SERVICE & MAINTENANCE

Models
80H

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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 RESPONSIBLITY 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.

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.

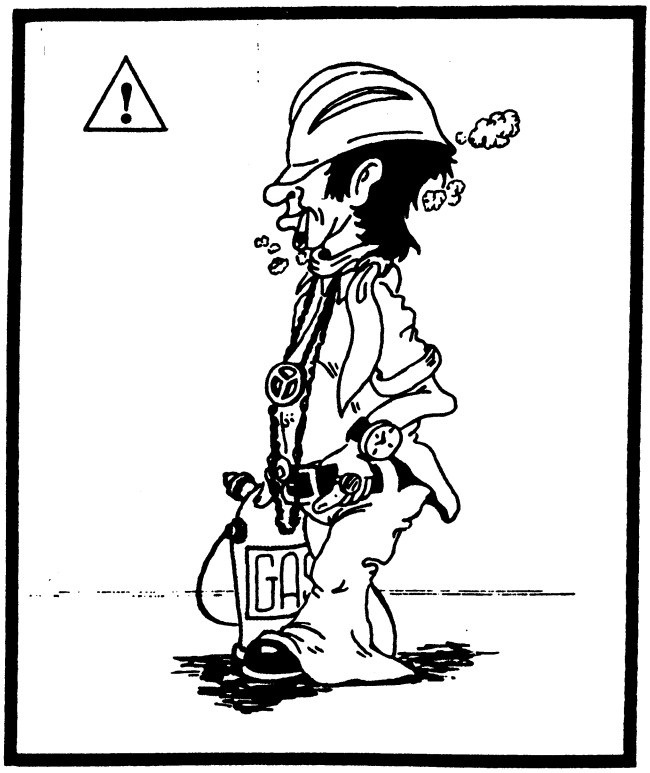
'NO SMOKING' IS MANDATORY. NEVER REFUEL DURING ELECTRICAL STORMS. ENSURE THAT FUEL CAP IS CLOSED AND SECURE AT ALL OTHER TIMES.

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

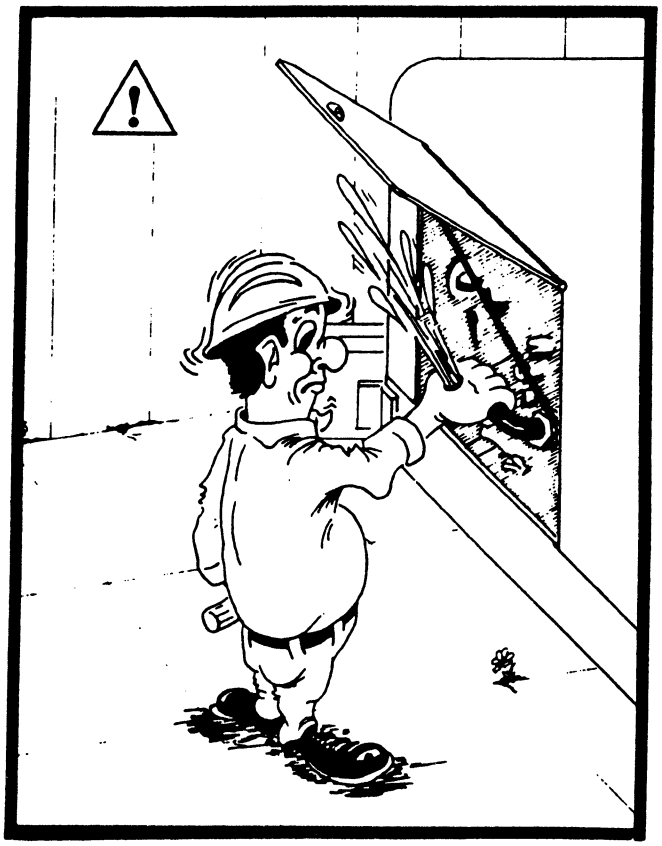
DO NOT WEAR LONG HAIR UNRESTRAINED, OR LOOSE-FITTING CLOTHING AND NECKTIES WHICH ARE APT TO BECOME CAUGHT ON OR ENTANGLED IN EQUIPMENT.

