT CONTROL OVER THE FIELD INSPECTION AND MAINTENANCE, SAFETY IN THIS AREA IS THE RESPONSIBILITY OF THE OWNER/OPERATOR.

B. HYDRAULIC SYSTEM SAFETY.

1. It should be particularly noted that the machines' hydraulic systems operate at extremely high and potentially dangerous pressures. Every effort should be made to relieve any system pressure prior to disconnecting or removing any portion of the system.

2. Relieve system pressure by cycling the applicable control several times with the engine stopped and ignition on, to direct any line pressure back into the return line to the reservoir. Pressure feed lines to system components can then be disconnected with minimal fluid loss.

C. MAINTENANCE.

WARNING

FAILURE TO COMPLY WITH SAFETY PRECAUTIONS LISTED IN THIS SECTION MAY RESULT IN MACHINE DAMAGE, PERSONNEL INJURY OR DEATH AND IS A SAFETY VIOLATION.

'NO SMOKING' IS MANDATORY. NEVER REFUEL DURING ELECTRICAL STORMS. ENSURE THAT FUEL CAP IS CLOSED AND SECURE AT ALL OTHER TIMES.

REMOVE ALL RINGS, WATCHES, AND JEWELRY WHEN PERFORMING ANY MAINTENANCE.

DO NOT WEAR LONG HAIR UNRESTRAINED, OR LOOSE-FITTING CLOTHING AND NECKTIES WHICH ARE APT TO BECOME CAUGHT ON OR ENTANGLED IN EQUIPMENT.

OBSERVE AND OBEY ALL WARNINGS AND CAUTIONS ON MACHINE AND IN SERVICE MANUAL.

KEEP OIL, GREASE, WATER, ETC. WIPED FROM STANDING SURFACES AND HAND HOLDS.

USE CAUTION WHEN CHECKING A HOT, PRESSURIZED COOLANT SYSTEM.

NEVER WORK UNDER AN ELEVATED PLATFORM UNLESS SAFETY PROPS HAVE BEEN INSTALLED, OR UNTIL IT HAS BEEN SAFELY RESTRAINED FROM ANY MOVEMENT BY BLOCKING OR OVERHEAD SLING.

BEFORE MAKING ADJUSTMENTS, LUBRICATING OR PERFORMING ANY OTHER MAINTENANCE, SHUT OFF ALL POWER CONTROLS.

BATTERY SHOULD ALWAYS BE DISCONNECTED DURING REPLACEMENT OF ELECTRICAL COMPONENTS.

KEEP ALL SUPPORT EQUIPMENT AND ATTACHMENTS STOWED IN THEIR PROPER PLACE.

USE ONLY APPROVED, NONFLAMMABLE CLEANING SOLVENTS.

SECTION 1 — SPECIFICATIONS

1-1. CAPACITIES.

a. Fuel Tank - 15.0 U.S. Gallons (56.78 l.).

b. Hydraulic Oil Tank - 20.0 U.S. Gallons (75.71 l.).

c. Hydraulic Oil System (including tank) - Aprox. 24.0 U.S. Gallons (90.85 l.).

d. Torque Hub Drive - 10 Ounces (0.28 kg).

Note
Torque Hubs should be one-half full of lubricant.

e. Engine Crankcase.

(1). Ford VSG-411 w/Filter - 3.50 Quarts (3.24 l.).

(2). Kohler M18 w/Filter - 1.75 Quarts (1.66 l.).

(3). Deutz F2L-1011 w/Filter - 6.87 Quarts (6.50 l.).

1-2. COMPONENT DATA.

a. Engine - Gas

(1). Manufacturer/Model - Ford VSG-411.

(2). Oil Capacity-
3.50 Quarts (3.24 l.) w/Filter.
2.90 Quarts (2.75 l.) w/o Filter.

(3). Idle RPM - 700 (early machines only)

(4). Low RPM - 2200

(5). High RPM - 2800

(6). Alternator - 55 Amp external.

(7). Battery - 85 Amphour, 550 Cold Cranking Amps.

(8). Fuel Consumption.

(a). Low RPM - 1.78 GPH (6.74 LPH)

(b). High RPM - 3.00 GPH (11.36 LPH)

(9). Horsepower - 33 @ 3600 RPM.

(10). Coolant - 14 Quarts (13.25 l.).

b. Engine - Gas.

(1). Manufacturer/Model - Kohler M18.

(2). Oil Capacity - 1.75 Quarts (1.64 l.) w/Filter, 1.50 Quarts (1.40 l.) w/o Filter.

(3). Low RPM - 2400

(4). High RPM - 3600

(5). Alternator - 63 Amp External.

(6). Battery - 85 Amphour, 550 Cold Cranking Amps.

(7). Fuel Consumption

(a). Low RPM - 1.60 GPH (6.06 LPH)

(b). High RPM - 1.73 GPH (7.31 LPH)

(8). Horsepower - 18 @ 3600, full load.

c. Engine - Diesel.

(1). Manufacturer/Model - Deutz F2L-1011.

(2). Oil Capacity - 6.87 Quarts (6.50 l.) w/Filter, 6.34 Quarts (6.00 l.)w/o Filter.

(3). Low RPM - 2200

(4). High RPM - 2800

(5). Alternator - 60 Amp External.

(6). Battery - 85 Amphour, 550 Cold Cranking Amps.

(7). Fuel Consumption

(a). Low RPM - 1.29 GPH (4.88 LPH)

(b). High RPM - 1.58 GPH (5.98 LPH)

(8). Horsepower - 27 @ 2800 RPM.

d. Motor - Electric.

(1). Manufacturer/Model - Baldor Spec 29-2496-2487.

(2). Horsepower - 6.6.

(3). RPM - 2500.

(4). Volts - 48DC.

(5). Batteries - 6 Volt, Douglas 6V-370-S.

e. Drive System.

(1). Tires, Standard - 26 X 12.00 X 12 Super Terra Grip, 4 Ply Rating, Poly Filled.

(2). Tires, Wide-Trak - 31 X 15.50 X 15 NHS Xtra Trac, 8 Ply Rating, 60 PSI (gas powered machines only).

(3). Drive Motor Displacement

(a). Early 2WD CM33RT - 10.6 $in.^3$/rev.

(b). Late 2WD CM33RT and CM25/40RT - 12.9 $in.^3$/rev.

(c). Std. 4WD rear - 8.8 $in.^3$/rev.

(d). Std. 4WD front - 12.9 $in.^3$/rev.

(e). Wide-Trak 2WD/2SPD - 2.48 $in.^3$/rev.

(f). Wide-Trak 4WD Front - 2.48 in^3/rev.

(g). Wide-Trak 4WD/2SPD Rear - 2.48 in^3/rev.

(4). Drive Hub Ratio

(a). Standard - 4.105 to 1.

(b). Wide-Trak - 30.05 to 1.

(c). Wide-Trak 4WD Front - 24.00 to 1.

(d). Wide-Trak 4WD Rear - 24.00 to 1.

(5). Drive Brake - Automatic spring applied hydraulically released disc brakes.

f. Steer System.

(1). Tires, Standard - 26 X 12.00 X 12 NHS Softrac Terra, 4 Ply Rating, Poly Filled.

(2). Tires, Wide-Trak - 31 X 15.50 X 15 NHS Xtra Trac, 8 Ply Rating, 60 PSI (gas or diesel powered machines only).

(3). Toe-in, adjust for 1/4" (6.35 mm) overall.

g. Hydraulic Pump.

(1). Ford and Deutz Engines.

(a). First Section - 10.00 GPM (37.85 lpm).

(b). Second Section - 7.92 GPM (29.98 lpm).

(2). Kohler Engine.

(a). First Section - 8.06 GPM (30.51 lpm).

(b). Second Section - 5.03 GPM (19.04 lpm).

(3). Electric Motor.

(a). First Section - 4.22 GPM (15.97 lpm).

(b). Second Section - 3.46 GPM (13.10 lpm).

(4). Clockwise Rotation.

h. Hydraulic Filter - Inline, 25 Micron Nominal.

1-3. PERFORMANCE DATA.

a. Travel Speed.

(1). Standard - 4.0 MPH (6.44 kph).

(2). Wide Trak/Electric - 3.5 MPH (5.63 kph)

b. Gradeability.

(1). 2WD - 25% or 14° slope.

(2). 4WD - 35% or 19° slope.

c. Turning Radius.

(1). Standard/Electric - 17 Ft. 0 In. (5.18 m).

(2). Wide-Trak - 15 Ft. 0 In. (4.57 m)

d. Platform Speed (no load).

(1). CM25RT

(a). Lift Up - 40 - 66 seconds.

(b). Lift Down - 27 - 45 seconds

(2). CM33/40RT

(a). Lift Up - 40-66 seconds.

(b). Lift Down - 27-45 seconds.

e. Sideslope

(1). Standard - 5% or 3.0° slope.

(2). Wide-Trac - 5% or 3.0° slope.

f. Machine Weight (Standard and Wide-Trak)

(1). CM25RT - Not Available.

(2). CM33RT - 7400 LBS. (3364 kg).

(3). CM40RT - 8450 LBS. (3841 kg).

g. Platform Height (Retracted)

(1). CM25RT - Standard 48 In. (1.22 m.), Wide-Trak 50.12 In. (1.27 m.).

(2). CM33RT

(a). Standard - 56 In. (1.42 m).

(b). Wide-Trak - 58 1/8 In. (1.48 m).

(3). CM40RT

(a). Standard - 64 In. (1.63 m).

(b). Wide-Trak - 66 3/8 In. (1.69 m).

h. Machine Length

(1). Standard - 11 Ft. 5 In. (3.48 m).

(2). Wide-Trak - 12 Ft. 6 In. (3.81 m).

i. Machine Width

(1). Standard - 7 Ft. 0 In. (2.13 m).

(2). Wide-Trak - 7 Ft. 7 In. (2.31 m).

j. Wheelbase

(1). Standard - 80 In. (2.03 m).

(2). Wide-Trak - 89 In. (2.26 m).

1-4. TORQUE REQUIREMENTS.

Description	Torque Value (Dry)	Interval Hours
Standard Wheel Lugs	90 FT.LB. (12.44 kgm)	50
Wide-Trak Wheel Lugs	80 FT.LB. (11.06 kgm)	50

NOTE

When maintenance becomes necessary or a fastener has loosened, refer to Torque Chart to determine proper torque value.

1-5. LUBRICATION.

a. Ford VSG-411 Engine.

(1). Single Viscosity Oil (SF,SF/CC,SF/CD).

When Outside Temperature Is Consistently	Use SAE Number
-10° F. to +60° F.	*10W
+10° F. to +90° F.	20W-20
Above +32°F.	30
Above +50°F.	40

(2). Multi-Viscosity Oil (SF,SF/CC,SF/CD).

When Outside Temperature Is Consistently	Use SAE Number
Below +10°F.	*5W-20
Below +60°F.	5W-30
-10°F. to +90F.	10W-30
Above -10°F.	10W-40/50
Above +20°F.	20W-40/50

* Not recommended for severe service, including high RPM operation.

b. Kohler M18 Engine.

(1). Single Viscosity Oil (API-SF).

When Outside Temperature Is Consistently	Use SAE Number
Above 32° F.	30

(2). Multi-Viscosity Oil (API-SF).

When Outside Temperature Is Consistently	Use SAE Number
Below 32° F.	5W-20;5W-30
+32° F. to 0° F.	10W-30;10W-40

c. Deutz F2L-1011.

(1). Single Viscosity Oil (API CD/SF).

When Outside Temperature Is Consistently	Use SAE Number
Above 77° F.	40
+41° F. to 86° F.	30
+5° F. to 50° F.	20W/20
*-22°F. to +23°F.	10W

(2). Multi-Viscosity Oil (API CD/SF)

When Outside Temperature Is Consistently	Use SAE Number
*-40° F. to +77° F.	5W-30 Synthetic
-13° F. to +68° F.	10W-30
-13°F. to +86°F.	10W-40
-4°F. to +77°F.	15W-30
-4° to Above 86°F.	15W-40

* Below -40°F. with engine oil preheating.

d. Hydraulic Oil.

Table 1-1. Hydraulic Oil.

HYDRAULIC SYSTEM OPERATING TEMPERATURE RANGE	SAE VISCOSITY GRADE
0° - 180° F. (-18° - 83° C.)	10W
0° - 210° F. (-18° - 99° C.)	10W-20/30
50° - 210° F. (10° - 99° C.)	20W-20

Notes

Hydraulic oils must have anti-wear qualities at least to API Service Classification GL-3, and sufficient chemical stability for mobile hydraulic system service. JLG Industries recommends Kendall Hyken 052 hydraulic oil, which has an SAE viscosity of 10W-20 and viscosity index of 152.

When temperatures remain consistently below 20°F. (-7°C.), an amount of no. 2 diesel fuel, not to exceed 20% of system capacity, may be added to the hydraulic oil reservoir. This diesel fuel will "thin" the hydraulic oil for easier cold weather operation, and will almost completely dissipate from the hydraulic system over a several month period of time. When cold weather is past, it may be necessary to drain and refill the hydraulic system to rid the system of any remaining diesel fuel.

Aside from JLG recommendations, it is not advisable to mix oils of different brands or types, as they may not contain the same required additives or be of comparable viscosities. If use of hydraulic oil other than Kendall Hyken 052 is desired, contact JLG Industries for proper recommendations.

Table 1-2. Lubrications Specifications.

KEY	SPECIFICATIONS
MPG	Multipurpose Grease having a minimum dripping point of 350°F. Excellent water resistance and adhesive qualities, and being of extreme pressure type.
EPGL	Extreme Pressure Gear Lube (oil) meeting API service classification GL-5 or Mil-Spec MIL-L2105.
HO	Hydraulic Oil. API service classification GL-3, e.g. Kendall Hyken 052.
EO	Engine (crankcase) Oil. Gas - SF class, MIL-L2104.

Note

Refer to Lubrication Chart, Figure 1-1 for specific lubrication procedures.

1-6. PRESSURE SETTINGS.

a. Modular Control Valve

(1). Differential Pressure Sensing - 400 PSI (28.12 kg/cm^2).

(2). Main Relief Cartridge - 3000 PSI (210.90 kg/cm^2).

b. Racine 2-Stack Valve

(1). Main Relief - 2500 PSI (175.75 kg/cm^2).

(2). Steer Reliefs - 1200 PSI (84.36 kg/cm^2).

c. Sequence Valve - 1800 PSI (126.54 kg/cm^2).

d. Leveling Jacks Valve - 1300 PSI (91.39 kg/cm^2).

e. Traversing Deck Valve - 1500 PSI (105.45 kg/cm^2).

1-7. CYLINDER SPECIFICATIONS

Table 1-3. Cylinder Specifications.

DESCRIPTION	BORE	STROKE	ROD DIA.
Steer Std.	2.00	5.00	1.12 in.
	(5.08)	(12.70)	(2.84 cm.)
Steer Wide Trak	2.50	7.12	1.25
	(6.35)	(18.08)	(3.18)
CM25/33RT Lift Std.	5.00	67.38	3.00
	(12.70)	(171.15)	(7.62)
CM25/33RT Lift Wide Trak	5.00	66.25	3.00
	(12.70)	(168.28)	(7.62)
CM40RT Lift Std.	5.00	65.94	3.50
	(12.70)	(167.49)	(8.89)
CM40RT Lift Wide Trak	5.00	65.12	3.50
	(12.70)	(165.40)	(8.89)
Leveling Jack	2.00	14.00	1.25
	(5.08)	(35.56)	(3.18)
Deck Ext.	2.00	42.00	1.00
	(5.08)	(106.68)	(2.54)

1-8. MAJOR COMPONENT WEIGHTS.

a. Deck:

(1). Standard - 660 LBS. (299.37 kg).

(2). Traversing - 1000 LBS. (453.60 kg).

(3). Manually Extending - add 300 LBS. (136.08 kg).

b. Sizzor Arm Assembly:

(1). CM25RT - 1500 LBS. (680.40 kg).

(1). CM33RT - 2000 LBS. (907.20 kg).

(2). CM40RT - 2500 LBS. (1134.00 kg).

1-9. RELAYS/CIRCUIT BREAKERS.

a. 3740049 - Relay, SPDT, Robert Bosch 0332204174, Potter Brumfield VF4-55F11-S02, Platform Control and Ground Control Box.

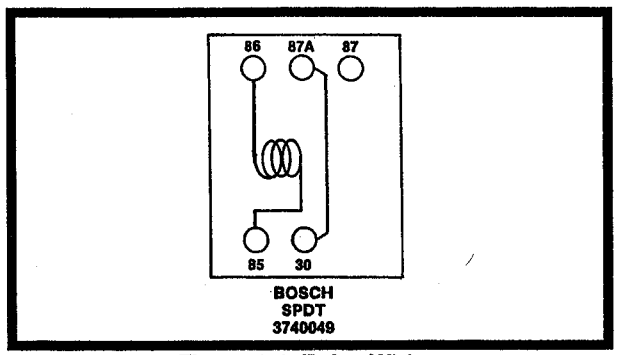


Figure 1-1. Relay Wiring.

b. 4360216 - Circuit Breaker, 30 Amp, Littlefuse 813030, Ground Control Box.

c. 4360232 - Circuit Breaker, 15 Amp, self resetting, Great Valley Industries CB2-15.

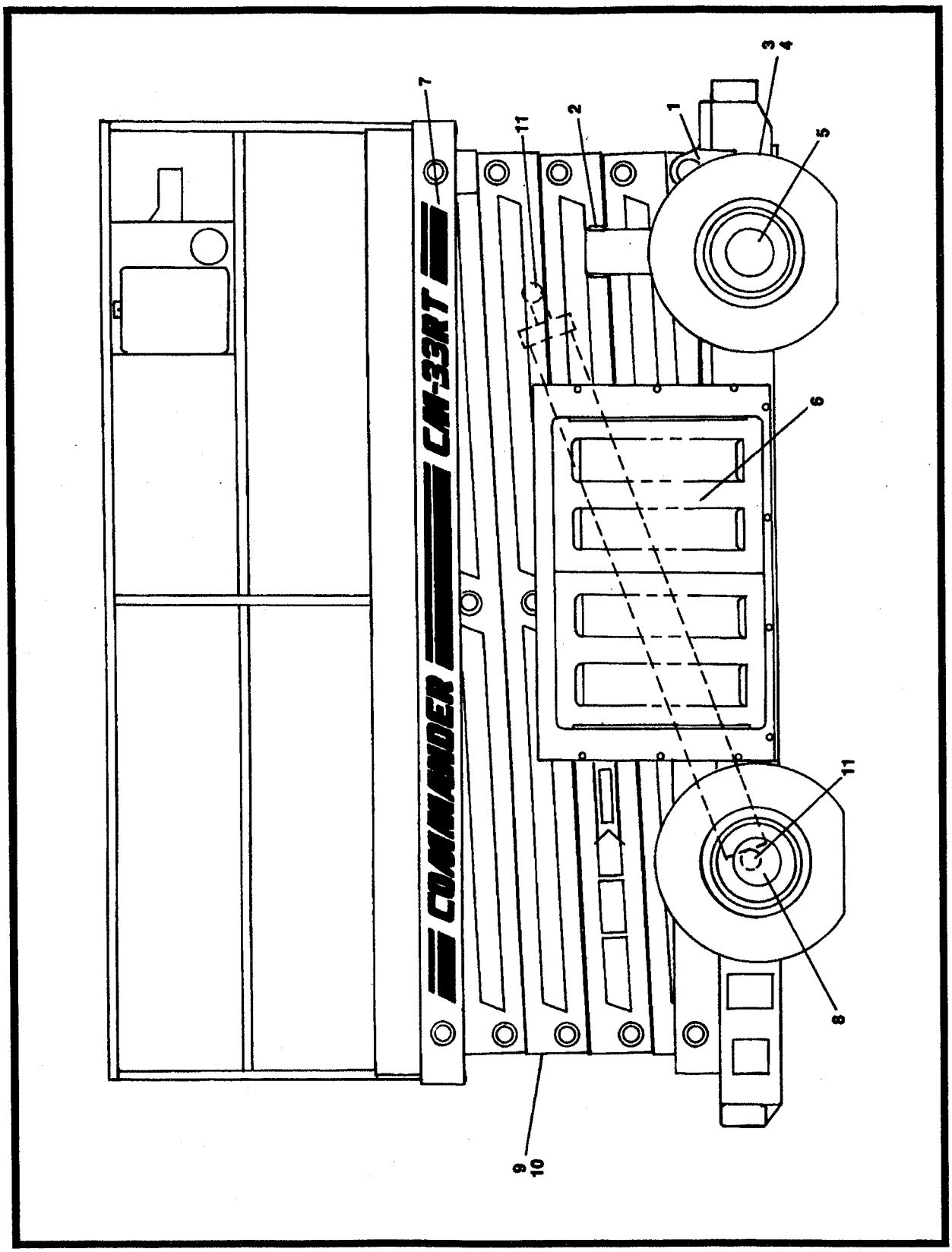


Figure 1-2. Lubrication Chart (Sheet 1 of 2).

INDEX NO.	COMPONENT	NUMBER/TYPE LUBE POINTS	LUBE & METHOD	INTERVAL (HOURS)
1	Oscillating Axle Pivot Point (Optional)	1 Grease Fitting	MPG - Pressure Gun	50
2	Oscillating Axle Lockout Cylinders (Optional)	2 Grease Fittings (1 Each Cylinder)	MPG - Pressure Gun	50
3	Steering Spindles	2 Grease Fittings	MPG - PressureGun	50
4	Tie Rod Ends	2 Grease Fittings	MPG - Pressure Gun	50
5	Wheel Bearings	N/A	MPG - Repack	2000
6	Engine Crankcase	Fill Cap/Drain Plug	Check EO Level	10
7	Rail Slides	N/A	MPG - Brush	50
8	*Wheel Drive Hub	Fill Plug	EPGL (SAE 90)	500
9	Hydraulic Oil Reservoir	Fill Cap/Drain Plug	HO - Check HO Level (See Note 4)	10
			HO - Change HO	2000
10	**Hydraulic Filter Element	N/A	Initial Change - 40 Hours	250
11	Lift Cylinder	2 Grease Fittings	MPG - Pressure Gun	50

*Torque hubs should be one half full of lubricant.

**JLG Industries recommends replacing the hydraulic filter after the first 40 hours of operation and every 250 hours thereafter.

Key to Lubricants:

MPG - Multi-Purpose Grease
EPGL - Extreme Pressure Gear Lube
EO - Engine Oil
HO - Hydraulic Oil (Kendall Hyken 052 or equal)

Notes:

1. Be sure to lubricate items on each side of machine.
2. Recommended lubricating intervals are based on normal use. If machine is subjected to severe operating conditions, user must adjust lubricating requirements accordingly.
3. Lubricating intervals are calculated on 50 hours of machine operation per week.
4. Operate hydraulic functions through one complete cycle before checking hydraulic oil level in tank. Oil should be visible in ADD sight window on hydraulic oil tank. If oil is not visible, add oil until oil is visible in both ADD and FULL sight windows on tank. Do not overfill tank.

WARNING

TO AVOID PERSONAL INJURY, USE SAFETY PROPS FOR ALL MAINTENANCE REQUIRING PLATFORM TO BE ELEVATED.