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.



NO SMOKING; REMOVE JEWELRY; WEAR APPROPRIATE CLOTHING.



SHUT OFF ALL POWER BEFORE LOOKING FOR TROUBLE – OR IT MAY FIND YOU FIRST!

USE CAUTION WHEN CHECKING A HOT, PRESSURIZED COOLANT SYSTEM.

NEVER WORK UNDER AN ELEVATED BOOM UNTIL BOOM 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.

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SECTION 1 - SPECIFICATIONS

1-1. CAPACITIES.

a. Fuel Tank - 26 U.S. Gallons (24.60 L).

b. Hydraulic Oil Tank - 56 U.S. Gallons (53.00 L).

c. Hydraulic System (Including Tank) - 67 U.S. Gallons (63.41 L).

d. Torque Hub, Drive - 44 Ounces. (1.30 L)

e. Torque Hub, Swing - 17 Ounces. (.50 L)

Note

Torque Hubs should be one-half full of lubricant (EPGL 90W).

f. Engine Crankcase, Ford w/filter - 5 Quarts (4.73 L).

g. Engine Crankcase, Deutz w/filter - 10 Quarts (9.50 L).

h. Engine Crankcase, Wisconsin w/filter - 7 Quarts (6.62 L).

1-2. COMPONENT DATA.

Note

Tolerance on all engine rpm settings ± 10%.

a. Engine - Gas.

(1). Manufacturer/Model - Ford LSG-423.

(2). Oil Capacity -

5 Quarts (4.73 L) with filter
4 Quarts (3.79 L) without filter

(3). Cooling System - 16 Quarts (15.14 L).

(4). Idle RPM - 1000, no load.

(5). Low RPM - 1800, no load.

(6). High RPM - 3000, no load.

(7). Alternator - 40 amps.

(8). Battery - 85 Amphour, 550 Cold Cranking amps.

(9). Fuel Consumption -

Low RPM - 3.08 GPH (11.66 LPH)
High RPM - 4.60 GPH (17.41 LPH)

(10). Horsepower - 54 at 2400 RPM, full load.

b. Engine - Diesel.

(1). Manufacturer/Model - Deutz F4L912.

(2). Oil Capacity -

10 Quarts (9.50 L) with filter
9 Quarts (8.52 L) without filter

(3). Low RPM - 1600, no load.

(4). High RPM - 2500, no load.

(5). Alternator - 33 amps.

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

(7). Fuel Consumption -

Low RPM - 2.40 GPH (9.08 LPH)
High RPM - 3.75 GPH (14.20 LPH)

(8). Horsepower - 70 at 2500 RPM, full load.

c. Engine - Gas.

(1). Manufacturer/Model - Wisconsin V465D

(2). Oil Capacity -

7 Quarts (6.62 L) with filter
6 Quarts (5.68 L) without filter

(3). Low RPM - 1600, no load.

(4). High RPM - 2400, no load.

(5). Alternator - 37 amps.

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

(7). Fuel Consumption -

Low RPM - 2.46 GPH (9.31 LPH)
High RPM - 3.59 GPH (13.59 LPH)

(8). Horsepower - 60 at 2400 RPM, full load.

d. Drive System.

(1). Tires - 15 x 22.5, 16 ply rated duplex, 120 PSI. (8.43 Kg/cm^2)

(2). Drive Motor Displacement (2 Speed) - 2.5 in^3/Rev., .98 in^3/Rev.

(3). Drive Hub Ratio - 30.04 to 1

(4). Drive Brake - Automatic spring applied, Hydraulically released disc brakes.

c. Steer System.

(1). Tires - 15 x 22.5, 16 ply rated duplex, 120 PSI (8.43 Kg/cm²)

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

f. Swing System.