Figure 1-2. Lubrication Chart (Sheet 2 of 2)

SIZE		BOLT DIA. (IN.)	TENSILE STRESS AREA (SQ.IN.)	SAE GRADE 5 BOLTS			SAE GRADE 8 BOLTS			RECOMMENDED TORQUE WRENCH SIZE		
				CLAMP LOAD (LB.)	TIGHTENING DRY LB. IN.	TORQUE LUB. LB. IN.	CLAMP LOAD (LB.)	TIGHTENING DRY LB. IN.	TORQUE LUB. LB. IN.	IN-OZS.	IN-LBS.	FT-LBS.
4	40	0.1120	0.00604	380	8	6	540	12	9	160	10	
	48	0.1120	0.00661	420	9	7	600	13	10	160	10	
6	32	0.1380	0.00909	580	16	12	820	23	17		25	
	40	0.1380	0.01015	610	18	13	920	25	19		25	
8	32	0.1640	0.01400	900	30	22	1260	41	31		25	
	36	0.1640	0.01474	940	31	23	1320	43	32		25	
10	24	0.1900	0.01750	1120	43	32	1580	60	45		50	
	32	0.1900	0.02000	1285	49	36	1800	68	51		50	
1/4	20	0.2500	0.0318	2020	96	75	2860	144	108		100	
	28	0.2500	0.0364	2320	120	86	3280	168	120		200	
					LB. FT.	LB. FT.		LB. FT.	LB. FT.			
5/16	18	0.3125	0.0524	3340	17	13	4720	25	18		200	
	24	0.3125	0.0580	3700	19	14	5220	25	20		200	
3/8	16	0.3750	0.0775	4940	30	23	7000	45	35		300	25
	24	0.3750	0.0878	5600	35	25	7900	50	35		300	50
7/16	14	0.4375	0.1063	6800	50	35	9550	70	55		600	50
	20	0.4375	0.1187	7550	55	40	10700	80	60		600	50
1/2	13	0.5000	0.1419	9050	75	55	12750	110	80		1200	100
	20	0.5000	0.1599	10700	90	65	14400	120	90		1200	100
9/16	12	0.5625	0.1820	11600	110	80	16400	150	110		1200	100
	18	0.5625	0.2030	12950	120	90	18250	170	130		1200	100
5/8	11	0.6250	0.2260	14400	150	110	20350	220	170		1800	150
	18	0.6250	0.2560	16300	170	130	23000	240	180		1800	150
3/4	10	0.7500	0.3340	21300	260	200	30100	380	280		2400	200
	16	0.7500	0.3730	23800	300	220	33600	420	320		2400	200
7/8	9	0.8750	0.4620	29400	430	320	41600	600	460		3600	300
	14	0.8750	0.5090	32400	470	350	45800	660	500		3600	300
1	8	1.0000	0.6060	38600	640	480	51500	900	680		7200	600
	12	1.0000	0.6630	42200	700	530	59700	1000	740		7200	600
1 1/8	7	1.1250	0.7630	42300	800	600	68700	1280	960		7200	600
	12	1.1250	0.8560	47500	880	660	77000	1440	1080		7200	600
1 1/4	7	1.2500	0.9690	53800	1120	840	87200	1820	1360			Mult*
	12	1.2500	1.0730	59600	1240	920	96600	2000	1500			Mult*
1 3/8	6	1.3750	1.1550	64100	1460	1100	104000	2380	1780			
	12	1.3750	1.3150	73000	1680	1260	118100	2720	2040			
1 1/2	6	1.5000	1.4050	78000	1940	1460	126500	3160	2360			Mult*
	12	1.5000	1.5800	87700	2200	1640	142200	3560	2660			Mult*

* Torque Multiplier.

Figure 1-2. Torque Chart.

2-1. GENERAL.

a. This section provides information necessary to perform maintenance on the aerial platform. Descriptions, techniques and specific procedures are designed to provide the safest and most efficient maintenance for use by personnel responsible for ensuring the correct installation and operation of machine components and systems.

CAUTION

WHEN AN ABNORMAL CONDITION IS NOTED AND PROCEDURES CONTAINED HEREIN DO NOT SPECIFICALLY RELATE TO THE NOTED IRREGULARITY, WORK SHOULD BE STOPPED AND TECHNICALLY QUALIFIED GUIDANCE OBTAINED BEFORE WORK IS RESUMED.

b. The maintenace procedures included consist of servicing and component removal and installation, disassembly and assembly, inspection, lubrication and cleaning. Information on any special tools or test equipment is also provided where applicable.

2-2. SERVICING AND MAINTENANCE GUIDELINES.

a. General.

The following information is provided to assist you in the use and application of servicing and maintenance procedures contained in this chapter.

b. Safety and Workmanship.

Your safety and that of others, is the first consideration when engaging in the maintenance of equipment. Always be conscious of weight. Never attempt to move heavy parts without the aid of a mechanical device. Do not allow heavy objects to rest in an unstable position. When raising a portion of the equipment, ensure that adequate supported is provided.

c. Cleanliness.

(1). The most important single item in preserving the long service life of a machine is to keep dirt and foriegn materials out of the vital components. Precautions have been taken to safeguard against this. Shields , covers, seals and filters are provided to keep air , fuel, and oil supplies clean; however, these items must be maintained on a scheduled basis in order to function properly.

(2). At any time when air, fuel, or oil lines are disconnected, clear adjacent areas as well as the openings and fittings themselves. As soon as a line or component is disconnected, cap or cover all openings to prevent entry of foreign matter.

(3). Clean and inspect all parts during sevicing or maintenance, and assure that all passages and openings are unobstructed. Cover all parts to keep them clean. Be sure all parts are clean before they are installed. New parts should remain in their containers until they are ready to be used.

d. Components Removal and Installation.

(1). Use adjustable lifting devices, whenever possible, if mechanical assistance is required. All slings (chains, cables, etc.) should be parallel to each other and as near perpendicular as possible to top of part being lifted.

(2). Should it be necessary to remove a component on an angle, keep in mind that the capacity of an eyebolt or similar bracket lessens, as the angle between the supporting structure and the component becomes less than 90°.

(3). If a part resists removal, check to see whether all nuts, bolts, cables, brackets, wiring, etc. have been removed and that no adjacent parts are interfering.

e. Component Disassembly and Reassembly.

When disassembling or reassembling a component, complete the procedural steps in sequence. Do not partially disassemble or assemble one part, then start on another. Always recheck your work to assure that nothing has been overlooked. Do not make any adjustments, other than those recommended, without obtaining proper approval.

f. Pressure-Fit Parts.

When assembling pressure-fit parts, use an "anti-seize" or molybdenum disulfide base compound to lubricate the mating surface.

g. Bearings.

(1). When a bearing is removed, cover it to keep out dirt and abrasives. Clean bearings in nonflammable cleaning solvent and allow to drip dry. Compressed air can be used but do not spin the bearing.

(2). Discard bearings if the races and balls (or rollers) are pitted, scored, or burned.

(3). If bearing is found to be serviceable, apply a light coat of oil and wrap it in clean (waxed) paper. Do not unwrap reusable or new bearings until they are ready to install.

(4). Lubricate new or used serviceable bearings before installation. When pressing a bearing into a retainer or bore, apply pressure to the outer race. If the bearing is to be installed on a shaft, apply pressure to the inner race.

h. Gaskets.

Check that holes in gaskets align with openings in the mating parts. If it becomes necessary to hand-fabricate a gasket, use gasket material or stock of equivalent material and thickness. Be sure to cut holes in the right location, as blank gaskets can cause serious system damage.

i. Bolt Usage and Torque Application.

(1). Use bolts of proper length. A bolt which is too long will bottom before the head is tight against its related part. If a bolt is too short, there will not be enough thread area to engage and hold the part properly. When replacing bolts, use only those having the same specifications of the original, or one which is equivalent.

(2). Unless specific torque requirements are given within the text, standard torque values should be used on heat-treated bolts, studs, and steel nuts, in accordance with recommended shop practices. (See the Torque Chart.)

j. Hydraulic Lines and Electrical Wiring.

Clearly mark or tag hydraulic lines and electrical wiring, as well as their receptacles, when disconnecting or removing them from the unit. This will assure that they are correctly reinstalled.

k. Hydraulic System.

(1). Keep the system clean. If evidence of metal or rubber particles are found in the hydraulic system, drain and flush the entire system.

(2). Disassemble and reassemble parts on clean work surfaces. Clean all metal parts with non-flammable cleaning solvent. Lubricate components, as required, to aid assembly.

l. Lubrication.

Service applicable components with the amount, type, and grade of lubricant recommended in this manual, at the specified intervals. When recommended lubricants are not available, consult your local supplier for an equivalent that meets or exceeds the specifications listed.

m. Battery.

Clean battery, using a non-metallic brush and a solution of baking soda and water. Rinse with clean water. After cleaning, thoroughly dry battery and coat terminals with an anticorrosion compound.

n. Lubrication and Servicing.

Components and assemblies requiring lubrication and servicing are shown in the Lubrication Chart.

2-3. LUBRICATION INFORMATION.

a. Hydraulic System.

(1). The primary enemy of a hydraulic system is contamination. Contaminants enter the system by various means, e.g., using inadequate hydraulic oil, allowing moisture, grease, sealing components, sand, etc., to enter when performing maintenance, or by permitting the pump to cavitate due to insufficient system warm-up or leaks in the pump supply (suction) lines.

(2). The design and manufacturing tolerances of the component working parts are very close, therefore, even the smallest amount of dirt of foriegn matter entering a system can cause wear or damage to the components and generally results in faulty operation. Every precaution must be taken to keep hydraulic oil clean, including reserve oil in storage. Hydraulic system filters should be checked, cleaned, and/or replaced as necessary, at the specified intervals required in the Lubrication Chart. Always examine filters for evidence of metal particles.

(3). Cloudy oils indicate a high moisture content which permits organic growth, resulting in oxidation or corrosion. If this condition occurs, the system must be drained, flushed, and refilled with clean oil.

(4). It is not advisable to mix oils of different brands or types, as they may not contain the same required additives or be of comparable viscosities. Good grade mineral oils, with viscosities suited to the ambient temperatures in which the machine is operating, are recommended for use.

Note

Metal particles may appear in the oil or filters of new machines due to the wear-in of meshing components.

b. Hydraulic Oil.

(1). Refer to Table 1-1 for recommendations for viscosity ranges.

(2). JLG recommends Kendall Hyken 052 hydraulic oil, which has an SAE viscosity of 10W-20 and a viscosity index of 152.

Note

Start-up of hydraulic system with oil temperatures below - 15°F. is not recommended. If it is necessary to start the system in a sub-zero environment, it will be necessary to heat the oil with a low density, 100VAC heater to a minimum temperature of -15°F.

(3). The only exception to the above is to drain and fill the system with Mobil DTE 11 oil or its equivalent. This will allow start up at temperatures down to -20°F. However, use of this oil will give poor performance at temperatures above 120°F. Systems using DTE 11 oil should not be operated at temperatures above 200°F. under any condition.

c. Changing Hydraulic Oil.

(1). Use of any of the recommended crankcase or hydraulic oils eliminates the need for changing the oil on a regular basis. However, filter elements must be changed after the first 40 hours of operation and every 250 hours thereafter. If it is necessary to change the oil, use only those oils meeting or exceeding the specifications appearing in this manual. If unable to obtain the same type of oil supplied with the machine, consult local supplier for assistance in selecting the proper equivalent. Avoid mixing petroleum and synthetic base oils. JLG Industries recommends changing the hydraulic oil annually.

(2). Use every precaution to keep the hydraulic oil clean. If the oil must be poured from the original container into another, be sure to clean all possible contaminants from service container. Always clean the mesh element of the filter and replace the cartridge any time the system oil is changed.

(3). While the unit is shut down, a good preventive maintenance measure is to make a thorough inspection of all hydraulic components, lines, fittings, etc., as well as a functional check of each system, before placing the machine back in service.

d. Lubrication Specifications.

Specified lubricants, as recommended by the component manufacturers, are always the best choice, however, multipurpose greases usually have the qualities which meet a variety of single purpose grease requirements. Should any question arise, regarding the use of greases in maintenance stock, consult your local supplier for evaluation. Refer to Table 1-2 for an explanation of the lubricant key designations appearing in the Lubrication Chart.

Note

Metal particles may appear in the oil or filters of new machines due to the wear-in of meshing component

2-4. CYLINDERS - THEORY OF OPERATION.

a. Double Acting Cylinders.

Systems incorporating double acting cylinders are as follows; Steer, Axle Lockout and Stabilizers. A double acting cylinder is one that requires oil flow to operate the cylinder rod in both directions. Directing oil (by actuating the corresponding control valve to the piston side of the cylinder) forces the piston to travel toward the rod end of the barrel, extending the cylinder rod piston (attached to rod). When the oil flow is stopped, the movement of the rod will stop. By directing oil to the rod side of the cylinder, the piston will be forced in the opposite direction and the cylinder rod will retract.

b. Single Acting Cylinders.

The Platform Lift Circuit incorporates single acting cylinders. A single acting cylinder requires oil flow to extend the cylinder only. Directing oil (by actuating the corresponding control valve to the piston side of the cylinder) forces the cylinder to extend. When the oil flow is stopped, movement will stop. To collapse the cylinder a normally closed solenoid opens allowing gravity to force hydraulic fluid to bleed off. When the normally closed solenoid closes, movement stops. A holding valve is used in the Platform Lift Circuit to prevent retraction of the cylinder rod should a hydraulic line rupture or a leak develop between the cylinder and its related control valve.

2-5. VALVES - THEORY OF OPERATION.

a. Solenoid Control Valves (Bang-Bang).

Control valves used are four-way three position solenoid valves of the sliding spool design. When a circuit is activated and the control valve solenoid energizes, the spool is shifted and the corresponding work port opens to permit oil flow to the component in the selected circuit with the opposite work port opening to reservoir. Once the circuit is deactivated (control returned to neutral) the valve spool returns to neutral (center) and oil flow is then directed through the valve body and returns to reservoir. A typical control valve consists of the valve body, sliding spool, and two solenoid assemblies. The spool is machine fitted in the bore of the valve body. Lands on the spool divide the bore
into various chambers, which, when the spool is shifted, align with corresponding ports in the valve body open to common flow. At the same time other ports would be blocked to flow. The spool is spring-loaded to center position, therefore when the control is released, the spool automatically returns to neutral, prohibiting any flow through the circuit.

b. Relief Valves.

Main relief valves are installed at various points with the hydraulic system to protect associated systems and components against excessive pressure. Excessive pressure can be developed when a cylinder reaches its limit of travel and the flow of pressurized fluid continues from the system control. The relief valve provides an alternate path for the continuing flow from the pump, thus preventing rupture of the cylinder, hydraulic line, or fitting.Complete failure of the system pump is also avoided by relieving circuit pressure. The relief valve is installed in the circuit between the pump outlet (pressure line) and the cylinder of the circuit, generally as an integral part of the system valve bank.Relif pressures are set slightly higher than the load requirement, with the valve diverting excess pump delivery back to the reservoir when operating pressure of the component is reached.

c. Crossover Relief Valves.

Crossover relief valves are used in circuits where the actuator requires an operating pressure lower than that supplied to the system. When the circuit is activated and the required pressure at the at the actuator is developed, the crossover relief diverts excess pump flow to the reservoir. Individual, integral reliefs are provided for each side of the circuit.

2-6. OSCILLATING AXLE - THEORY OF OPERATION.

The oscillating front axle is attached to the frame by a single pivot pin which allows for all four wheels to remain on the ground when traveling on rough terreain. The oscillating axle also incorporates two lockout cylinders connected between the frame and each wheel end. The lockout cylinders permit axle oscillation when the platform is lowered and lock and hold when platform is raised.

2-7. WEAR PADS.

a. Original height - 5.00 In. (12.70 cm).

b. Replace when height reaches 4.75 In. (12.06 cm).

2-8. TILT ALARM SWITCH LEVELING.(Optional)

Note

The Tilt Alarm Switch (Sensor) is factory is factory set to activate between 4.5-5.0°. The only field adjustment necessary is leveling the switch on the spring loaded mounting studs. Consult factory for tilt sensor adjustment. There are two methods of adjustment. Version a. is a manual procedure. Version b. uses a voltmeter.

CAUTION

PERFORM TILT ALARM SWITCH LEVELING PROCEDURE A MINIMUM OF EVERY SIX MONTHS TO ENSURE PROPER OPERATION AND ADJUSTMENT OF SWITCH.

a. Manual Version.

(1). Park the machine on a flat level surface. Ensure machine is level and tires are filled to rated pressure.

Note

Ensure switch mounted bracket is level and securely attached.

(2). Level the base of the indicator by tightening the three flange nuts through approximately one half of its spring travel. DO NOT ADJUST THE 'X' NUT DURING THE REMAINDER OF THE PROCEDURE.

(3). With the electrical connections complete, slowly tighten one of the 'Y' nuts until the circuit is closed and the light on the platform control console illuminates.

(4). Slowly back off the nut, counting the number of turns, until the circuit is again closed and the light again illuminates.

(5). Divide the number of turns determined in step (4) in half. Tighten the nut this many turns. The line determined by this nut and the 'X' nut is now parallel to the ground.

(6). Repeat steps (3) through (5) for the remaining 'Y' nut. The switch is now level.

(7). Individually push down on one corner at a time; there should be enough travel to cause the switch to trip. If the switch does not trip in all three tests, the flange nuts have been tightened too far. Loosen the 'X' nut and repeat steps (3) through (7).

b. Voltmeter Version. (See Figure 2-1)

(1). Park machine on a flat, level surface. Ensure machine is level and tires are filled to rated pressure.

(2). If engine is not running, turn ignition switch to ON position.

(3). Connect black lead of voltmeter to ground and red lead to yellow wire protruding from potting on bottom of sensor.

(4). Adjust the leveling nuts to obtain the highest possible voltage reading.

(5). Check voltage at trip point in all four directions. If the voltage reading is not symmetrical, repeat (4) above.

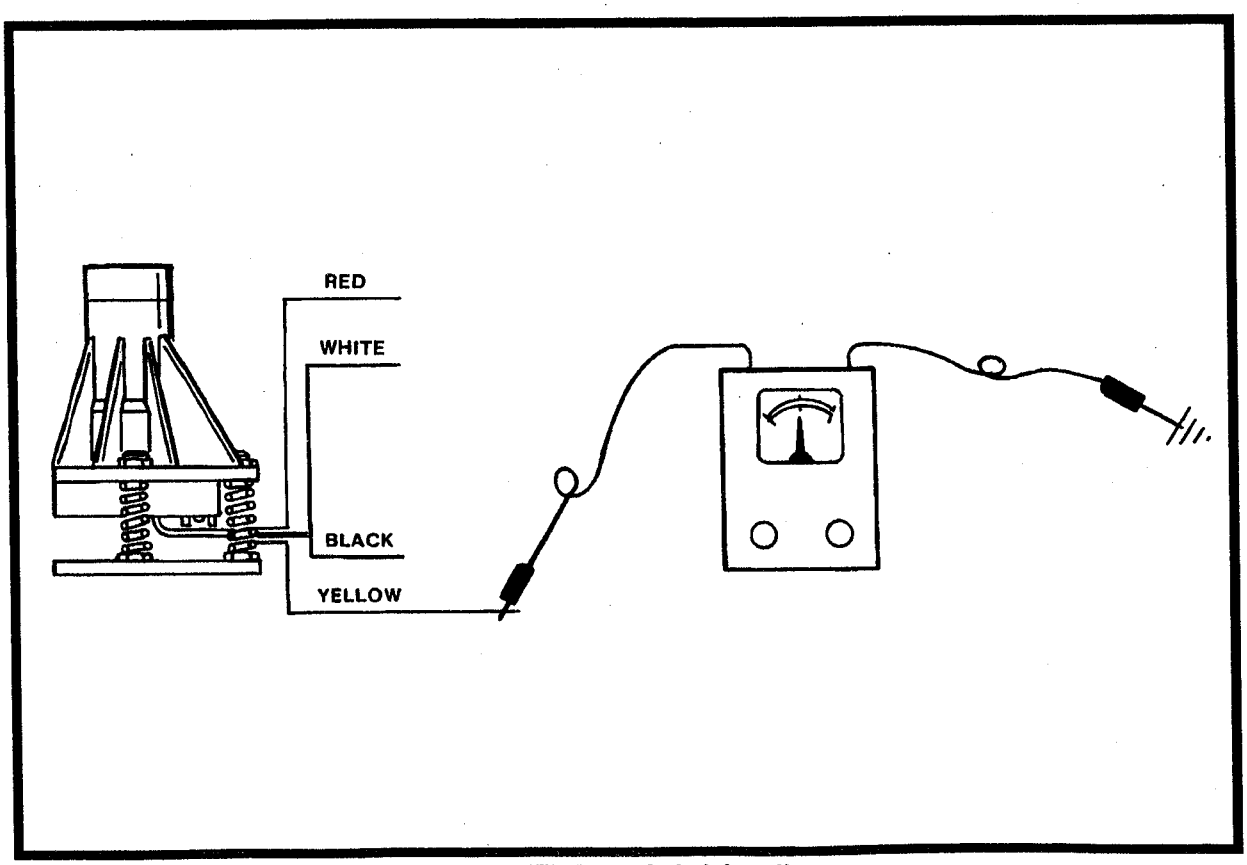


Figure 2-1. Tilt Alarm Switch Leveling.

2-9. CYLINDER REPAIR.

Note

The following are general procedures that apply to all of the cylinders on this machine. Procedures that apply to a specific cylinder will be so noted.

a. Disassembly.

IMPORTANT

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

(1). Connect a suitable auxiliary hydraulic power source to the cylinder port block fitting.

(2). Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.

(3). If applicable, remove the cartridge-type holding valve and fittings from the cylinder port block. Discard 0-rings.

(4). Place the cylinder barrel into a suitable holding fixture.

(5). Using a suitable spanner wrench loosen the cylinder head retainer(s), if applicable, and/or cylinder head gland(s), and remove from cylinder barrel.

(6). Attach a suitable pulling device to the cylinder rod port block or cylinder rod end, as applicable.

IMPORTANT

EXTREME CARE SHOULD BE TAKEN WHEN REMOVING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

(7). With the barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

(8). Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.

Note

Step (9) applies to leveling jack cylinder.

(9). Remove the cotter pin and nut which attach the piston to the rod, and remove the piston.

(10). Remove the setscrew(s), if applicable, and nut which attach the piston to the rod, and remove the piston. Discard set screws.

(11). Remove the piston rings.

(12). Remove and discard the piston o-rings, and backup rings.

(13). Remove the setscrew, if applicable, piston spacer, and wear ring, if applicable, from the rod.

(14). Remove the rod from the holding fixture. Remove the cylinder head gland and retainer, if applicable. Discard the o-rings, back-up rings, rod seals, and wiper seals.

b. Cleaning and Inspection.

(1). Clean all parts thoroughly in an approved cleaning solvent.

(2). Inspect the cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.

(3). Inspect threaded portion of rod for excessive damage. Dress threads as necessary.

(4). Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.

(5). Inspect threaded portion of barrel for damage. Dress threads as necessary.

(6). Inspect piston surface for damage and scoring and for distortion. Dress piston surface or replace piston as necessary.

(7). Inspect seal and o-rings grooves in piston for burrs and sharp edges. Dress applicable surfaces as necessary.

(8). Inspect cylinder head inside diameter for scoring or other damage and for ovality and tapering. Replace as necessary.

(9). Inspect seal and o-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.

(10). If applicable, inspect cylinder head retainer or end cap for surface or thread damage. Repair or replace as necessary.

(11). Inspect cylinder head outside diameter for scoring or other damage, ovality and tapering. Replace as necessary.

(12). If applicable, inspect thread ring for scoring or other damage. Dress threads or applicable surfaces as necessary.

(13). If applicable, inspect rod and barrel bushings for signs of correct lubrication and excessive wear.

(14). Inspect travel limiting collar or spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.

(15). If applicable, inspect port block fittings and holding valve. Replace as necessary.

(16). Inspect the oil ports for blockage or the presence of dirt or other foriegn material. Repair as necessary.

(17). If applicable, inspect piston rings for cracks or other damage. Replace as necessary.

c. Assembly.

Note

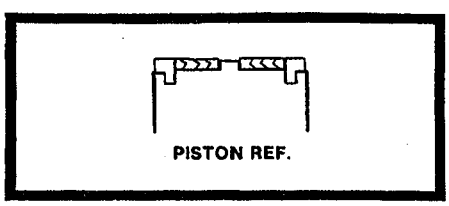
Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.

Note

Apply a light film of hydraulic oil to all components prior to assembly.

IMPORTANT

WHEN INSTALLING NEW POLY-PAK TYPE PISTON SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. REFER TO ILLUSTRATION BELOW FOR CORRECT SEAL ORIENTATION. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.



(1). Place a new wiper seal and rod seal into the applicable cylinder head gland grooves.

(2). Carefully install the head gland on the rod, ensuring that the wiper and rod seals are not damaged or dislodged. Push the head gland along the rod to the end, as applicable.

(3). Carefully slide the piston spacer on the rod, if applicable. If applicable, align the oil holes in the rod and spacer. Secure the spacer.

(4). If applicable, correctly place a new o-ring and backup rings in the inner piston diameter groove.

(5). Carefully place the piston on the cylinder rod, ensuring that the o-ring and back-up rings are not damaged or dislodged.

(6). Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.

(7). Push the piston onto the rod until it abuts the spacer end and install the attaching nut, and cotter pin, as applicable.

WARNING

WHEN REBUILDING THE CYLINDERS, APPLY LOCTITE #242 TO PISTON NUT, SETSCREWS, AND CYLINDER CAP.

Note

Nylon point set screws should be discarded and replaced whenever they are removed.

(8). If applicable, install the setscrew(s) which secure the piston attaching nut to the diameter groove.

(9). Remove the cylinder rod from the holding fixture.

(10). Place new o-rings and seals in the applicable outside diameter grooves of both the piston and the cylinder head.

(11). Position the cylinder barrel in a suitable holding fixture.

IMPORTANT

EXTREME CARE SHOULD BE TAKEN WHEN INSTALLING THE CYLINDER ROD, HEAD, AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

(12). With barrel clamped securely, and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading o-ring and seal ring are not damaged or dislodged.

(13). Continue pushing the rod into the barrel until the cylinder head gland can be inserted into the barrel cylinder, or, if applicable, until the cylinder head threads engage the threads of the barrel.

(14). If applicable, secure the cylinder head gland using a suitable spanner type wrench in the holes provided.

(15). If applicable, secure the cylinder head retainer using a suitable spanner type wrench in the holes provided.

(16). After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.

(17). If applicable, install the cartridge-type holding valve and fittings in the rod port block using new o-rings as applicable.

CAUTION

IF THE CYLINDER IS TO BE TESTED PRIOR TO INSTALLATION ON THE MACHINE, EXTREME CARE SHOULD BE USED TO ENSURE THAT THE OUTER END OF THE ROD IS SUPPORTED. USE EITHER A TRAVELING OVERHEAD HOIST, FORK LIFT, OR OTHER MEANS TO SUPPORT THE OVERHANGING WEIGHT OF THE EXTENDING ROD.

2-10. THROTTLE CHECKS AND ADJUSTMENTS, VSG-411. See Figure 2-2 and 2-3)

a. Checks.

(1). Check that anti-dieseling solenoid is operating. If solenoid is operating, an audible click should be heard when the ignition is switched 'on' and 'off'.

(2). Check throttle linkage for smooth operation by rotating throttle lever by hand to full throttle position then slowly back to idle position feeling closely for sticking or binding.

b. Adjustments, in Sequence.

Note

Only early machines have idle speed, wiring was changed on later machines to eliminate idle speed.

Note

Steps (1), and (2) are preliminary settings.

(1). Remove cover from controller. With engine shut down turn 'gain' CCW as far as it will go. Then turn screw slot CW until vertical. Gain may need fine tuning.

(2). Turn 'droop' CCW as far as it will go. Then turn screw slot CW until vertical. 'Droop' should not need further adjustment.

(3). Turn idle adjusting screw on carburetor all the way out CCW until there is a gap between the screw and stop plate.

(4). Start engine and allow to come up to operating temperature.

(5). Remove wire from no. 7 connector on controller, which will switch engine speed to HIGH. Adjust 'speed' screw until engine runs at 2800 RPM.

Note

If engine surges, turn 'gain' screw one or two degrees CCW until surging stops, no more.

(6). Replace wire to no. 7 connector on controller, which will return engine to LOW speed. Adjust 'remote' until engine runs at 2200 RPM.

(7). Recheck speeds. When satisfied, apply a drop of fingernail polish to all trimpot screws. Replace cover.

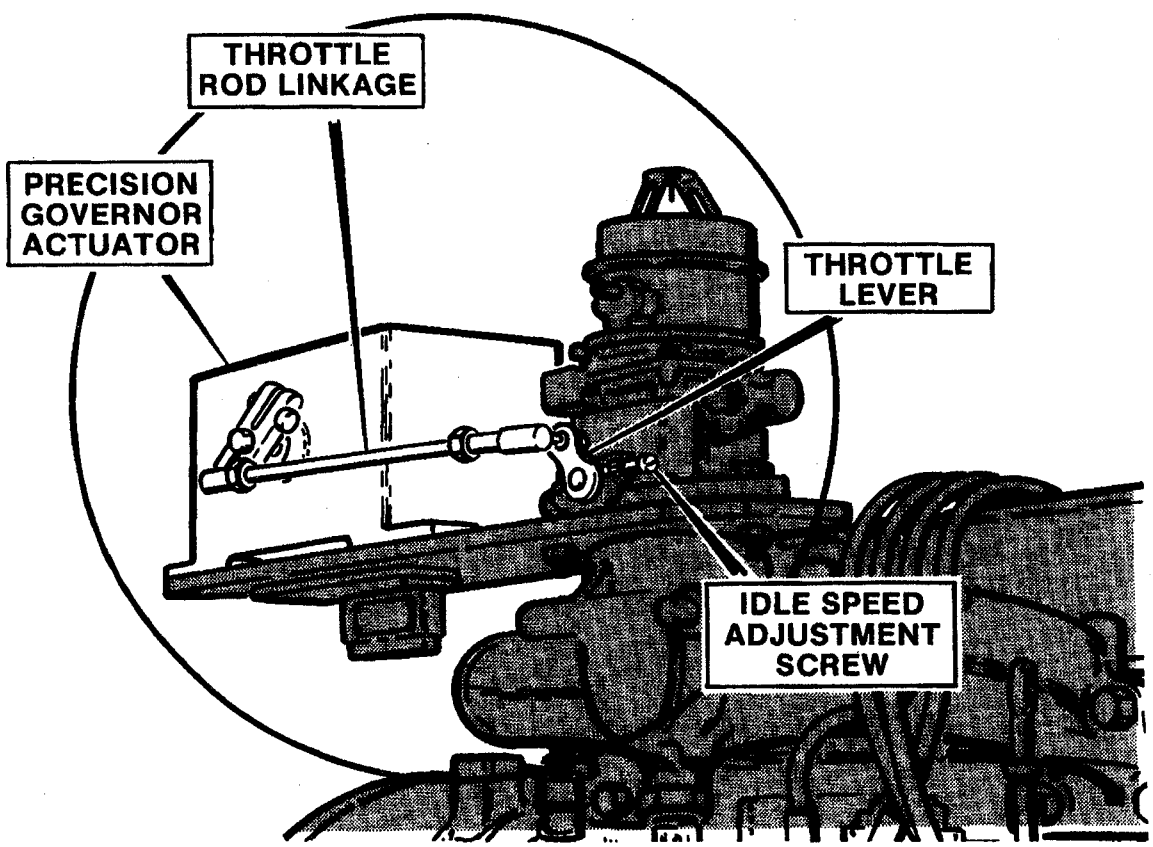


Figure 2-2. Throttle Adjustment, VSG-411.

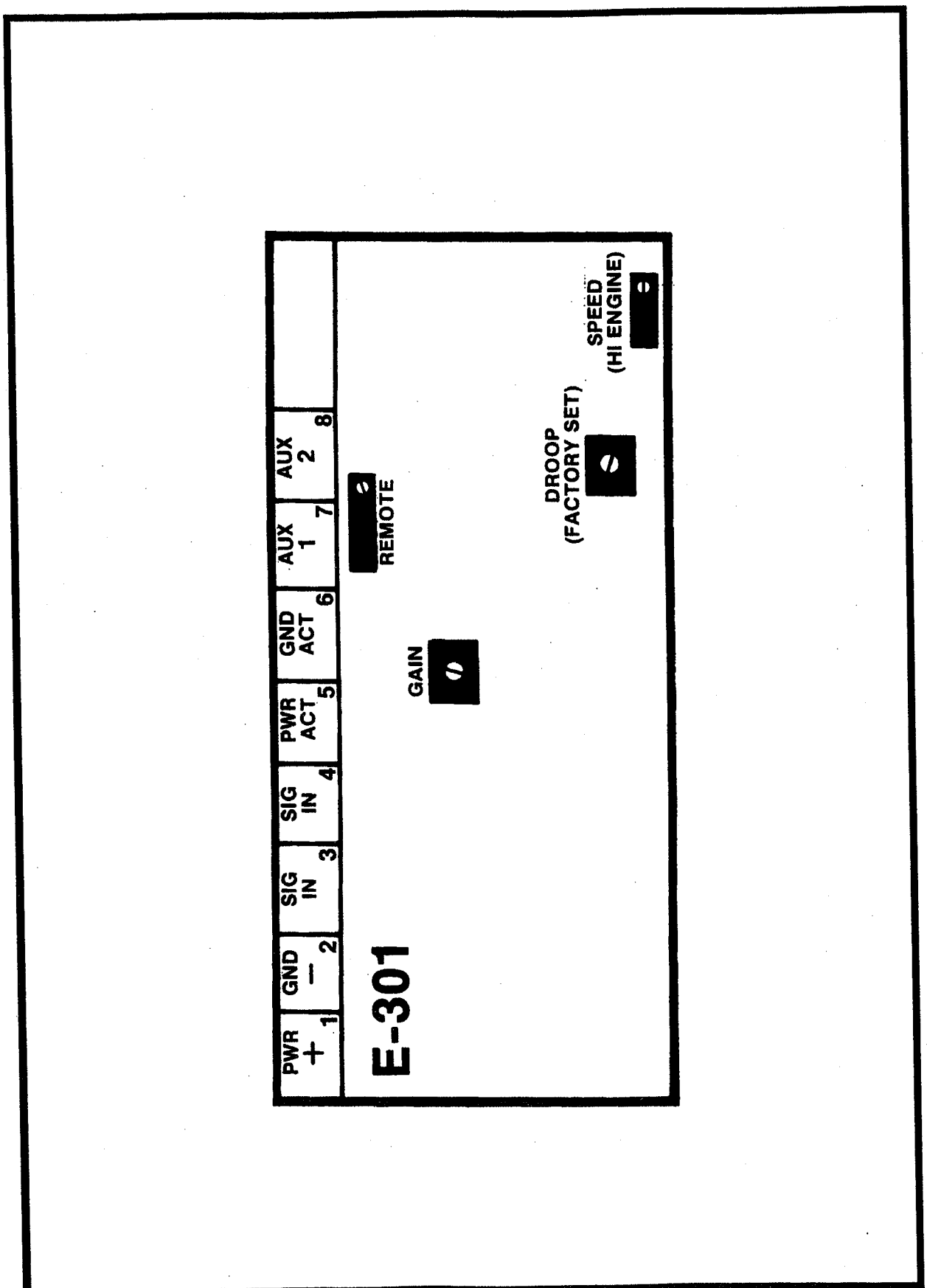


Figure 2-3. Precision Governor Adjustments, VSG-411.

2-11. THROTTLE CHECKS AND ADJUSTMENTS - KOHLER M18. (See Figure 2-4)

a. Checks.

(1). Check that fuel tank is filled with fresh, clean gasoline.

(2). Check that fuel tank cap vent is not blocked and that it is operating properly.

(3). Check that in-line fuel filter is clean and unobstructed. Replace as necessary.

(4). Check that air cleaner element is clean and all air cleaner components properly secure.

b. Adjustments.

(1). Set Dual Fuel Switch (if equipped) to GASOLINE.

(2). Remove engine air filter assembly and L.P. carburetor adapter (if equipped) from carburetor.

(3). Turn Idle Fuel Adjusting Needle all the way in (clockwise) until it seats, taking care not to damage needle or seat by overtightening. Then turn out (counterclockwise) 1 1/4 turns.

(4). Set Engine Speed Switch to LOW and start engine. Allow engine to come up to operating temperature.

(5). Turn Idle Speed Adjusting Screw until engine runs at approximately 2400 RPM.

(6). Set Engine Speed Switch to HIGH.

(7). Adjust throttle solenoid linkage until engine runs at 3600 RPM.

(8). Set Engine Speed Switch to LOW.

(9). Adjust throttle solenoid linkage until engine runs at 2400 RPM.

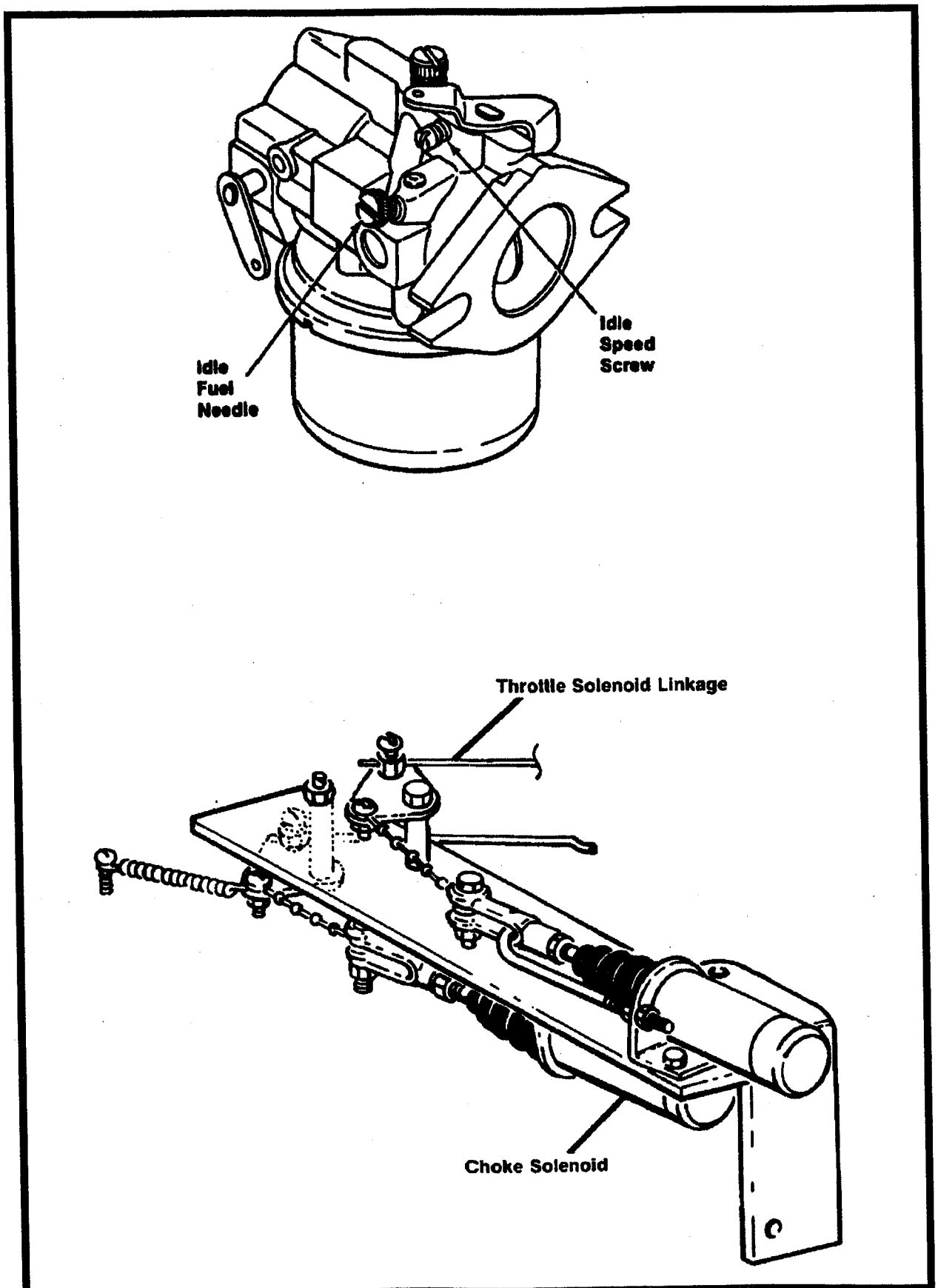


Figure 2-4. Throttle Adjustments, Kohler.

2-12. THROTTLE CHECKS AND ADJUSTMENTS, DEUTZ. (See Figure 2-5)

Note

Never run fuel tank dry. Diesel engines cannot be restarted after running out of fuel until fuel system has been air-vented or "bled" of air. (See Deutz Operators Manual for procedure).

a. Disconnect actuator cable from throttle lever. With the aid of an assistant, start the engine and allow it to come up to operating temperature. Adjust throttle lever stop until engine runs at 2200 RPM. Shut down engine. Reattach actuator cable to throttle lever making sure that low engine setting remains the same. If necessary, adjust slide pin to contact low engine limit switch at 2200 RPM. Shut down engine.

b. With the aid of an assistant, start engine from platform and allow to come up to operating temperature. Disconnect modular dump valve wire. Turn on HIGH ENGINE switch. Hold drive controller in full drive position. Adjust slide pin to contact high engine limit switch at 2800 RPM. Shut off all switches and controllers. Reconnect modular control dump valve wire.

Note

Actuator cable travel must stop slightly before lever makes contact with throttle lever stop. Failure to do so will burn out actuator.

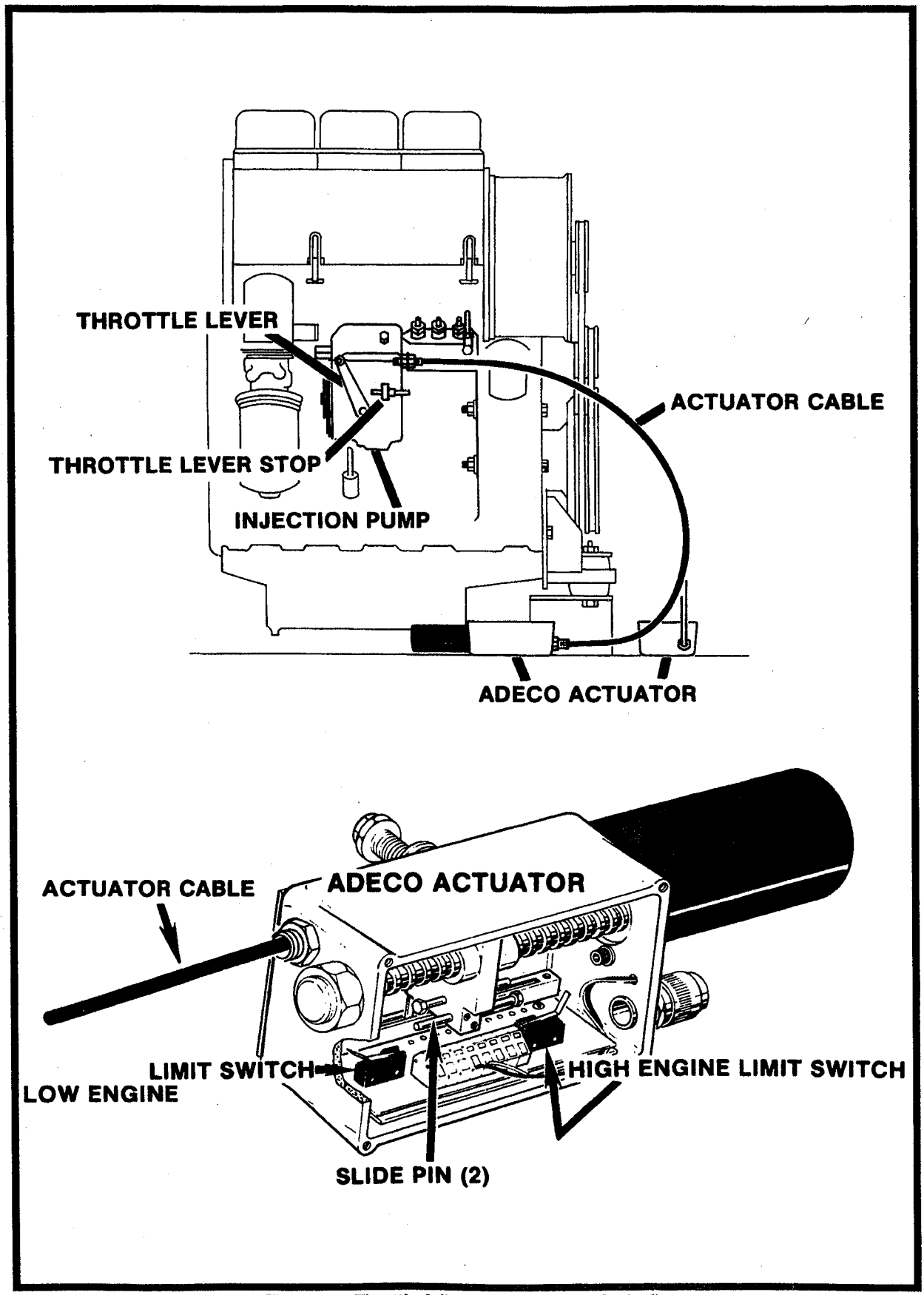


Figure 2-5. Throttle Adjustments, Deutz. (Typical)

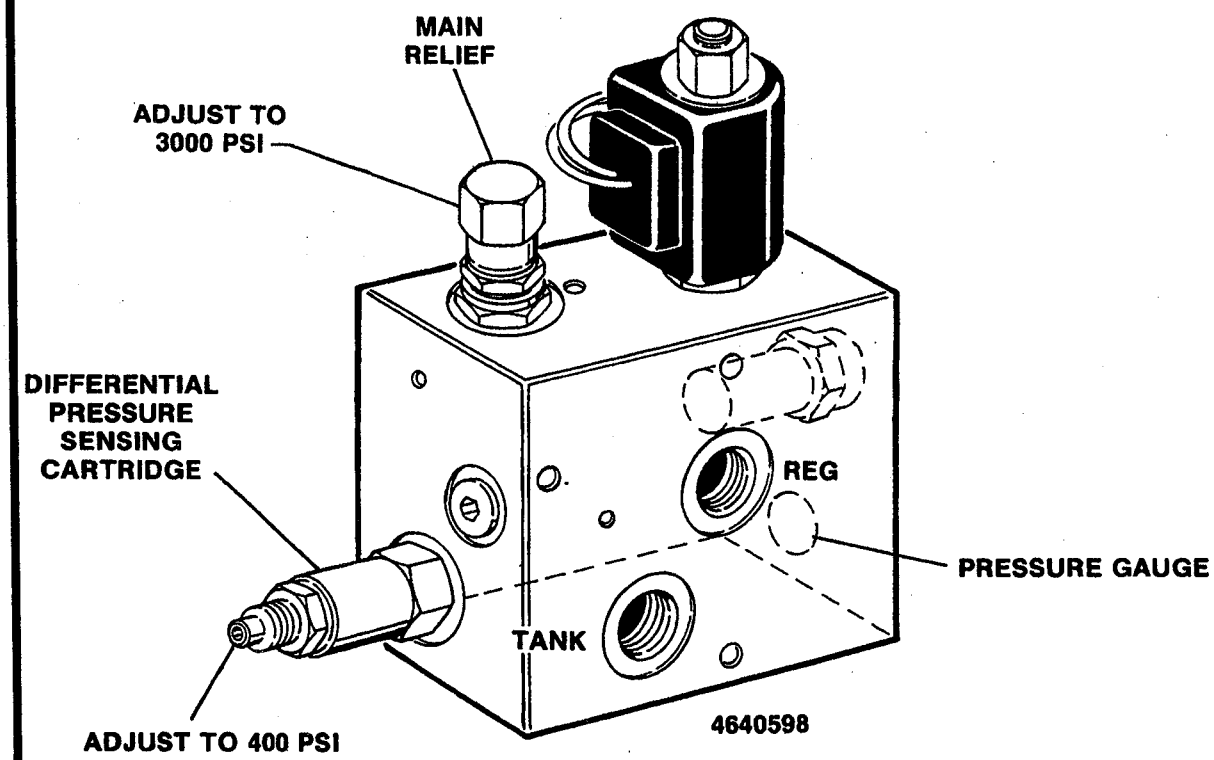
2-13. PRESSURE SETTING PROCEDURES.

a. Modular Control Valve pressure setting procedures are shown in Figure 2-6.

b. Racine 2-Stack Valve pressure setting procedures are shown in Figure 2-7.