(1). Swing Motor Displacement - 6.0 in³/Rev.

(2). Swing Hub Ratio - 69 to 1

(3). Swing Brake - Automatic spring applied, Hydraulically released disc brakes.

g. Hydraulic Pump (Gear) - Ford LSG-423 and Deutz F4L912.

(1). First Section to Proportional Valve - 15 GPM.

(2). Second Section to Bang-Bang Valve - 9 GPM.

(3). Third Section to High Drive - 9 GPM.

(4). Clockwise Rotation.

h. Hydraulic Pump (Gear) - Wisconsin V465D.

(1). First Section - 14.5 GPM. (54.89 LPM)

(2). Second Section - 9.5 GPM. (35.96 LPM)

(3). Third Section - 9.5 GPM. (35.96 LPM)

(4). Clockwise Rotation.

i. Auxiliary Power Pump.

(1). 3.75 GPM (14.19 LPM).

(2). 12 VDC Motor.

(3). Clockwise Rotation.

j. Hydraulic Filter - Tank.

(1). Return - Bypass Type.

(2). 10 Microns Nominal.

k. Hydraulic Filter - Inline.

(1). High Pressure - Non-Bypass Type.

(2). 10 Microns Nominal.

Note

Only machines built with Racine Proportional Valves will normally have Inline High Pressure Hydraulic Filters.

1-3. PERFORMANCE DATA.

a. Travel Speed - 3.0 MPH (4.83 KMH).

b. Gradeability - 20% on hard surface.

c. Turning Radius (Outside) - 20 ft. 2 in. (614.68 cm).

d. Boom Speed.

Extend - 85-130 Seconds.
Retract - 50-85 Seconds.
Lift Up - 75-100 Seconds.
Lift Down - 60-100 Seconds.

e. Swing Speed - 110-181 Seconds.

f. Boom Elevation - -16° to +75°.

g. Machine Weight - 36,150 (16,398 KG).

h. Machine Height - 9 ft. 9 in. (2.97 m).

i. Machine Length - 34 ft. 4 5/8 in. (10.48 m).

j. Machine Width - 8 ft. 6 in. (2.59 m).

k. Wheel Base - 108 in. (2.74 m).

1-4. TORQUE REQUIREMENTS.

Description	Torque Value (Dry)	Interval Hours
A. Bearing To Chassis	220 FT LBS (30.42 Kgm)	Initially 200/ Then 500
B. Bearing To Turntable	220 FT LBS (30.42 Kgm)	Initially 200/ Then 500
C. Wheel Lugs	300 FT LBS (41.48 Kgm)	50
D. Boom Chains	58 FT LBS (6.91 Kgm)	200

Note

See Procedure Section for tightening sequence of turntable bearing bolts.

Note

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

1-5. LUBRICATION.

a. Ford LSG-423 Engine.

(1). Single Viscosity Oils (SF, SF-SE, SF-CC, SF-CD).

When Outside Temp is Consistently	Use SAE Viscosity Number
-10° F. - +60° F.	*10W
+10° F. - +90° F.	20W-20
Above +32° F.	30
Above +50° F.	40

(2). Multi-Viscosity Oils (SF, SF-SE, SF-CC, SF-CD).

When Outside Temp is Consistently	Use SAE Viscosity Number
Below +10° F.	*5W-20
Below +60° F.	5W-30
-10° F.- +90° F.	10W-30
Above -10° F.	10W-40 or 10W-50
Above +20° F.	20W-40 or 20W-50

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

b. Deutz F4L912 Engine.

(1). Single Viscosity Oils (CD-SE, CD-SF).

When Outside Temp is Consistently	Use SAE Viscosity Number
-20° F. - +25° F.	*10W
+15° F. - +50° F.	20W-20
+40° F. - +85° F.	30
Above +75° F.	40

*This viscosity can be used at colder temperatures only with engine oil preheating.