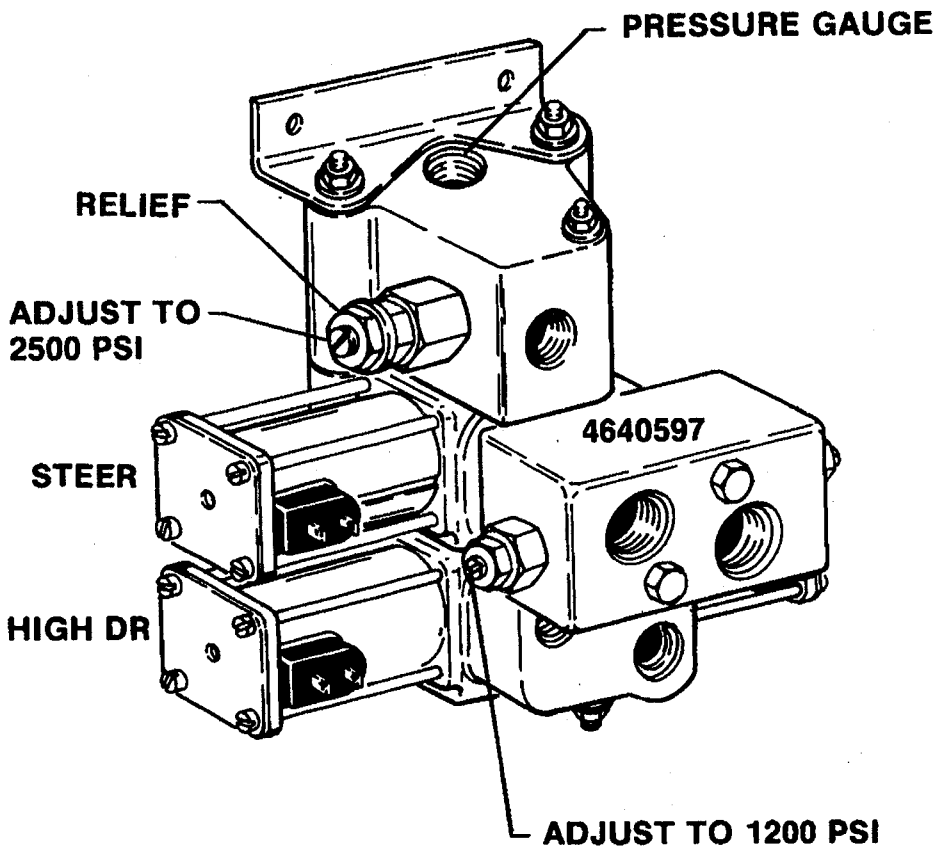
c. Sequence Valve pressure setting procedures are shown in Figure 2-8.

d. Leveling Jack Valve pressure setting procedures are shown in Figure 2-9.



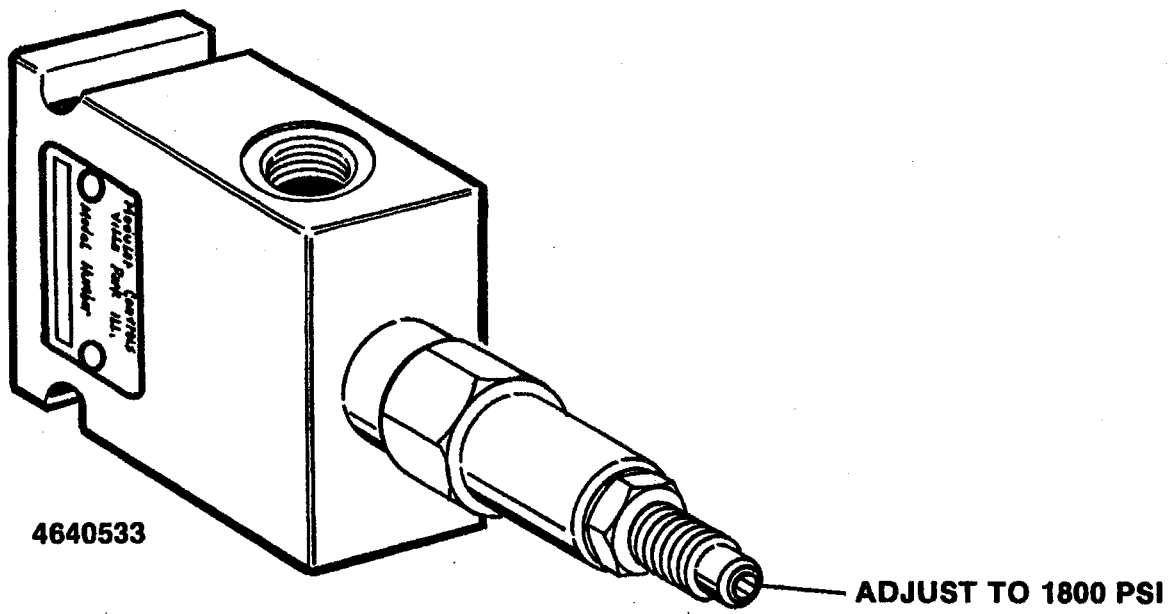
1. Place a low pressure (1000 PSI) pressure gauge at the quick connect on the Modular Control Valve.
2. Start engine and allow to come up to operating temperature.
3. Monitor gauge while adjusting Differential Pressure Sensing Cartridge to 400 PSI.
4. Replace low pressure gauge with high pressure gauge.
5. Disconnect and cap hoses to Drive Section of Racine Valve 4640399.
6. Start engine and allow to come up to operating temperature.
7. Energize Drive Control. Adjust Main Relief Cartridge on Modular Control Valve until gauge reads 3000 PSI.
8. De-energize Drive Control. Shut down engine. Reconnect hoses. Remove gauge.

Figure 2-6. Modular Control Valve Pressure Setting Procedure.



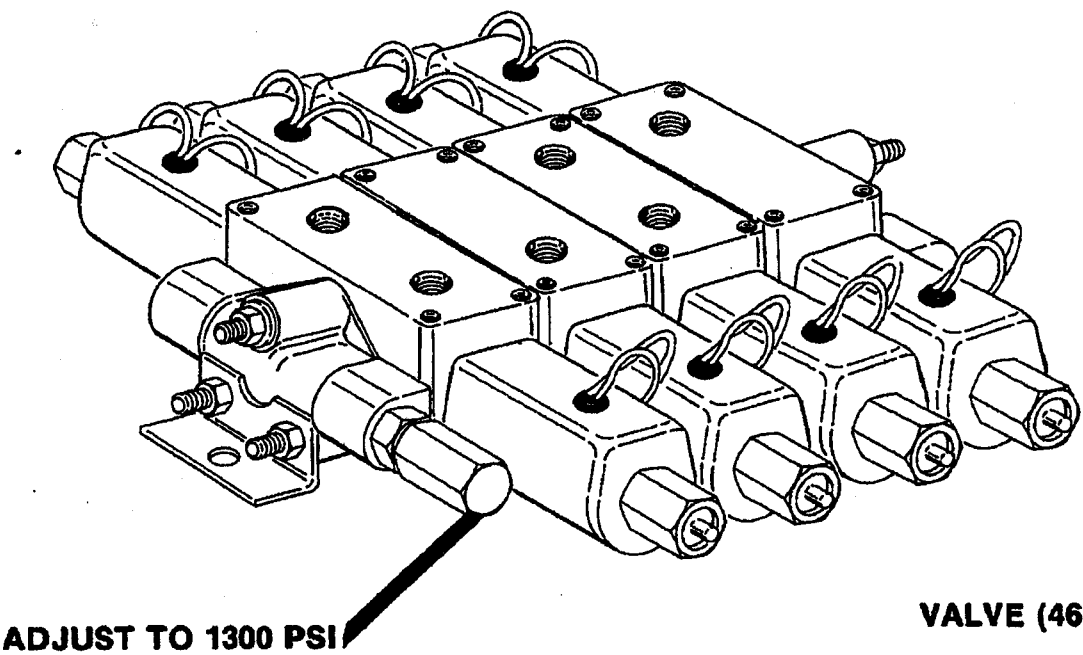
1. Connect a pressure gauge at quick connect on Racine 2-Stack Valve 4640597.
2. Adjust both Steer Section Crossover Reliefs all the way in.
3. Adjust Main Relief Cartridge out several turns.
4. Start engine and allow to come up to operating temperature.
5. Bottom out Steer. Adjust Racine 2-Stack Main Relief to 2500 PSI.
6. With Steer bottomed out adjust both Steer Crossover Reliefs to 1200 PSI.
7. De-energize Steer Function. Shut down engine. Disconnect pressure gauge.

Figure 2-7. Racine 2-Stack Valve Pressure Setting Procedure.



1. Disconnect and cap hoses to Drive Section of Racine Valve 4640399.
2. Back out Sequence Cartridge several turns.
3. Place pressure gauge at quick connect on Modular Control Valve 4640598.
4. Start engine and allow to come up to operating temperature.
5. Energize Drive and set Main down to 1700 PSI.
6. Energize Drive and High Drive.
7. Adjust Sequence Cartridge to 1800 PSI.
8. Reset Main to 3000 PSI.
9. De-energize Drive and High Drive. Shut down engine. Reconnect hoses. Disconnect pressure gauge.

Figure 2-8. Sequence Valve Pressure Setting Procedure.



1. Start engine and allow to come up to operating temperature.
2. Place Pressure Gauge at quick connect on Racine 2-Stack Valve 4640597.
3. Bottom out any Jack function. Adjust Relief Cartridge. to 1300 PSI.
4. De-energize Jack function. Shut down engine. Disconnect gauge.

Figure 2-9. Leveling Jacks Pressure Setting Procedure.

2-14. FREEWHEELING FEATURE. (See Figure 2-10.)

a. To Disengage Torque Hubs (Freewheel).

(1). Chock the wheels securely.

(2). Disengage (reverse) the disconnect caps on both drive torque hubs by removing the two attaching capscrews, turning the cap around, and reinstalling and tightening the capscrews.

(3). If desired, remove chocks and using suitable equipment for assistance, move the machine to an appropriate maintenance area. Again chock wheels securely.

b. To Engage Torque Hubs.

(1). Engage (reverse) the disconnect cap on both drive torque hubs by removing the two attaching capscrews, turning the cap around, and reinstalling and tightening the capscrews.

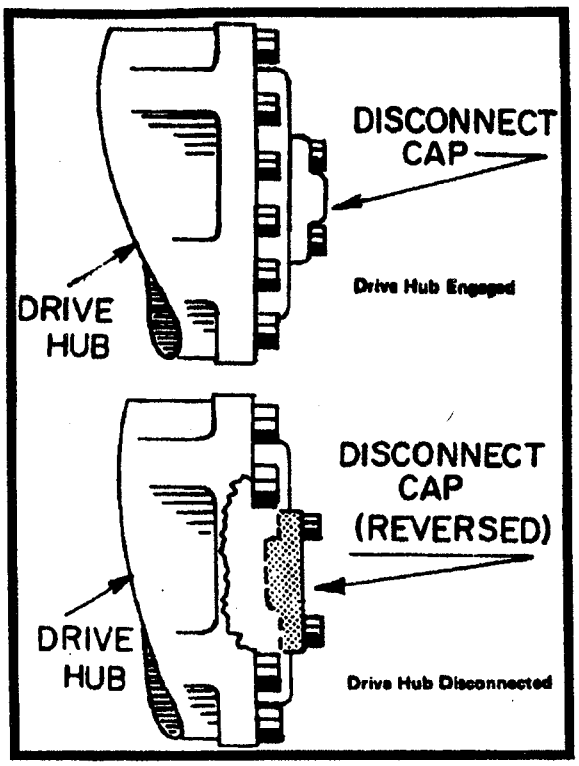


Figure 2-10. Drive Disconnect Hub.

2-15. OSCILLATING AXLE BLEEDING PROCEDURE.

Note

Ensure platform is fully lowered prior to beginning oscillating axle bleeding procedure.

a. Place an 8" (20.32 cm) high block with ascension ramp in front of left front wheel.

b. Activate the machine hydraulic system from platform control station.

c. Place the engine speed and drive speed control switches to their respective "LOW" positions.

d. Place the drive controller to the "FORWARD" position and carefully drive the machine up the ascension ramp until the left front wheel is on top of the 8" (20.32 cm) high block.

e. With the engine at idle, crack open both fittings at the lockout cylinder one at a time and close when all air is dissipated (bled).

f. Place the drive controller to the "REVERSE" position and carefully drive the machine off the block and ramp.

g. Transfer the 8" (20.32 cm) high block to the front of the right front wheel and repeat steps a. thru f. exchanging the word "right" for "left" in steps a. and d.

h. To check the lockout cylinder after bleeding perform the LOCKOUT CYLINDER CHECK.

2-16. LOCKOUT CYLINDER CHECK.

Note

Ensure platform is fully lowered prior to beginning lockout cylinder check.

a. Place an 8" (20.31 cm) high block with ascension ramp in front of the left front wheel.

b. Activate the machine hydraulic system from platform control station.

c. Place the engine speed and drive speed control switches to their respective "LOW" positions.

d. Place the drive controller to the "FORWARD" position and carefully drive the machine up the ascension ramp until the left front wheel is on top of the 8" (20.32 cm) block.

e. Raise the machine platform approximately 2 feet; ensure the lockout cylinder cam valve is free of the sizzor arm trip bar.

f. Place the drive controller to the "REVERSE" position and carefully drive the machine off of the block and ramp.

g. Have an assistant check to see that the left front wheel remains locked in position off of the ground.

h. Lower the machine platform; the lockout cylinder should then release the wheel and allow it to rest on the ground.

i. If the lockout cylinder does not function properly, have qualified personnel correct the malfunction prior to any further operation.

2-17. DRIVE MOTOR (2WD & 4WD Rear). (See Figure 2-11)

a. Disassembly.

(1). Mount the motor in a vise or other holding device with the shaft facing down.

(2). Remove the eight bolts (10).

(3). Remove the cover/bearing assembly (18) and the square ring (8).

(4). Remove the IGR set components (6) starting with the outer locating ring and rollers. Note that the innermost IGR component and rotary valve (4) are retained on the shaft by the snap ring (7). Do not remove this snap ring.

(5). Remove the two check balls (5). Note that the check balls may fall into the body tapped holes or into the body valve ports during disassembly. Be sure that the check balls are removed.

(6). Remove the shaft (13), the IGR inner element and the rotary valve (4) as one assembly.

(7). With the shaft assembly removed from the body, inspect the IGR inner component, the rotary valve (4), and the shaft (13), for wear or other damage. The shaft should have smooth polished surfaces in the bearing and seal areas. If any of these components are damaged, the snap ring (7) must be removed and the appropriate components replaced. If the snap ring (7) is removed, discard it.

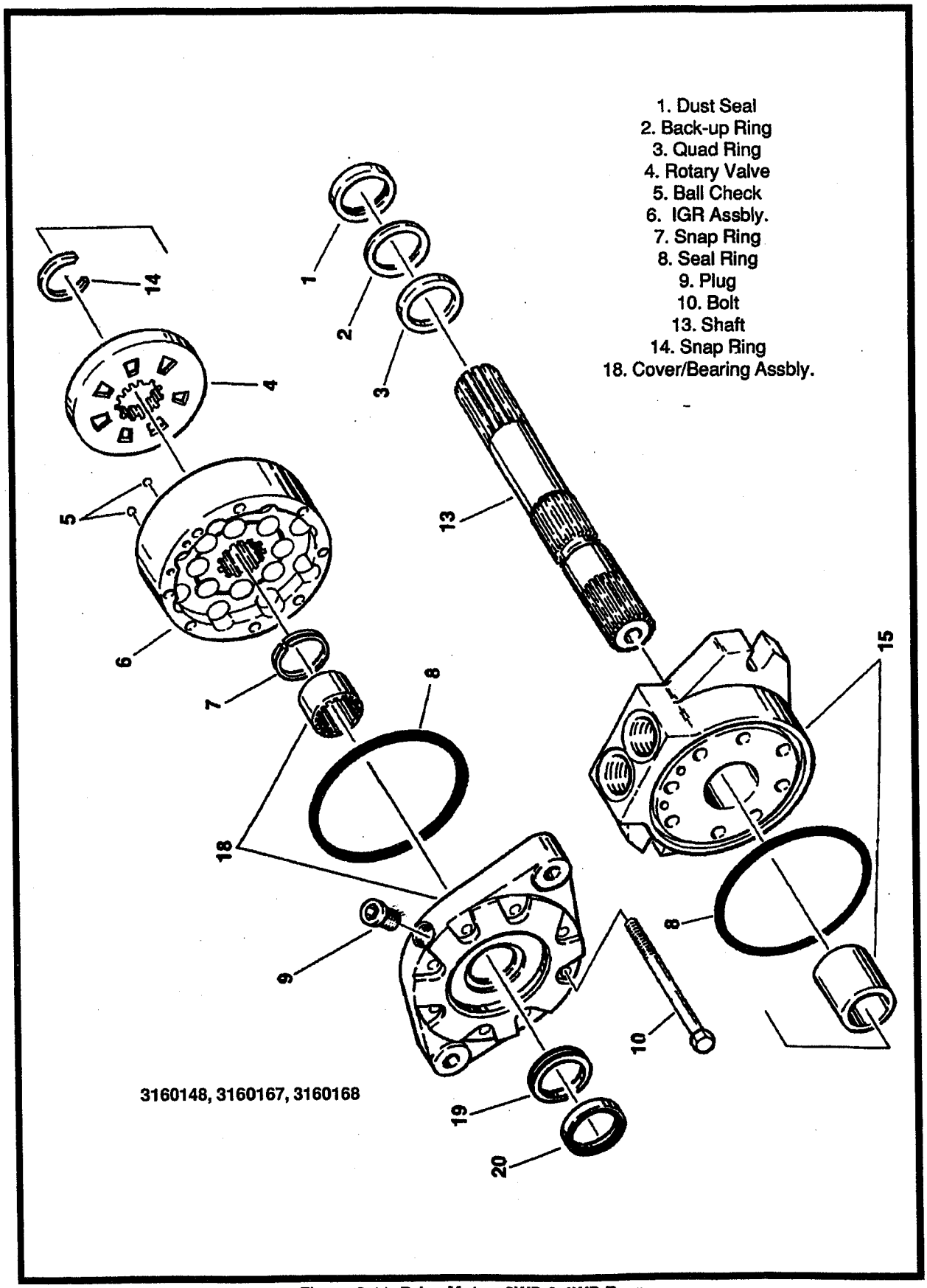


Figure 2-11. Drive Motor, 2WD & 4WD Rear.

(8). Check IGR tip clearance. Replace IGR assembly if the clearance between the inner most rolls and outer contour exceeds 0.010 inches (0.254 mm).

b. Main Shaft Seal Replacement.

(1). If the motor body shaft seal has shown signs of leakage during operation, the quad ring seal (3) and back-up ring (2) must be replaced with the motor completely disassembled per a. above.

(2). The quad ring seal (3) and the back-up ring (2) can be removed using a dull pointed object such as a pencil point or paperclip. Do not use a sharp object such as a knife because the sealing surface in the body or cover can be damaged.

(3). With the old quad ring seal and back-up ring removed, install a new back-up ring first and push it against the sealing surface toward the outside of the motor. The back-up ring can be seated with a dull object.

(4). Next install the new quad ring seal on the inboard side of the back-up ring and push it against the back-up ring.

(5). Lubricate the inside diameter of the quad ring and back-up ring with oil.

c. Thru-cover Shaft Seal Replacement.

(1). If the motor body thru-cover shaft seal has shown signs of leakage during operation, the seals must be replaced with the motor completely disassembled per **a.** above.

(2). The lip seal (19) can be removed using a dull pointed object such as a pencil point or a paper clip. Do not use a sharp object such as a knife because the sealing surface in the cover can be damaged.

(3). With the old seal removed, install the new lip seal into the bore with the rubber lips facing the inboard side (the flat seal against the bore floor). Install the back-up ring into the cover bore and push it against the sealing surface toward the outside of the motor. Put the quad ring in next on the inboard side of the back-up ring and push it against the back-up ring.

(4). Press the dust seal into the bore on the outboard side of the cover. Make sure that rubber lips are facing the outside of the motor. The dust seal's back should be flush with the bottom of the bore.

(5). Lubricate the inside diameter of the seals with oil.

d. Assembly.

(1). If the shaft assembly has been disassembled intact, proceed to (5).

(2). Place the rotary valve (4) on the shaft spline with the "T" shaped slots on first.

(3). Next put the IGR inner member on the shaft spline with the semi-circular roll pockets between the rotary valve ports.

(4). Now install the new snap ring (7) which holds the inner member and valve on the shaft. Be sure not to overextend the snap ring during assembly. The snap ring should be snug in the groove when finally assembled.

(5). Prior to assembly of complete motor, all parts must be cleaned with a suitable solvent and be free of nicks and burrs.

(6). Mount the body with the pilot and bearing down, in a vise or other holding mechanism.

(7). Check the output shaft end for burrs and scratches. Deburr if necessary. The shaft end must be free of burrs because it slides through the quad ring and can cut it. Install the shaft assembly into the body.

(8). Place the contour member of the IGR over the inner component and insert the seven rolls into the inner pockets.

(9). Lightly oil the square ring seal (8) and place in the body groove.

(10). Place the check balls (5) over the two 1/8 inch diameter holes in the body. Be sure the check balls do not fall into the tapped holes.

(11). Place the locating ring section of the IGR (6) onto the body with the check ball holes facing downward over the balls. Align the eight bolt holes in the locating ring with the eight holes in the body. The holes align in only one position.

Note

Be sure not to dislodge the body square ring seal while moving the locating ring.

(12). Install the eight locating ring rollers into their pockets and oil lightly.