(2). Multi-Viscosity Oils (CD-SE, CD-SF).

When Outside Temp is Consistently	Use SAE Viscosity Number
-40° F. - +75° F.	*5W-30 (Synthetic)
-5° F. - +70° F.	10W-30
-5° F.- +85° F.	10W-40
+15° F. - +75° F.	15W-30
Above +15° F.	15W-40

*This viscosity can be used at colder temperatures only with engine oil preheating.

c. Wisconsin V465D Engine.

(1). Single Viscosity Oils (MS, SD, SE).

When Outside Temp is Consistently	Use SAE Viscosity Number
+15° F. - 0° F.	10W
+40° F. - +15° F.	20-20W
+120° F. - 40° F.	30

(2). Multi-Viscosity Oils (MS, SD, SE).

When Outside Temp is Consistently	Use SAE Viscosity Number
Below Zero	5W-20

Note

Do not use any oil heavier than SAE 30 in the Wisconsin Engine.

d.

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

NOTES:

1. Crankcase oils must meet API service classification.
- **a. Gas - SF, SF-SE, SF-CC, SF-CD, MS, SD, SE.**
- **b. Diesel - CD-SE, CD-SF.**

2. Hydraulic oils must have anti-wear qualities at least to API Service Classification GL-3, and sufficient chemical stability for mobile hydraulic system service. (e.g. Kendall Hyken 052).

3. Temperatures listed in above hydraulic oil charts are system cold start to maximum operating temperatures.

4. For machines equipped with a steering wheel, hydraulic oils must be diluted with diesel fuel by 20% when ambient temperature is below 20° F. System capacity is 67 U.S. gal. (253.62 L). Add 13.4 gal. (50.72 L) diesel fuel after draining an equivalent amount of hydraulic fluid. Diesel fuel will dissipate gradually over time so that this would need to be done each winter as necessary.

e.

KEY	SPECIFICATIONS
MPG	Multipurpose Grease having a minimum dripping point of 350 degrees F. Excellent water resistance and adhesive qualities, and being of extreme pressure type (Timken OK 40 pounds minimum).
EPGL	Extreme Pressure Gear Lube (oil) meeting API service classification GL-5 or Mil-Spec MIL-L-2105.
HO	Hydraulic Oil API Class GL-3, SAE 10W-20, Viscosity Index 152, e.g. Kendall Hyken 052.
EO	Engine (crankcase) Oil. Mil-Spec MIL-L-2104.

Note

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

1-6. PRESSURE SETTING.

a. Proportional Valve (Vickers).

(1). Main Relief - 3400 PSI +150 PSI -0 (239.02 Kg/cm²).

(2). Drive - 3200 PSI (224.96 Kg/cm²).

(3). Lift Up - 2500 PSI +150 PSI -0 (175.75 Kg/cm²).

(4). Lift Down - 1200 PSI (84.36 Kg/cm²).

(5). Swing - 1100 PSI (77.33 Kg/cm²).

Note

Allowable variance for all Vickers Valve pressures - plus or minus 150 PSI, except where noted.

b. Sequence Valve - 400 PSI ±50 PSI (28.12 Kg/cm²).

c. Pressure Reducing Valve - 600 PSI ±50 PSI (42.18 Kg/cm²).

d. Solenoid Valve.

(1). Main Relief - 2500 PSI (175.75 Kg/cm²).

(2). Level Up - 2500 PSI (175.75 Kg/cm²).

(3). Level Down - 1500 PSI (105.45 Kg/cm²).

(4). Telescope In (without wheel) - 2500 PSI (175.75 Kg/cm²).

Telescope In (with wheel) - 2000 PSI (140.60 Kg/cm²).

(5). Telescope Out - 1500 PSI (105.45 Kg/cm²).

(6). Steer (without wheel) - 2000 PSI (140.60 Kg/cm²).

Steer (with wheel) - 2500 PSI (175.75 Kg/cm²).