(13). Place the other lightly oiled square ring seal (8) into the groove in the cover and place the cover over the shaft end and align the bolt holes.

(14). Install the eight bolts with lightly oiled thread ends into the bolt holes and tighten diagonally to 30 lb.ft. (4.15 kgm). The motor is now ready for installation.

2-17. DRIVE MOTOR, 4WD Front. (See Figure 2-12)

a. Disassembly.

(1). Mount the motor in a vise or other holding device with the shaft facing down.

(2). Remove the eight bolts (10).

(3). Remove the cover/bearing assembly (13), and the seal ring (8).

(4). Remove the IGR set components (6) starting with the outer locating ring and rollers. Note that the innermost IGR component and rotary valve (4) are retained on the shaft by the snap ring (7). Do not remove the snap ring.

(5). Remove the two check balls (5). Note that the check balls may fall into the body tapped holes or into the body valve parts during disassembly. Be sure that the check balls are removed.

(6). Remove the shaft (11), the IGR inner element, and the rotary valve (4) as one assembly.

(7). With the shaft assembly removed from the body, inspect the IGR inner component, the rotary valve (4) and the shaft (11) for wear or other damage. The shaft should have smooth polished surfaces in the bearing and seal areas. If any of these components are damaged, the snap ring (7) must be removed and the appropriate components replaced. If the snap ring (7) is removed, discard it.

(8). Check IGR tip clearance. Replace IGR assembly if the clearance between the innermost rolls and outer contour exceeds 0.010 inches (0.254 mm).

b. Shaft Seal Replacement

(1). If the motor body shaft seal has shown signs of leakage during operation, the quad ring seal (3) and back-up ring (2) must be replaced with the motor completely disassembled per **a.** above.

(2). The quad ring seal (3) and the back-up ring (2) can be removed using a dull pointed object such as a pencil point or paper clip. Do not use a sharp object such as a knife because the sealing surfaces in the body or cover can be damaged.

(3). With the old quad ring seal and back-up ring removed, install a new back-up ring first and push it against the sealing surface toward the outside of the motor. The back-up ring can be seated with a dull object.

(4). Next install the new quad ring on the inboard side of the back-up ring and push it against the back-up ring.

(5). Lubricate the inside diameter of the quad ring and the back-up ring with oil.

c. Assembly.

(1). If the shaft assembly has been disassembled intact proceed to (5).

(2). Place the rotary valve (4) on the shaft spline with the 'T' shaped slots on first.

(3). Next put the IGR inner member on the shaft spline with the semi-circular roll pockets between the rotary valve ports.

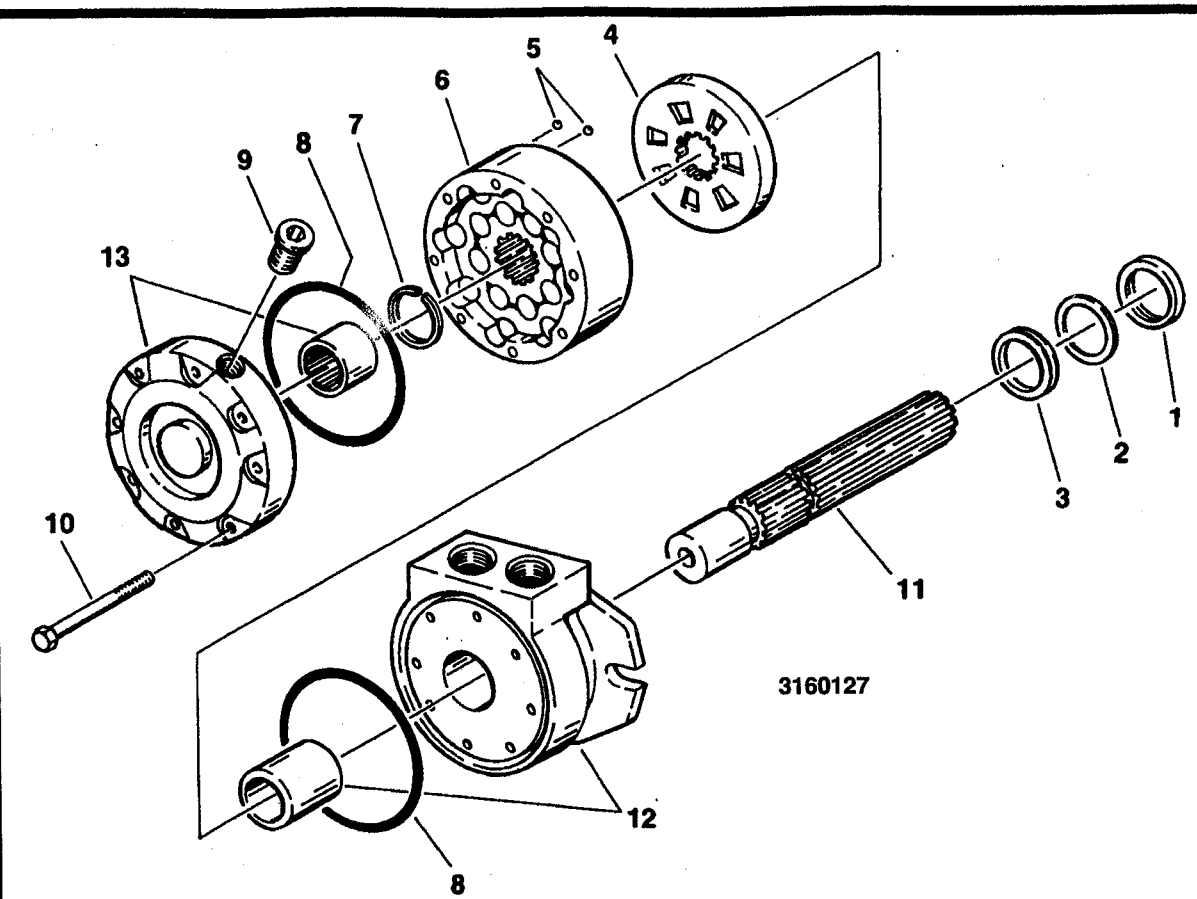
(4). Now install the snap ring (7) which holds the IGR inner and rotary valve on the shaft. Be sure not to overextend the snap ring during assembly. The snap ring should be snug in the groove when finally assembled.

(5). Prior to assembly of complete motor, all parts must be cleaned with a suitable solvent and be free of nicks and burrs.

(6). Mount the body with the pilot and bearing down, in a vise or other holding mechanism.

(7). Check the output shaft end for burrs and scratches. Deburr if necessary. The shaft end must be free of burrs because it slides through the quad ring and can cut it. Install the shaft assembly into the body.

(8). Place the contour member of the IGR over the inner component and insert the seven rolls into the inner pockets.



1. Dust Seal.
2. Back-Up Ring.
3. Quad Ring Seal.
4. Rotary Valve.
5. Check Valve Ball.
6. IGR Assembly.
7. Snap Ring.
8. Ring Seal.
9. Vent Plug w/O-ring.
10. Bolt.
11. Shaft.
12. Body/Bearing Assembly.
13. Cover/Bearing Assembly.

Figure 2-12. Drive Motor, 4WD Front.

(9). Lightly oil the square ring seal (8) and place in the body groove.

(10). Place the check balls (5) over the two 1/8 inch diameter holes in the body. Be sure the check balls do not fall into the tapped holes.

(11). Place the locating ring section of the IGR (6) onto the body with the check ball holes facing downward over the balls. Align the eight bolt holes in the locating ring with the eight holes in the body. The holes align in only one position

Note

Be sure not to dislodge the body square ring seal while moving the locating ring.

(12). Install the eight locating ring rollers into their pockets and oil lightly.

(13). Place the other lightly oiled square ring seal (8) into the groove in the cover and place the cover over the shaft end and align bolt holes.

(14). Install the eight bolts with lightly oiled thread ends into the bolt holes and tighten diagonally to 30 LB. FT. (4.15 kgm). The motor is now ready for installation.

2-19. SPARK ARRESTOR MUFFLER.

The multiple discs on these mufflers will require frequent cleaning if used with oily or sooty exhaust (diesel) or on malfunctioning engines (as evidenced by visible exhaust).

2-20. DUAL FUEL/LPG SYSTEM.

CAUTION

IT IS POSSIBLE TO SWITCH FROM ONE FUEL SOURCE TO THE OTHER WITHOUT ALLOWING THE ENGINE TO STOP. EXTREME CARE MUST BE TAKEN AND THE FOLLOWING INSTRUCTIONS MUST BE FOLLOWED.

a. Changing from Gasoline to LP-Gas.

(1). Start the engine from ground control station.

(2). Open the hand valve on the LP gas supply tank by turning counterclockwise.

CAUTION

BE SURE ALL GASOLINE IS EXHAUSTED BEFORE SWITCHING TO LP GAS.

(3). While the engine is operating, place the three position LPG/Gasoline switch at the ground control station to the center "off" position. Allow the engine to operate, without load, until the engine begins to "stumble" from lack of gasoline.

(4). As the engine begins to stumble, place the switch to the "LPG" position, allowing the LP fuel to be sent to the fuel regulator.

b. Changing from LP Gas to Gasoline.

(1). With engine operating on LP under a no-load condition, throw the "LPG/Gasoline" switch at the ground control station across to the "Gasoline" position.

(2). If engine "stumbles" because of lack of gasoline, place the switch to the "LPG" position until engine regains smoothness, then return the switch to "Gasoline" position. Repeat as necessary until engine runs smoothly on gasoline.

(3). Close the hand valve on the LP gas supply tank by turning clockwise.

c. Using Liquid Petroleum Gas (LPG).

WARNING

CLOSE THE FUEL VALVE ON THE TANK WHEN PARKING THE AERIAL PLATFORM MORE THAN MOMENTARILY.

WARNING

WHEN REFUELING LPG POWERED WORK PLATFORMS, ALWAYS FOLLOW MANUFACTURERS SPECIFICATIONS AND/OR APPLICABLE REGULATIONS.

(1). If the platform is to be left overnight or longer, it must be parked outside or the LPG tank removed and stored outside.

(2). LPG is extremely flammable. No smoking.

(3). Only trained and authorized personnel are permitted to operate filling equipment.

(4). Fill LPG tanks outdoors. Stay at least 50 feet (15 m) from buildings, motor vehicles, electrical equipment or other ignition sources. Stay at least 15 feet (5 m) from LPG storage tanks.

(5). During the transfer of LPG metal components can become very cold. Always wear gloves when refilling or changing tanks to prevent "freeze burns" to skin.

(6). Do not store LPG tanks near heat or open flame. For complete instructions on the storage of LPG fuels, refer to ANSI/NEPA 58 & 505.

WARNING

DO NOT USE AN LPG TANK THAT IS DAMAGED. A DAMAGED LPG TANK MUST BE REMOVED FROM SERVICE. FROST ON THE SURFACE OF A TANK, VALVES OR FITTINGS INDICATES LEAKAGE. A STRONG ODOR OF LPG FUEL CAN INDICATE A LEAK.

2-21. HIGH ENGINE/HIGH DRIVE CUTOUT SWITCH. (See Figure 2-13)

High Engine/High Drive Cutout Switch settings are shown in Figure 2-13.

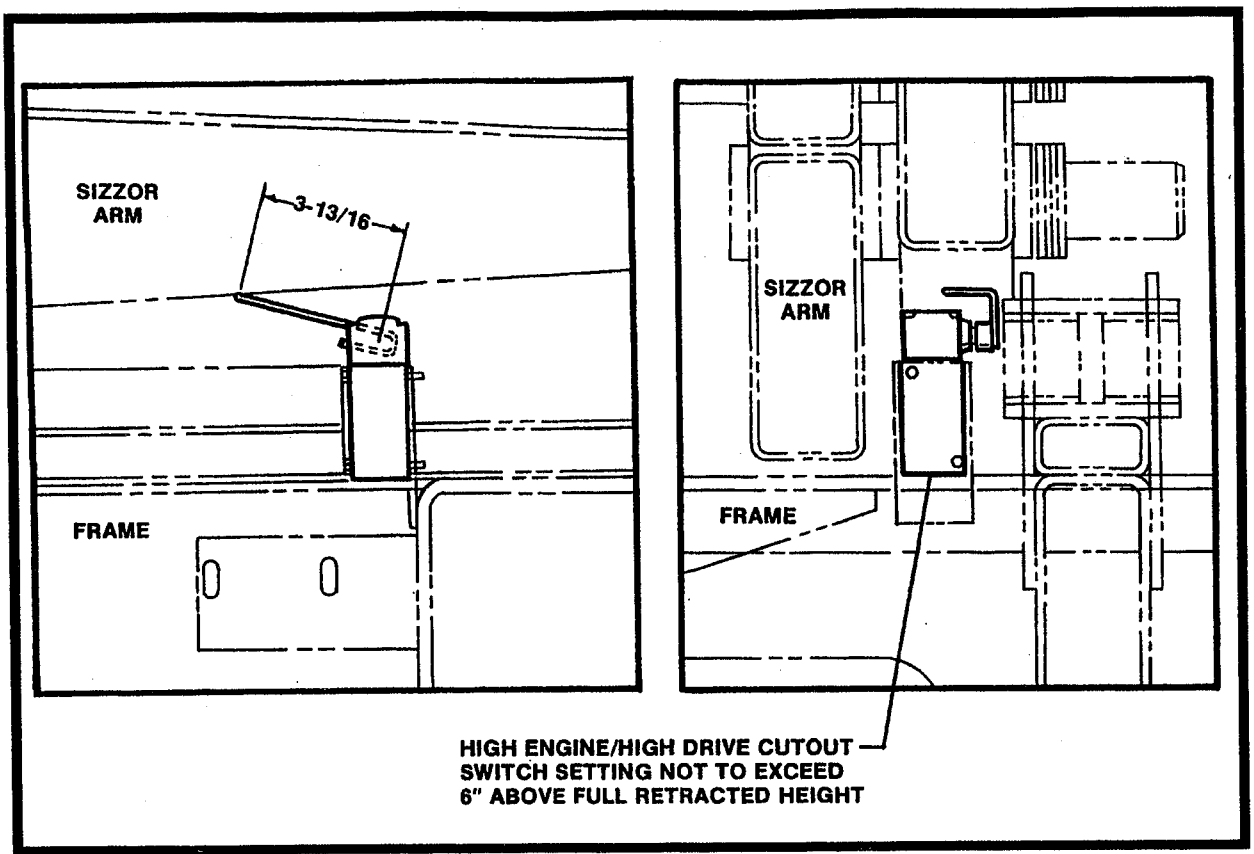


Figure 2-13. High Engine/High Drive Cutout Switch.

2-20. PREVENTIVE MAINTENANCE AND INSPECTION SCHEDULE.

a. The preventive maintenance and inspection checks are listed and defined in the following table. This table is divided into two basic parts, the "AREA" to be inspected and the "INTERVAL" at which the inspection is to take place. Under the "AREA" portion of the table, the various systems along with the components that make up that system are listed. the "INTERVAL" portion of the table is divided into five columns representing the various inspection time periods. The numbers listed within the interval column represent the applicable inspection code for which that component is to be checked.

b. The checks and services listed in this schedule are not intended to replace any local or regional regulations that may pertain to this type of equipment nor should the lists be considered as all inclusive.Variances in interval times may occur due to climate and/or conditions and depending on the location and use of the machine.

Note

This machine requires periodic safety and maintenance inspections by a JLG Dealer. A decal on the frame affords a place to record (stamp) inspection dates.

c. JLG Industries requires that a complete annual inspection be performed in accordance with the "Annual Machine Inspection Report" form. Forms are supplied with each new machine and are also available from JLG Customer Service. Form must be completed and returned to JLG Industries.

IMPORTANT

JLG INDUSTRIES REQUIRES THAT A COMPLETE ANNUAL INSPECTION BE PERFORMED IN ACCORDANCE WITH THE "ANNUAL MACHINE INSPECTION REPORT" FORM.

Note

This machine requires periodic safety and maintenance inspections be a JLG Dealer. A decal located on the frame affords a place to record (stamp) inspection dates. Notify dealer if inspection is overdue.

c. The inspection and maintenance code numbers are as follows:

1. Check for proper and secure installation.
2. Check for visible damage and legibility.
3. Check for proper fluid level.
4. Check for any structural damage; cracked or broken welds; bent or warped surfaces.
5. Check for leakage.
6. Check for presence of excessive dirt or foreign material.
7. Check for proper operation and freedom of movemen.
8. Check for excessive wear or damage.
9. Check for proper tightness and adjustment.
10. Drain, clean and refill.
11. Check for proper operation while engine is running.
12. Check for proper lubrication.
13. Check for evidence of scratches, nicks or rust and for straightness of rod.
14. Check for condition of element; replace as necessary.
15. Check for proper inflation.
16. Clean or replace suction screen.

PREVENTIVE MAINTENANCE AND INSPECTION SCHEDULE

AREA	INTERVAL				
PLATFORM	10 HOURS DAILY	50 HOURS WEEKLY	200 HOURS MONTHLY	500 HOURS 3 MONTH	1000 HRS 6 MONTH
1. Footswitch	1, 11				
2. Controllers	1, 11				
3. Switches	1, 11				
4. Placards and Decals	1, 2				
5. Control Tags	1, 2				
6. Hose and Cable	1	4, 8			
7. Wear Pads			8		
8. Handrails	1, 4				
CHASSIS					
1. Engine Oil	3	5			
2. Battery	3	5			
3. Air Cleaner	1	14			
4. Exhaust System	1		1, 5		
5. Engine Mounts			1		
6. Gauges/Ground Controls	1, 2, 11				
7. Main Hydraulic Pump	1	5			
8. Valves	1	5			
9. Hydraulic Filter (see lube chart)		5, 14	14		
10. Hydraulic Hoses and Tubing	1	5			
11. Hydraulic Oil Tank *	3	5	4		16
12. Breather Hydraulic Tank		6, 14			
13. Fuel Tank	3, 5		4		
14. Lift Cylinder(s)	1, 12	5, 6, 13	4		
15. Limit Switch	1, 7				
16. Placards and Decals	1, 2				
17. Tilt Alarm Switch					1, 7
18. Wheel and Tire Assemblies	1	8, 9, 15			
19. Drive Motors		1, 5, 6			
20. Drive Torque Hubs		1, 3, 5, 6		10	
21. Drive Brakes		1, 5, 6	8		
22. Steer Cylinder	1	5, 6, 12, 13	4		
23. Steer Components	1	4, 6, 12	8		
24. Wheel Bearings			8	12	
25. Sizzor Arms	1, 4				
26. Safety Props	1, 4				
27. Wear Pads			8		
28. Pivot Pins/Bolts	1, 4	12	7, 8		
29. Lockout Cylinders	1	5, 6, 12, 13	4		
30. Oscillating Axle	1			7, 8	
31. Switches, Ground Control	1, 11				
32. Control Tags	1, 2				
33. Placards and Decals	1, 2				
34. Hose and Cable	1	4, 8			

* Code 10 to be performed annually.

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SECTION 3 — TROUBLESHOOTING

3-1. GENERAL.

a. This chapter contains troubleshooting information to be used for locating and correcting most of the operating problems which may develop. If a problem should develop which is not presented in this chapter or which is not corrected by listed corrective actions, technically qualified guidance should be obtained before proceeding with any maintenance.

b. Troubleshooting and maintenance information pertaining to the prime mover (engine) that are not contained in the applicable engine maintenance manual.

3-2. TROUBLESHOOTING INFORMATION.

a. The troubleshooting procedures applicable are listed and defined in tables 3-1 through 3-4. As an aid to table use, the aerial platform is divided into four major groups, each covered within a seperate section in this chapter. These groups are as follows; elevation assembly (including platform and sizzor arms), chassis assembly (including prime mover), hydraulic system and electrical system.

b. Each malfunction within an individual group or system is followed by a listing of probable causes which will enable determination of the applicable remedial action. The probable causes and the remedial actions should, where possible, be checked in the order listed in the tables.

c. It should be noted that there is no substitute for a thorough knowledge of the equipment and related systems. Constant reference should be made to the applicable maintenance portion of the manual for detailed instructions pertaining to the remedies listed in the troubleshooting tables.

d. It should be recognized that the majority of the problems arising in the machine will be centered in the hydraulic and electrical systems. For this reason, every effort has been made to ensure that all likely problems in these areas are given the fullest possible treatment. In the remaining machine groups only those problems which are symptomatic of greater problems or which have more than one probable cause and remedy are included. This means that problems for which the probable cause and remedy may be immediately obvious are not listed in this chapter.

3-3. HYDRAULIC CIRCUIT CHECKS.

The first reference for improper function of a hydraulic system, where the cause is not immediately apparent, should be the troubleshooting chart. The best place to begin the problem analysis is at the power source (pump). Once it is determined that the pump is serviceable, then a systematic check of the circuit components, beginning with the controls, would follow. To help avoid unnecessary removal and replacement of parts, in determining whether a problem is being caused by an improperly adjusted or defective check valve or defective seals in a cylinder, fuctional checks have been devised to assist in conducting the process of elimination.

Table 3-1. Elevation System Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Elevation System.		
No response to control switch.	Control switch inoperative.	Replace control switch.
	Hydraulic system oil low.	Repenish oil as necessary.
	No power supply.	See wiring diagram.
	Restricted or broken supply line on valve bank or hydraulic pump.	Clean or replace line.
	Control valve not functioning properly.	Repair or replace valve.
	No power to dump valve on cylinder.	Repair or replace cylinder.
	Defective dump valve on cylinder.	Repair or replace dump valve.
	Lift cylinders not functioning properly.	See wiring diagram.
	Hydraulic pump not functioning properly.	Repair or replace pump.
Platform will not raise.	Load capacity exceeded (personnel and/or equipment on platform).	Reduce load.
	Hydraulic system oil low.	Replenish oil as necessary.
	Broken or binding pivot pin.	Repair or replace pivot pin.
	Restricted or broken hydraulic line or fitting.	Clean, repair, or replace line or fitting.
	Control valve not functioning properly.	Repair or replace valve.
	Lift cylinder not functioning properly.	Repair or replace cylinder.
	Worn/defective pump.	Repair or replace pump.
Platform will not lower.	No electrical signal sent to the lift "DOWN" control valve cartridge.	Refer to Electrical System Troubleshooting Chart - No Response to Control Switch.
	Lift cylinder not functioning properly.	Repair or replace cylinder.

Table 3-2. Chassis Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Platform raises and lowers erratically.	Hydraulic system oil low.	Replenish oil as required.
	Restricted or broken hydraulic line or fitting.	Clean, repair, or replace line or fitting.
	Lack of lubricant on cylinder attach pins.	Lubricate as necessary.
	Counterbalance valve on lift cylinder improperly adjusted or not functioning properly.	Replace the valve.
	Control valve not functioning properly.	Repair or replace valve.
	Boom pivot pin not properly lubricated.	Lubricate as necessary.
	Worn seals in lift cylinder(s).	Replace seals.
	Cylinder(s) not functioning properly.	Repair or replace cylinder(s).
Platform drifts down.	Worn seals in lift cylinder(s).	Replace seals.
	Holding valve on cylinders(s) not functioning properly.	Repair or replace valve.
Drive System.		
No response to control, or erratic response.	Hydraulic system oil low.	Replenish as necessary.
	Drive hubs disengaged.	Engage hubs.
	Controller not properly adjusted.	Correctly adjust controller.
	Proportional dump valve defective.	Repair or replace dump valve.
	Hydraulic pump not functioning properly.	Repair or replace pump.
	Restricted or broken pump supply line.	Clean, repair or replace line.
	Restricted or broken line on valve bank.	Clean, repair or replace line.
	Drive motor(s) not functioning properly.	Repair or replace motor(s).
	No power to controller.	See wiring diagram.
	Damaged wiring on control switch.	Repair or replace wiring.
	Control switch not functioning properly.	Replace switch.

Table 3-2. Chassis Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Machine will not travel forward.	Hydraulic system oil low.	Replenish oil as necessary.
	Restricted or broken hydraulic line or fitting.	Clean, repair or replace line or fitting.
	Controller not adjusted properly.	Correctly adjust controller.
	Control valve not functioning properly.	Repair or replace valve.
	Drive motor(s) not functioning properly.	Repair or replace motor(s).
	Circuit breaker open.	Determine and correct cause. Reset circuit breaker.
	Defective controller.	Repair or replace controller.
Machine will not travel in reverse.	(see: Machine will not travel forward.)	
Machine overspeeds when descending a grade.	Counterbalance valve improperly adjusted or defective.	Replace valve.
	Drive motor shaft broken.	Repair or replace drive motor.
	One torque hub disengaged or defective.	Repair hub.
	1-wheel/2-wheel drive valve defective.	Repair or replace valve.
Steering System.		
No response to control.	Circuit breaker open.	Determine and correct cause; reset circuit breaker.
	Hydraulic system oil low.	Replenish oil as necessary.
	Damaged wiring on control switch or solenoid valve.	Repair or replace wiring.
	Control switch not functioning properly.	Replace switch.
	Restricted or broken hydraulic line on valve bank or hydraulic pump.	Clean, repair, or replace line.
	Control valve not functioning properly.	Repair or replace valve.
	Steer cylinder not functioning properly.	Repair or replace cylinder.

TROUBLESHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
Machine hard to steer or steering erratic.	Hydraulic system oil low.	Replenish oil as necessary.
	Restricted hydraulic line or fitting.	Clean, repair, or replace line or fitting.
	Lack of lubrication.	Lubricate as required. (Refer to Lubrication Chart.)
	Restricted crossover relief valve (pressure low).	Clean or replace valve.
	Bent linkage (tie rod(s) or steering hitch)	Repair or replace linkage as required.
	Hydraulic pump not functioning properly.	Repair or replace pump.
	Steer cylinder not functioning properly.	Repair or replace cylinder.
	Tire pressure low.	Correct tire pressure.
	Bent or seized spindle.	Replace spindle.
Steering inoperative.	Circuit breaker open.	Determine and correct cause; reset circuit breaker.
	Wiring on control switch or solenoid open.	Repair or replace wiring.
	Solenoid valve not functioning properly.	Repair or replace valve.
	Control switch not functioning properly.	Replace switch.
	Relief valve improperly set or not functioning properly.	Reset, repair, or replace valve as required.
	Steer cylinder not functioning properly.	Repair or replace cylinder.
Machine will not steer left.	Wiring on control switch damaged.	Repair or replace wiring.
	Wiring on solenoid valve damaged.	Repair or replace wiring.
	Coil on solenoid valve damaged.	Replace coil.
	Bent cylinder rod.	Repair cylinder.
	Damaged tie rod.	Replace tie rod.
	Crossover relief valve "stuck".	Repair or replace crossover relief valve.
	Pressure setting incorrect.	Reset pressure setting.
Machine will not steer right.	See: machine will not steer left.	
Machine "wanders", steering not firm.	Crossover relief valve set too low or not functioning properly.	Reset, repair, or replace valve as required.

Table 3-2. Chassis Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Oscillating Axle.		
Axle will not oscillate.	Defective lockout cylinder.	Repair or replace cylinder.
	Lockout valve sticking.	Repair or replace valve.
	Lack of lubrication on axle pin.	Lubricate pin.
	Lockout valve defective.	Repair or replace valve.
Axle will not lock.	Air in lockout system.	Bleed lockout system.
	Defective lockout valve.	Repair or replace valve.
	Defective presure reducing valve feeding lockout system.	Repair or replace valve.
Insruments and Indicators.		
Ammeter inoperative.	Damaged wiring in circuit.	Repair or replace wiring.
	Ammeter not functioning properly.	Replace ammeter
	Alternator not charging.	Repair or replace alternator.
Travel warning horn inoperative.	Circuit breaker open.	Determine and correct cause; reset circuit breaker.
	Damaged wiring in horn circuit.	Repair or replace wiring.
	Damaged horn.	Replace horn.
	Damaged wiring in hourmeter circuit.	Repair or replace wiring.
	Inoperative hourmeter.	Replace hourmeter.

TROUBLESHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
Power Plant.		
Engine will not start.	Station power selector switch is not in required position.	Actuate switch as required.
	Circuit breaker open.	Determine and correct cause; reset circuit breaker.
	Start lockout solenoid not working.	Replace solenoid.
	"Start" switch defective.	Replace start switch
	Defective anti-dieseling solenoid on carburetor.	Replace solenoid on carburetor.
	Damaged wiring in ignition circuit (broken wire on starter).	Replace or repair wiring.
	Ignition switch not functioning properly.	Replace switch.
	Defective ignition module.	Repair circuit as required.
	Ignition circuit shorted to ground.	Replace ignition module.
	Battery cable(s) not making contact.	Clean and tighten cables.
Engine will not start. (Ignition O.K.)	No fuel.	Replenish fuel as necessary.
	Restricted or broken fuel line.	Clean or replace line.
	Battery defective or requires charging.	Replace or charge battery, as required.
Engine will not accelerate above LOW speed.	Damaged wiring on speed control switch on governor solenoid.	Repair or replace wiring.
	Speed control switch not functioning properly.	Replace switch.
	Defective Precision Governor (Ford).	Repair or replace governor.
	Defective Adeco Throttle Actuator (diesel).	Repair or replace actuator.
	Defective electronic governor.	Replace governor.
	Governor not functioning properly.	Repair or replace governor.
Engine will not decelerate below HIGH speed.	See: Engine will not accelerate above LOW speed.	

Table 3-3. Hydraulic Systems Troubleshooting

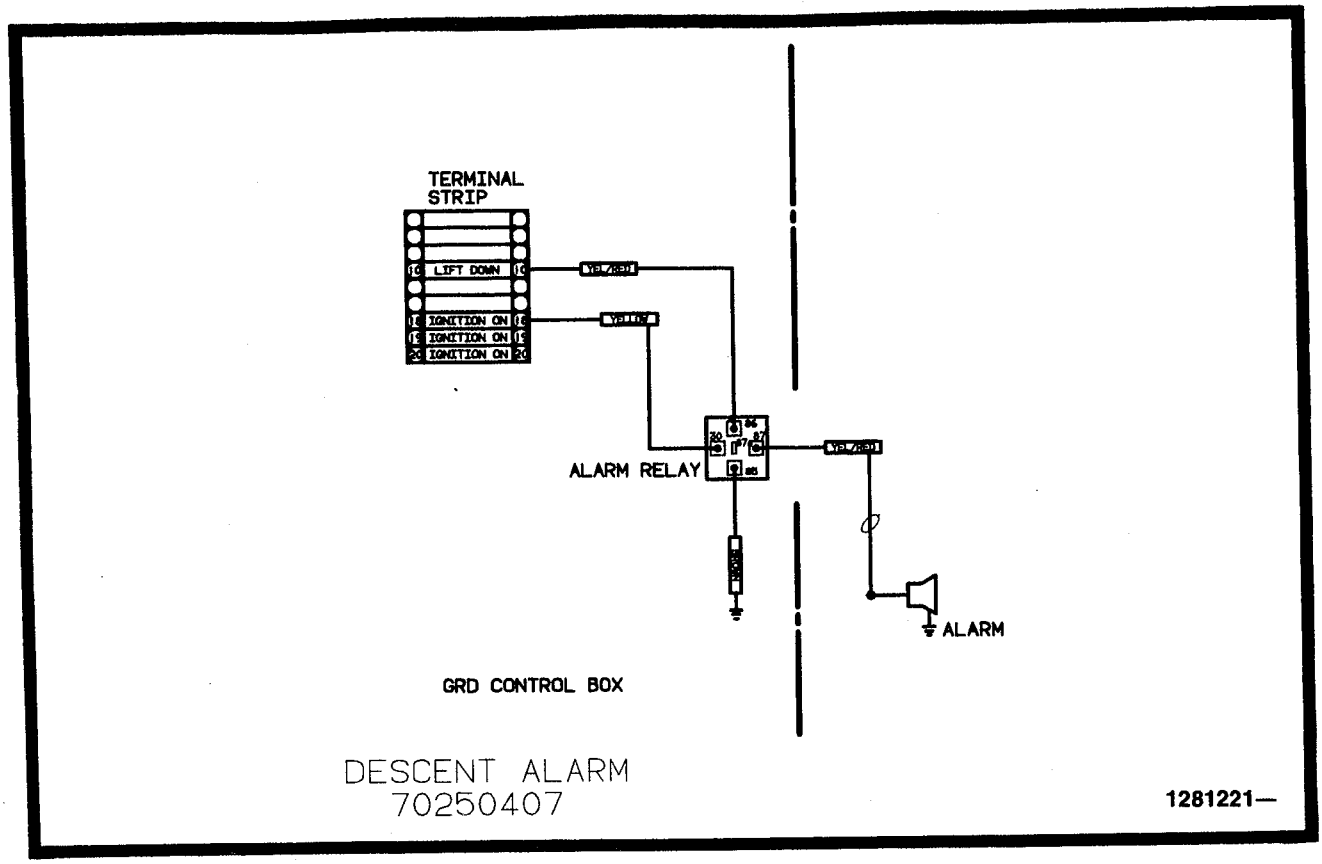
TROUBLE	PROBABLE CAUSE	REMEDY
Hydraulic Systems - General.		
Hydraulic pump noisy.	Air entering system through broken line or fitting. (Suction side.)	Repair or replace line or fitting.
	Air bubbles in oil. (Reservoir - oil level too low.)	Replenish oil as necessary.
	Faulty pump coupler.	Replace coupler.
	Defective pump bearing.	Repair or replace pump.
	Oil filter(s) dirty.	Clean and/or replace filter(s) as necessary.
Pump cavitating. (Vacuum in pump due to oil starvation.)	Resricted suction line.	Clean, repair or replace line.
	Oil in reservoir low.	Replenish oil in reservoir to proper level.
	Restricted reservoir air vent.	Clean vent.
	Oil viscosity too high.	Drain system and replace with recommended oil. (Refer to Hydraulic Oils.)
	Leak in suction line or manifold.	Repair or replace line or manifold as necessary.
System overheating.	Oil viscosity too high.	Drain system and replace with recommended oil. (Refer to Hydraulic Oils.)
	Restricted or blocked hydraulic line.	Repair or replace line.
	Overloading machine.	Check weight in platform.
	Main relief valve set too high.	Reset valve as required.
	Hydraulic oil low in reservoir.	Replenish oil to proper level.
Pump not delivering oil.	Restricted suction line.	Clean, repair or replace line.
	Air entering system through broken line or fitting. (Suction side.)	Repair or replace line or fitting.
	Oil level too low.	Fill to proper level.
	Plugged strainer in tank.	Clean strainer.
	Pump coupling defective.	Replace pump coupling.
	Broken pump drive shaft.	Repair or replace pump.

Table 3-4. Electrical Systems Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
System pressure too low.	Main relief valve set too low.	Reset valve to correct pressure.
	Main relief valve stuck in open position.	Clean, repair, or replace valve. (Check system oil for contamination.)
	Leak in component, line, or fitting.	Repair or replace component, line or fitting.
	Hydraulic pump not functioning properly.	Repair or replace pump.
	Scored valve spool; scored cylinder.	Replace valve; replace components as required.
System(s) operate erratically.	Sticking or binding valve spools, piston rods, etc.	Clean, repair or replace components as required.
	Hydraulic oil not at optimum operating temperature.	Allow oil sufficient time to warm up.
	Pump drive slipping.	Repair or replace drive.
Hand Controller.		
Regardless of which way the handle is moved, only one function occurs.	Improper or loose wiring to the solenoid(s).	Check all wiring for proper connections.
	Directional valve stuck in one direction.	Repair or replace valve.
Valve will not function at all when handle is moved in either direction.	No electrical power to handle.	Check electrical input to handle. (12V.)
	No electrical signal to valve.	Check electrical output and electrical signal at the valve.
	Improper ground.	Check for proper grounding of handle.
	Defective controller.	Repair or replace controller.
	Microswitches on controller bad or need adjustment.	Adjust or replace switches.

Table 3-4. Electrical Systems Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Engine Starter System.		
Engine will not crank.	Discharged battery or loose battery terminals.	Check and charge battery or replace battery as necessary. Clean and secure battery terminals.
	Starter relay faulty or faulty relay connections.	Using a test meter, check relay coil terminals for presence of electrical power and for energization of relay coil. Also check relay terminals for correct switching of contacts. Replace relay as necessary.
	Malfunctioning starter solenoid or motor.	Replace solenoid or motor in accordance with applicable manufacturer's manual.
	Defective start lockout solenoid.	Replace start lockout solenoid.
	Malfunctioning ignition switch.	Using a test meter, check ignition switch for correct switching of contacts. Replace switch as necessary.
	Faulty ignition and/or starter circuit wiring.	Check wiring continuity. Refer to wiring diagram.
	Defective ring gear on flywheel.	Replace ring gear.



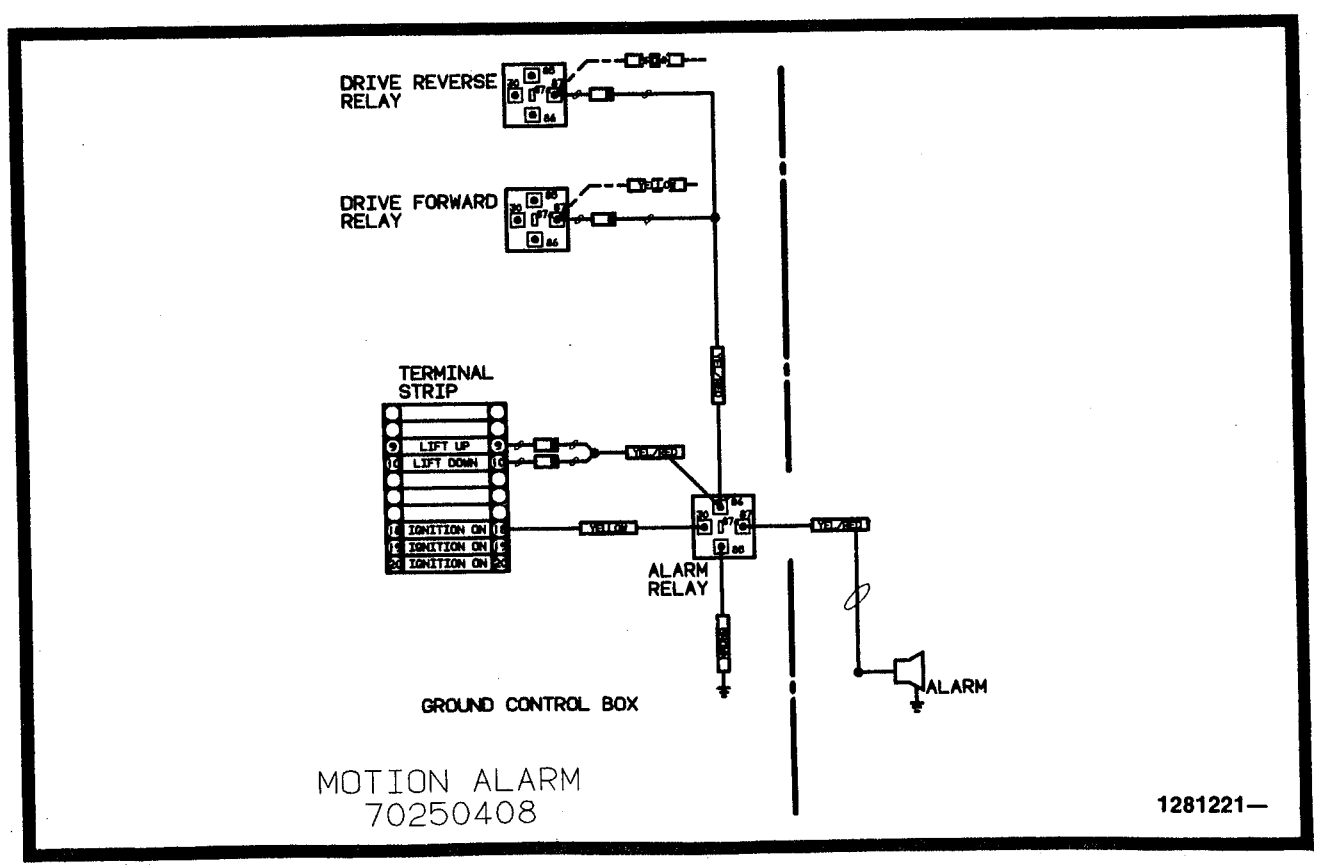
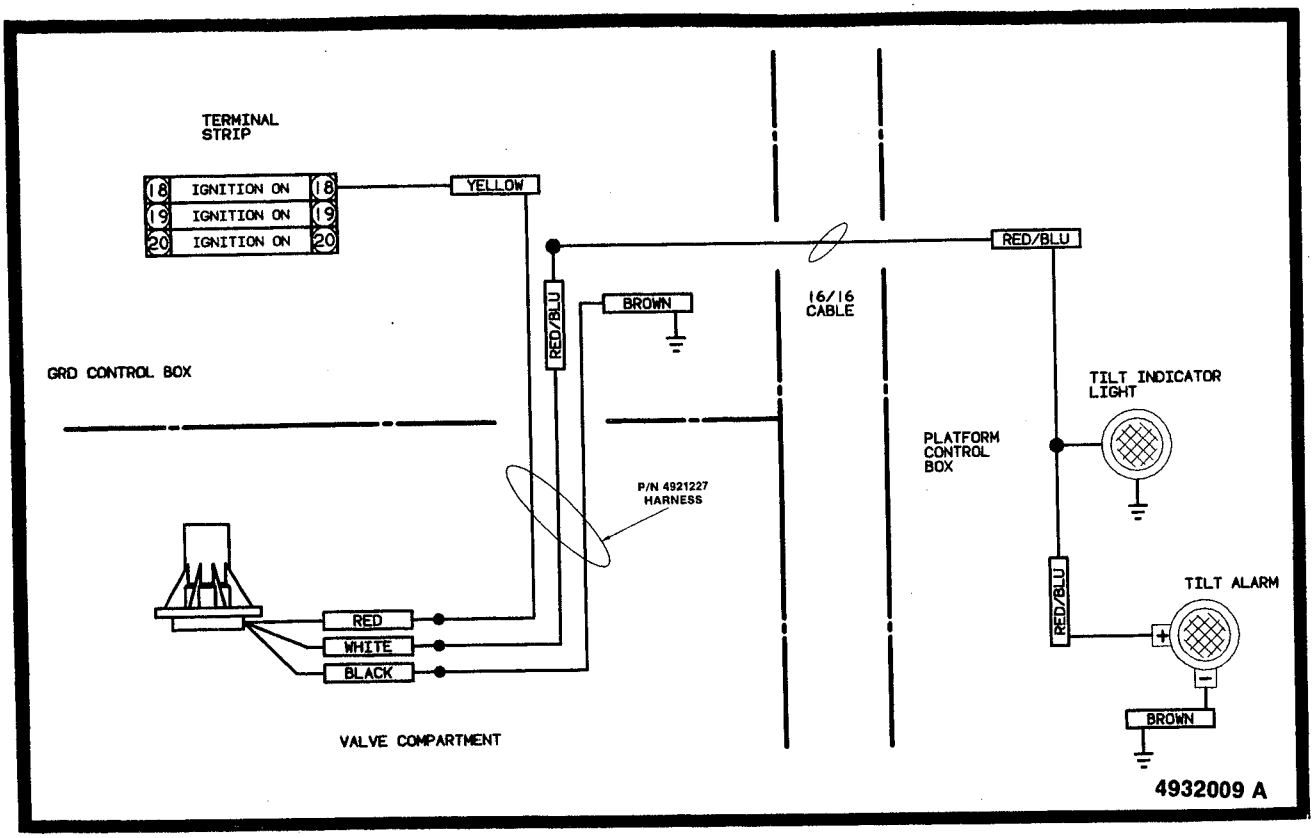


Figure 3-1. Electrical Diagram, Alarm (Descent, Motion).



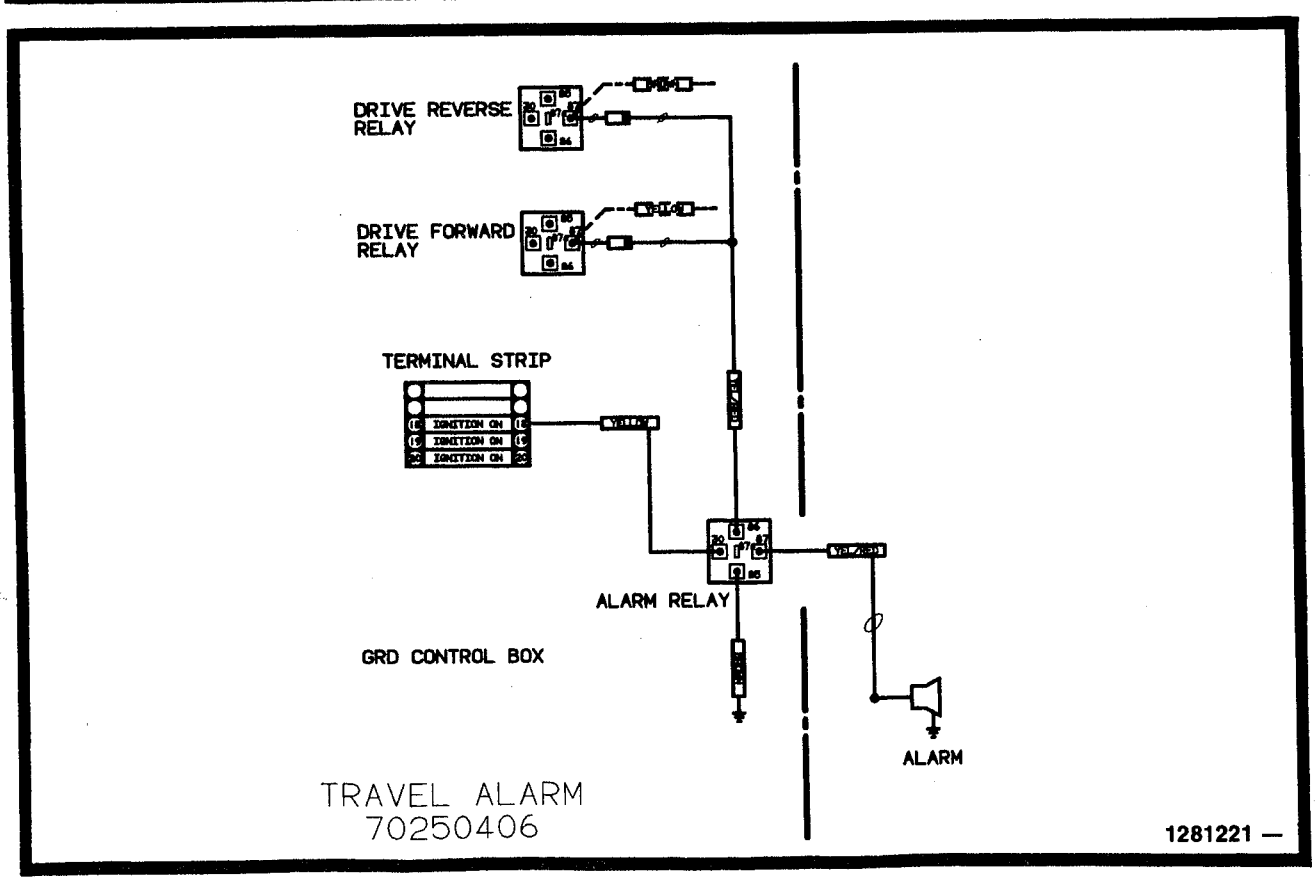


Figure 3-2. Electrical Diagram, Alarm (Tilt, Travel).