(7). Rotate (if applicable) - 2500 PSI (175.75 Kg/cm²).

1-7. CYLINDER SPECIFICATIONS.

DESCRIPTION	BORE	STROKE	ROD DIA.
Lift	7.00 (17.78)	44.00 (111.76)	3.00 In. (7.62 Cm)
Telescope	3.50 (8.89)	257.88 (655.02)	2.50 In. (6.35 Cm)
Steer	3.00 (7.62)	8.06 (20.47)	1.25 In. (3.18 Cm)
Master Level	2.50 (6.35)	15.12 (38.40)	1.25 In. (3.18 Cm)
Slave Level	2.50 (6.35)	15.22 (38.66)	1.25 In. (3.18 Cm)

WARNING

WHEN REBUILDING THE SLAVE AND MASTER CYLINDERS, APPLY LOCTITE #242 TO PISTON NUT THREADS AND TIGHTEN SECURELY.

WARNING

WHEN REBUILDING THE TELESCOPE, LIFT AND STEER CYLINDERS, APPLY LOCTITE #242 TO PISTON NUT AND SETSCREWS, THEN TIGHTEN BOTH SECURELY.

Note

These cylinders use nylon point setscrews which should be discarded and replaced whenever they are removed.

1-8. BOOM TAPE.

1.5:1
Blue - 193.88 in. (492.46 cm)
Yellow - 34.00 in. (86.36 cm)
Red - 39.00 in (99.06 cm)

1-9. MAJOR COMPONENT WEIGHTS.

Standard Lift with Ford LSG-423 Engine

Platform (3 x 5) less console box	=	210 LBS (95.26 KG)
Boom complete incl. A-frame support and rotator	=	4,830 LBS (2192.80 KG)
Turntable complete (incl. engine)	=	13,980 LBS (6341.33 KG)
Frame Complete (incl. tires and wheels)	=	17,380 LBS (7883.59 KG)
Total	=	36,400 LBS (16,512.98 KG)