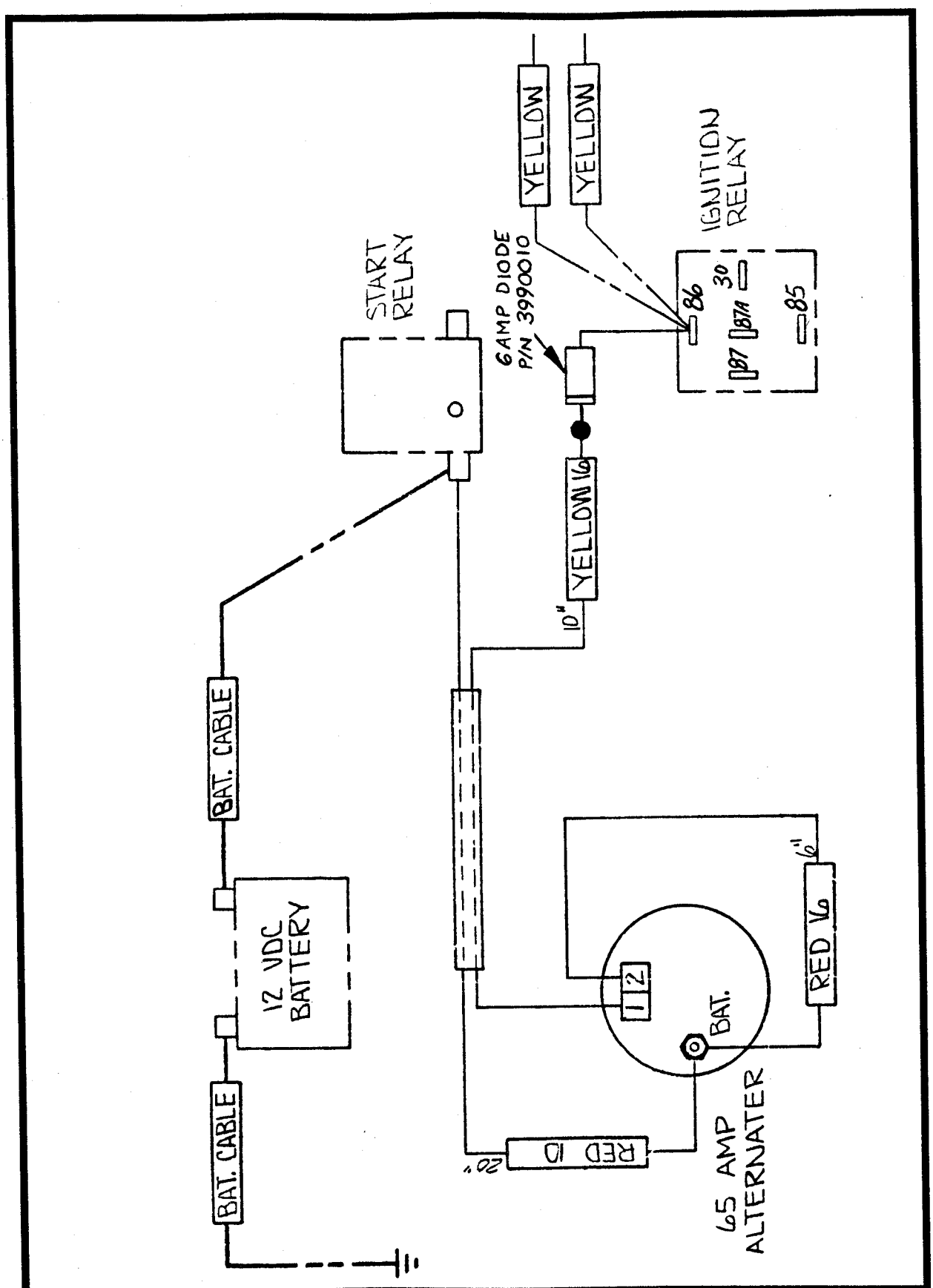


Figure 3-3. Electrical Diagram, Alternator (Kohler).

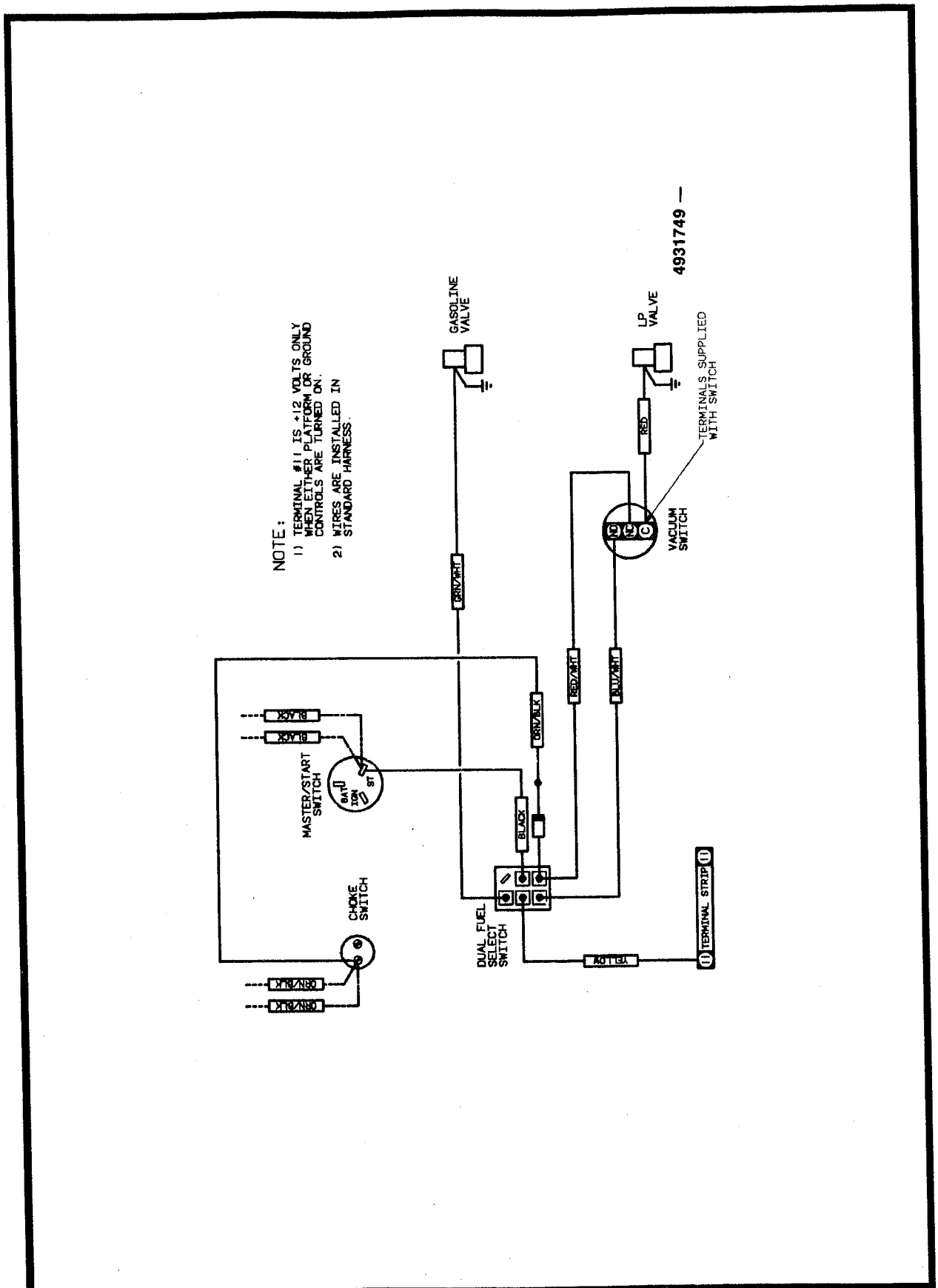


Figure 3-4. Electrical Diagram, Dual Fuel (Kohler).

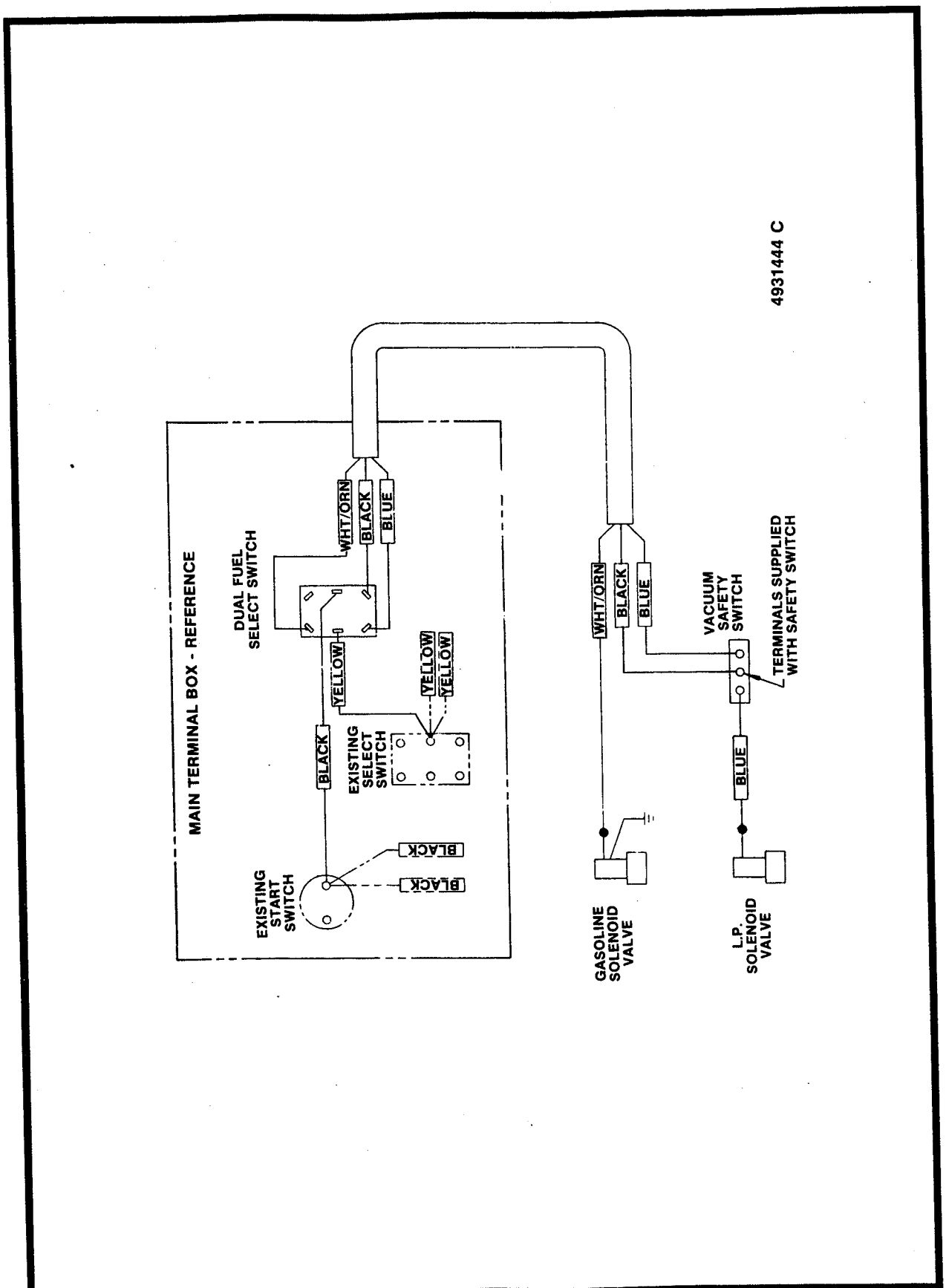


Figure 3-5. Electrical Diagram, Dual Fuel (Ford).

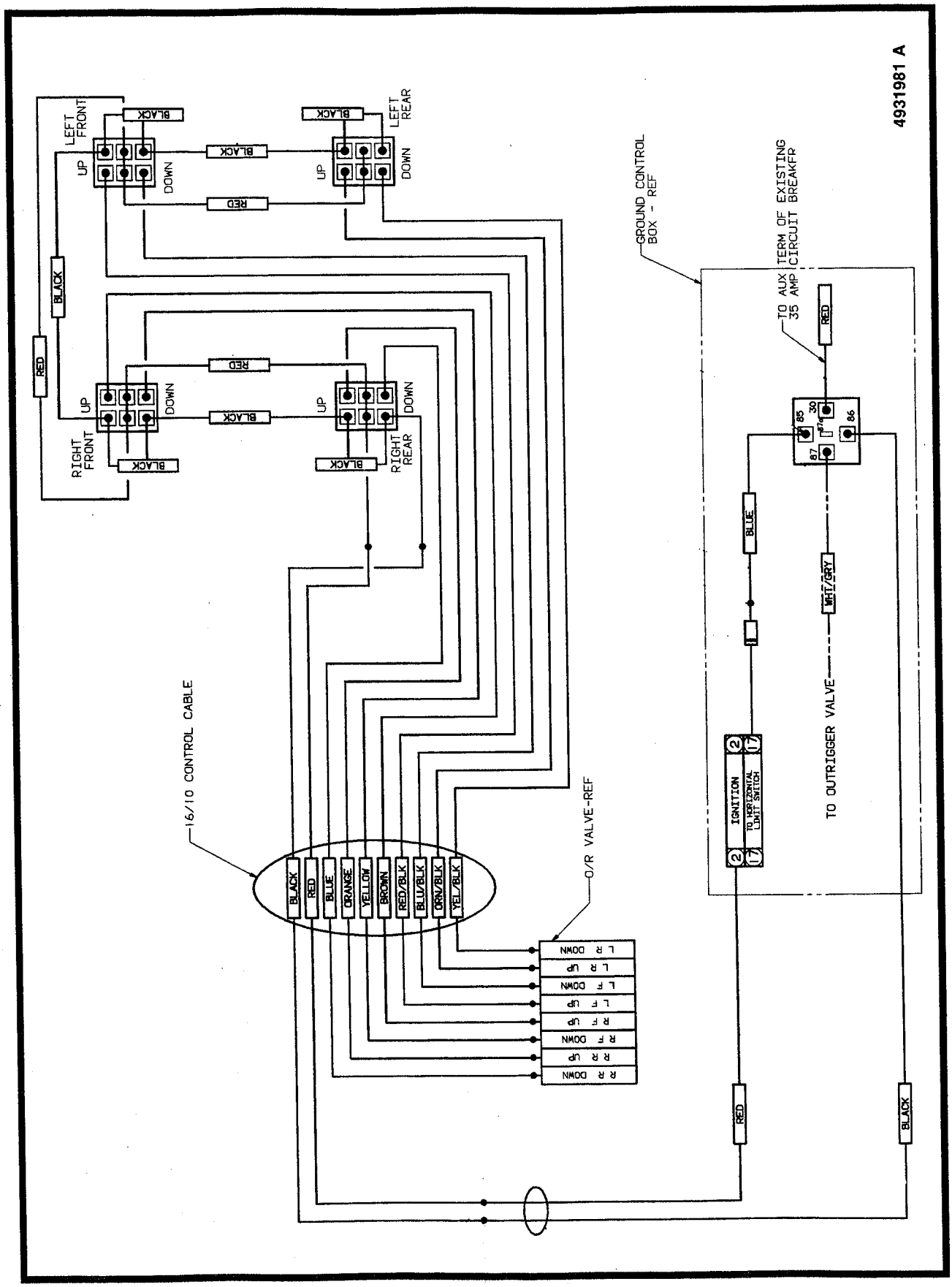


Figure 3-6. Electrical Diagram, Leveling Jacks.

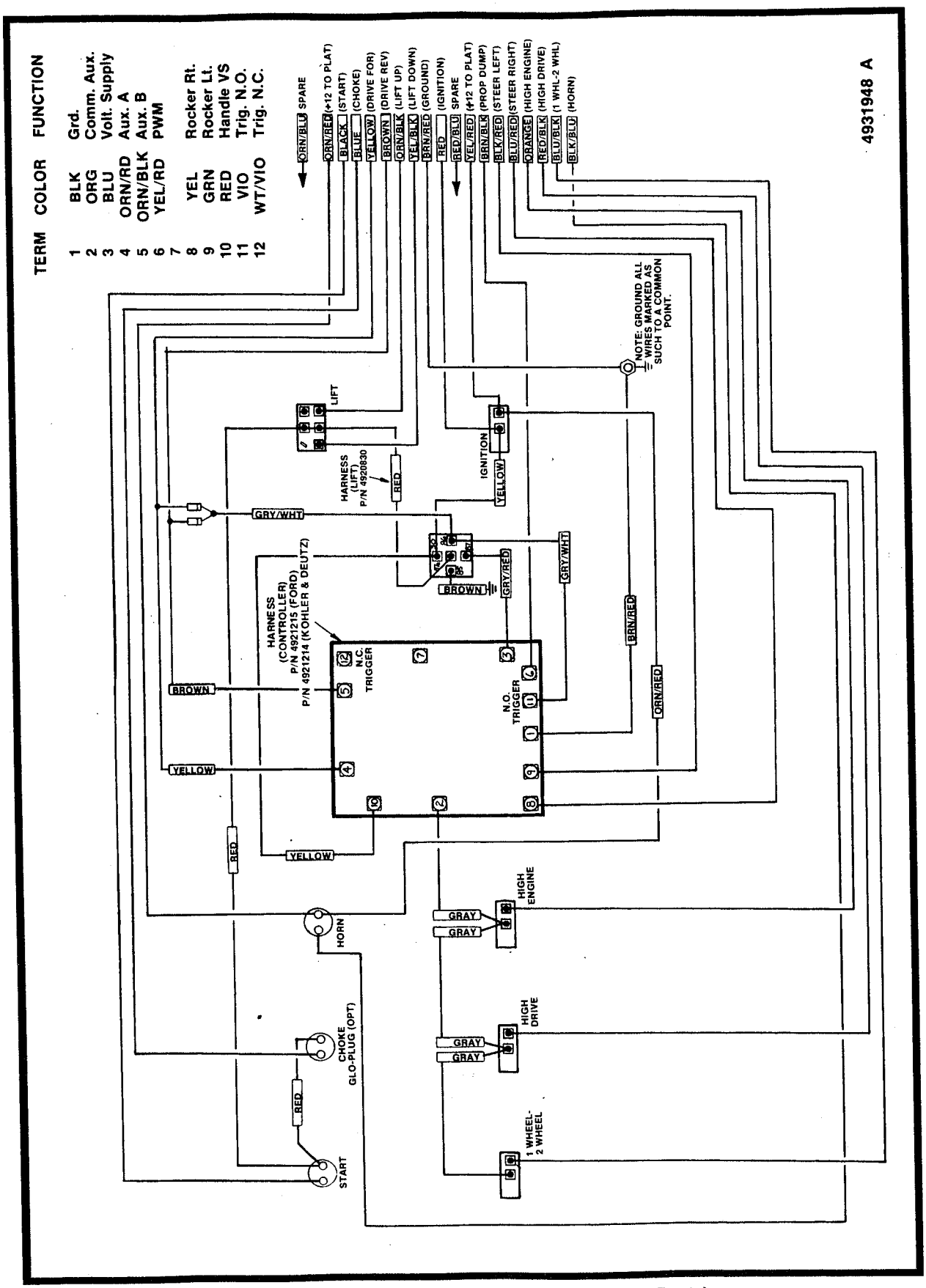


Figure 3-7. Electrical Diagram, Platform (Kohler and Deutz).

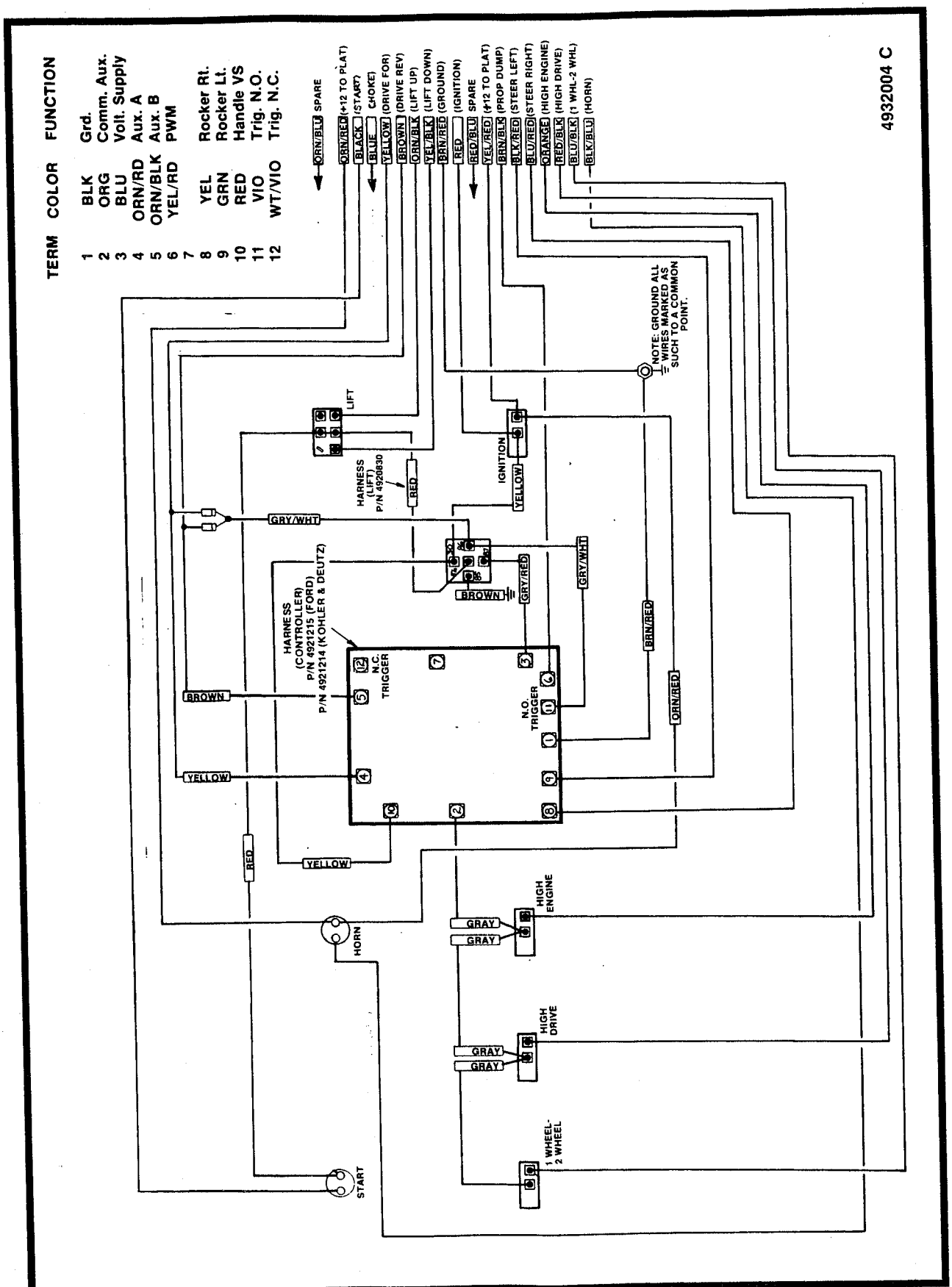


Figure 3-8. Electrical Diagram, Platform (Ford).

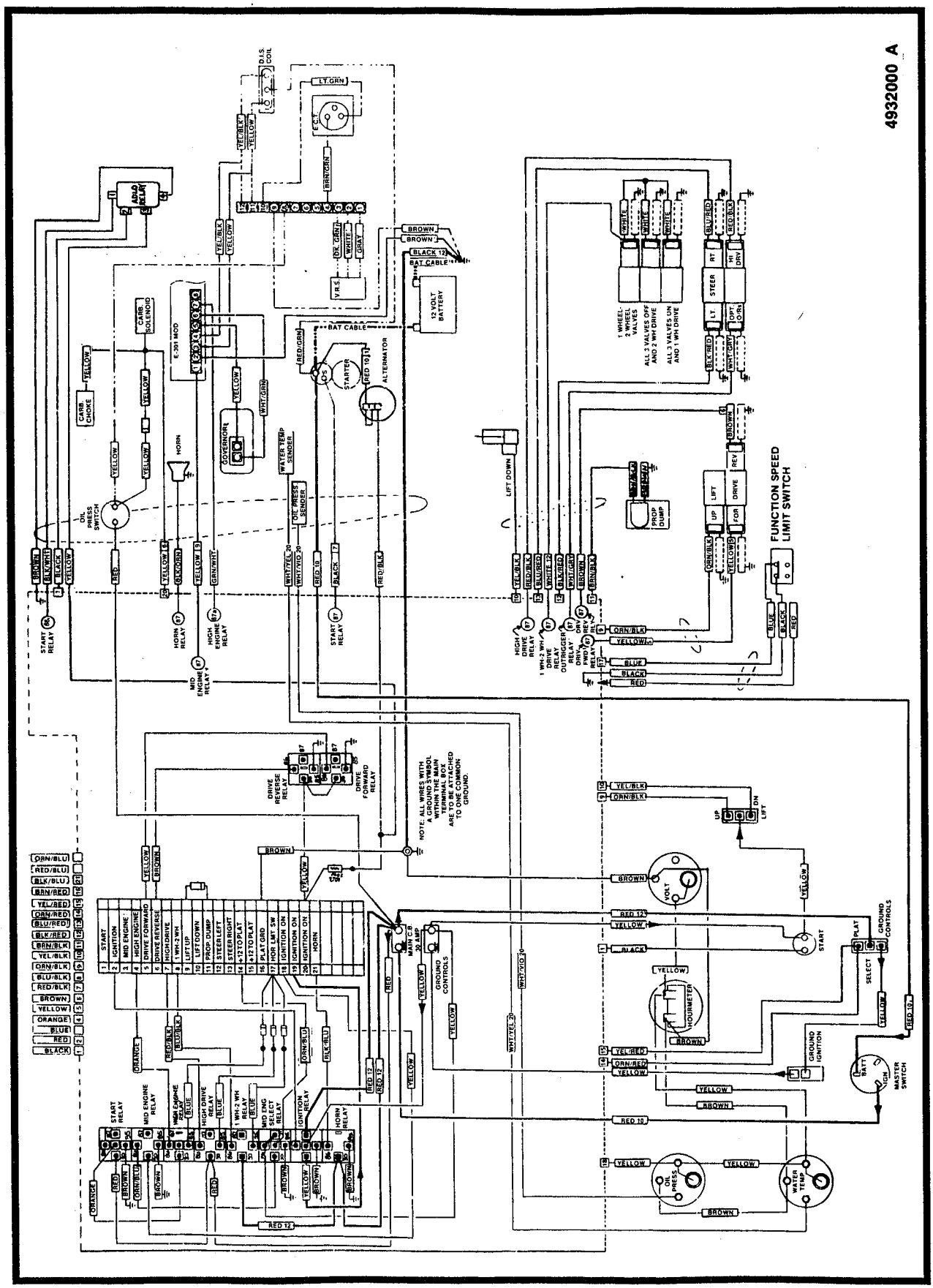


Figure 3-9. Electrical Diagram, Ground Control (Ford) W/O Engine Terminal Strip.

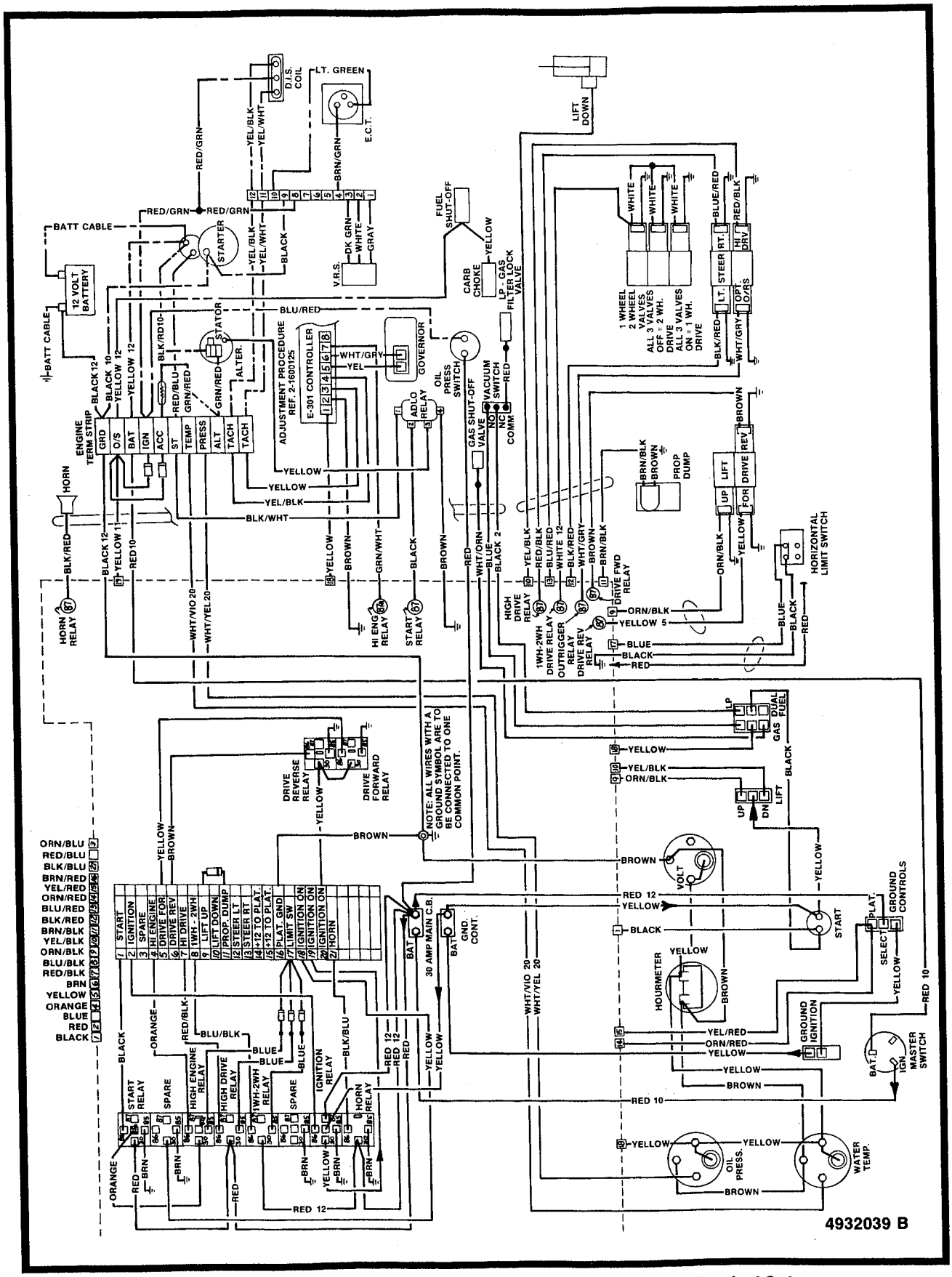


Figure 3-10. Electrical Diagram, Ground Control (Ford) With Engine Terminal Strip.

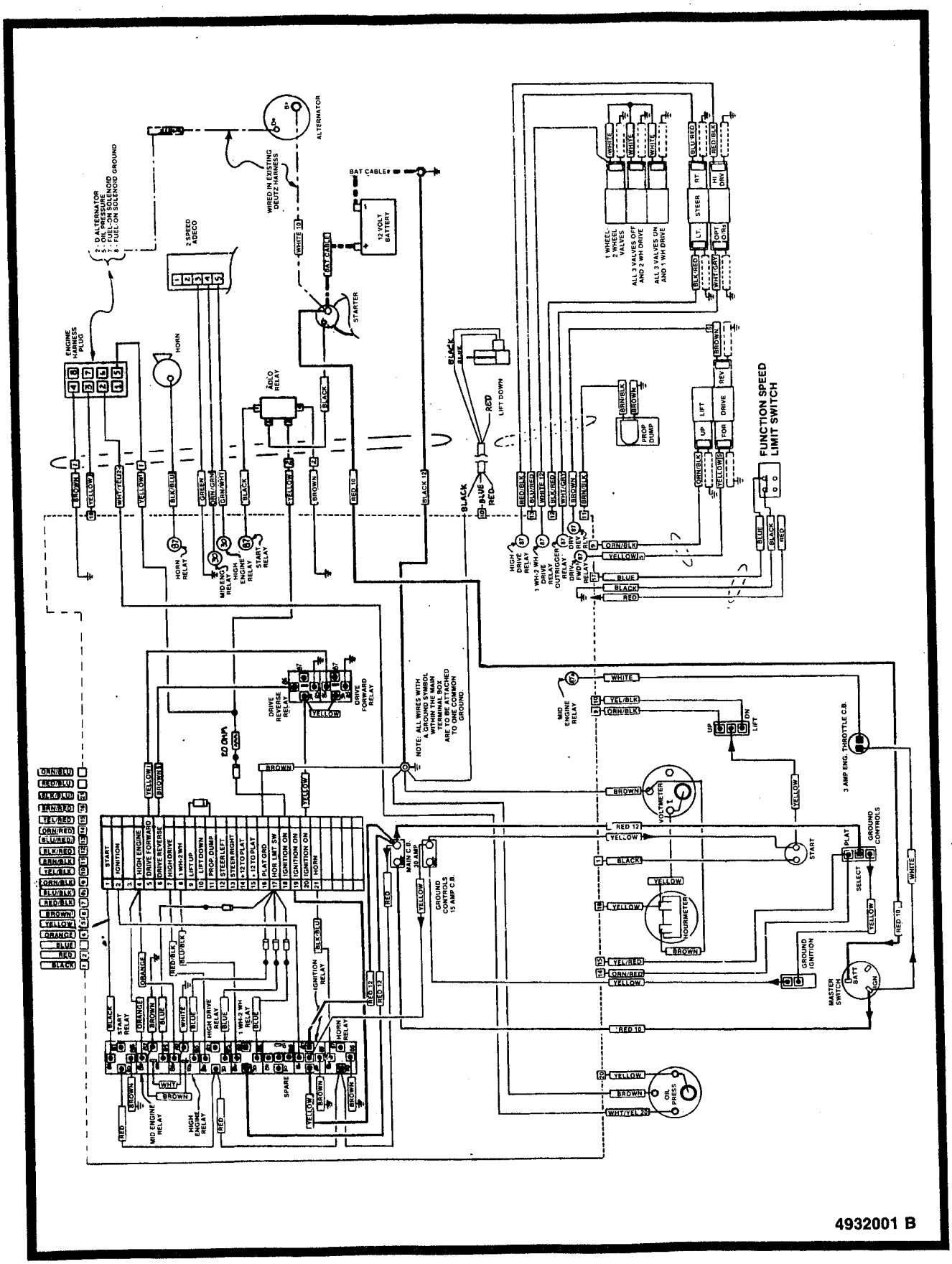


Figure 3-11. Electrical Diagram, Standard (Deutz).

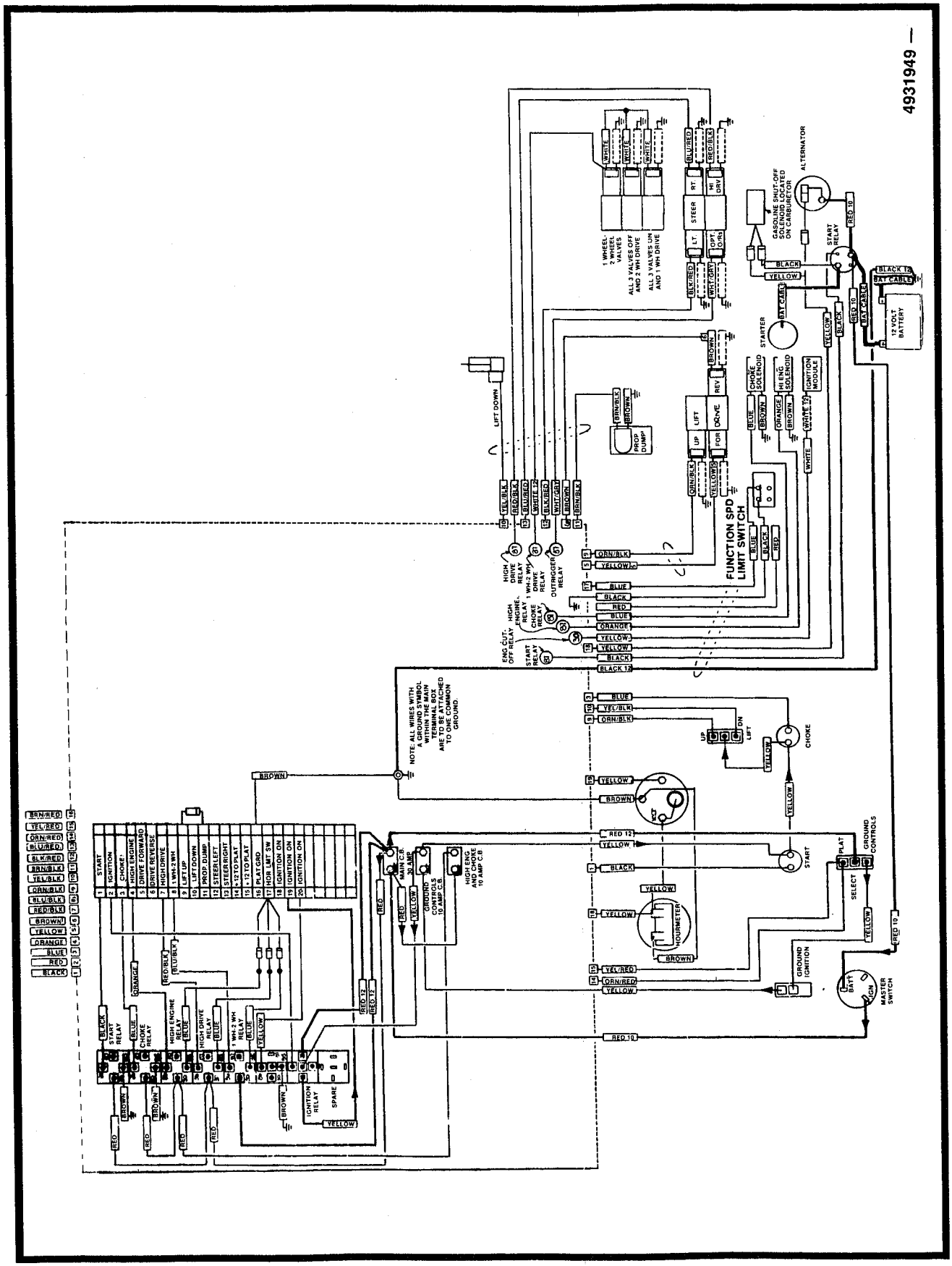


Figure 3-12. Electrical Diagram, Standard (Kohler).

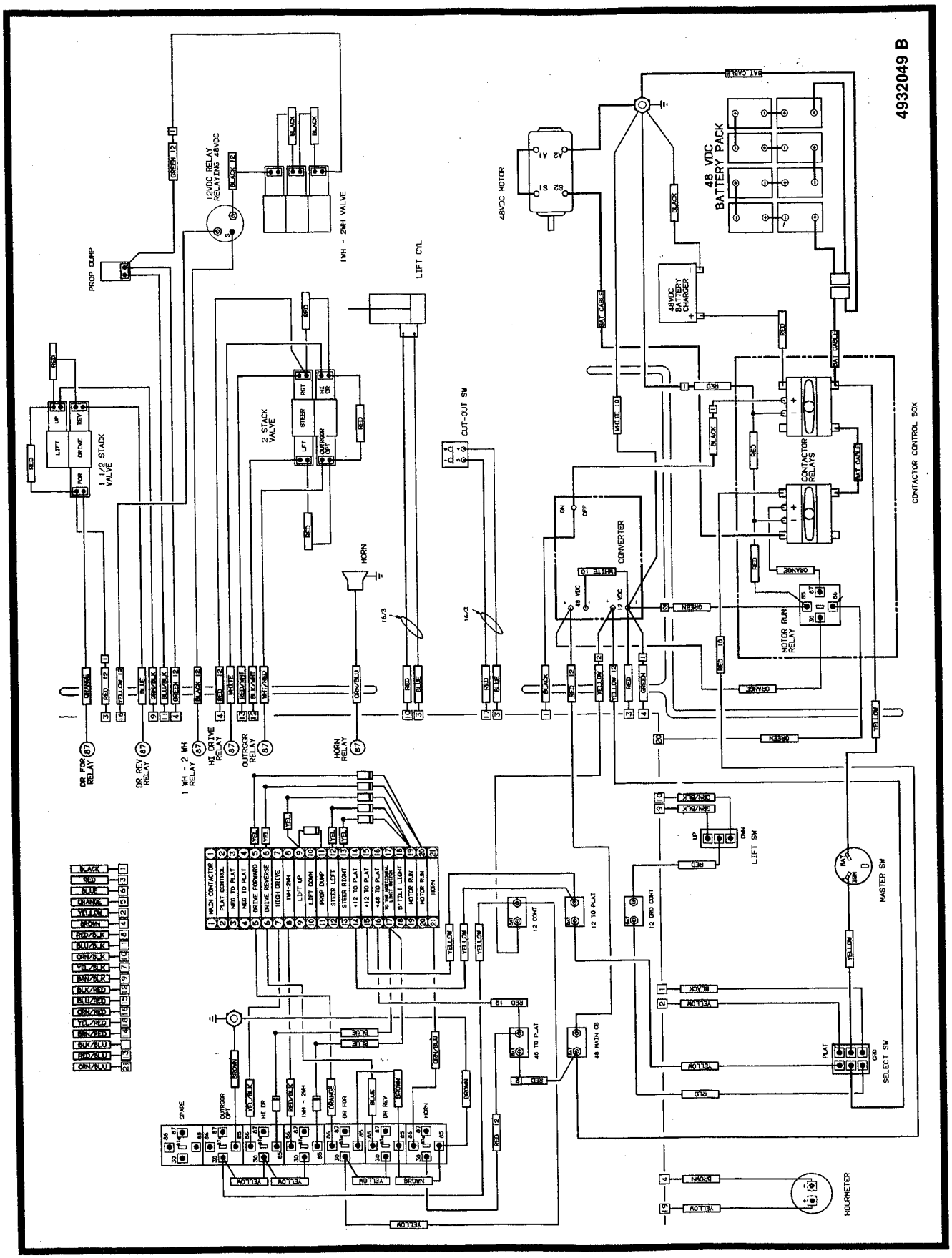


Figure 3-13. Electrical Diagram, Ground Control (Standard Electric).

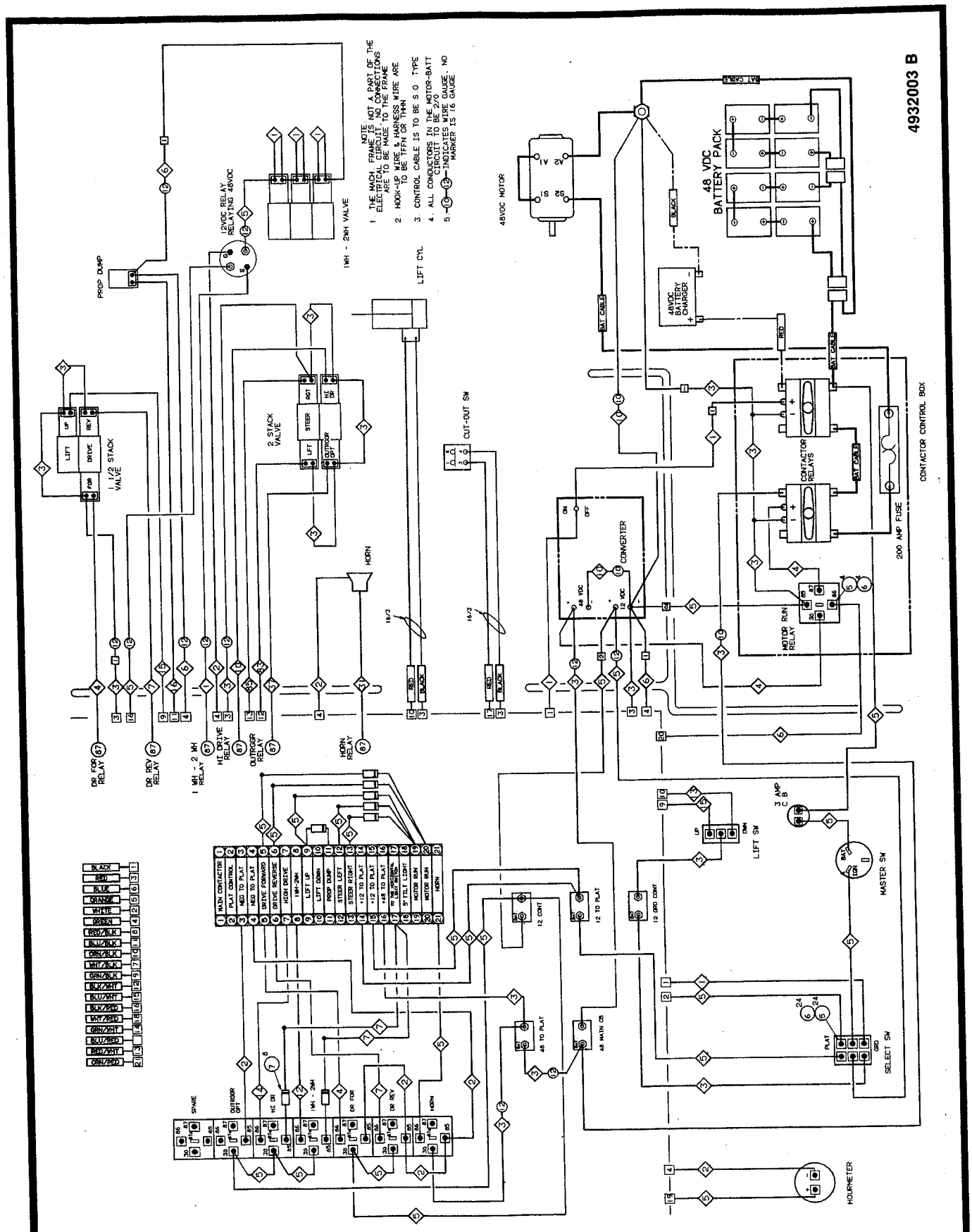


Figure 3-14. Electrical Diagram, Ground Control (Factory Mutual).

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