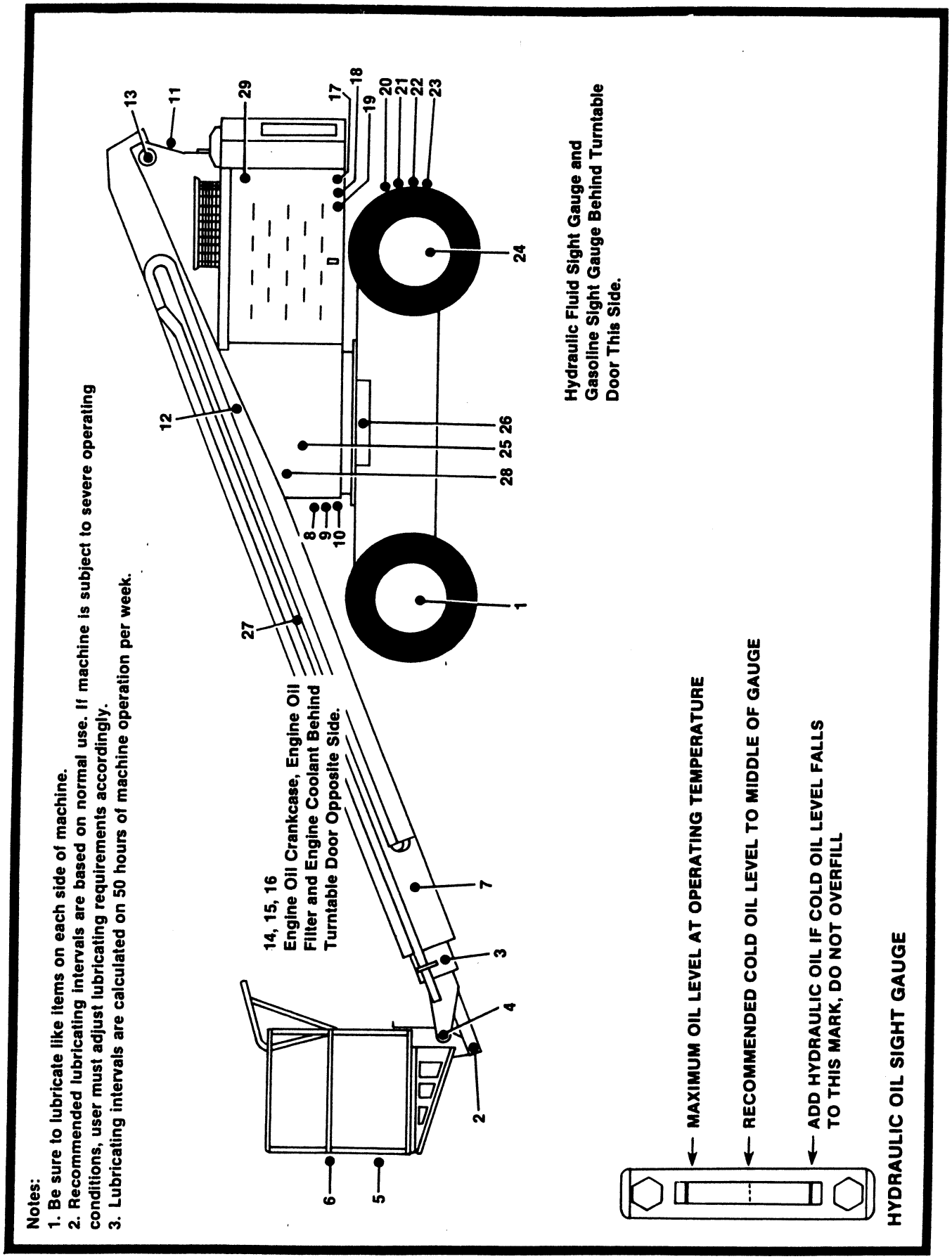


Figure 1-1. Lubrication Chart (Sheet 1 of 2).

INDEX NUMBER	COMPONENT	NO/TYPE LUBE POINTS	LUBE/METHOD	INTERVAL HOURS	COMMENTS
1	Wheel Drive Hubs	Fill Plug	EPGL (SAE-90)	50/500	Check oil every 50 hours. Hubs should be one-half full of lubricant. Change oil every 500 hours.
2	Slave Cylinder (Rod End)	1 Grease Fitting	MPG-Pressure Gun	50	N/A
3	Slave Cylinder (Barrel End)	1 Grease Fitting	MPG-Pressure Gun	50	Lube through hole in fly boom.
4	Platform Pivot	1 Grease Fitting	MPG-Pressure Gun	50	N/A
	Rotating Column (Optional)	2 Grease Fittings	MPG-Pressure Gun	50	N/A
	Rotary Worm Gear (Optional)	N/A	MPG-Brush	100	N/A
5	Platform Door Hinges	2 Grease Fittings	MPG-Pressure Gun	100	N/A
6	Platform Door Latch	N/A	SAE10-Oil Can	100	N/A
7	Boom Chain Extension Sheave	1 Grease Fitting	MPG-Pressure Gun	50	Align access holes in mid and fly boom.
8	Swing Bearing	1 Grease Fitting	MPG-Pressure Gun	50	Remote access.
9	Lift Cylinder (Barrel End)	1 Grease Fitting	MPG-Pressure Gun	50	Remote access.
10	Master Cylinder (Barrel End)	1 Grease Fitting	MPG-Pressure Gun	50	Remote access.
11	Master Cylinder (Rod End)	1 Grease Fitting	MPG-Pressure Gun	50	N/A
12	Boom Chain Retract Sheave	1 Grease Fitting	MPG-Pressure Gun	50	Align with access hole in base boom.
13	Boom Pivot Bushing	2 Grease Fittings	MoS_2-Pressure Gun	50	N/A
14	Engine Oil Crankcase	Fill Cap	Refer to Engine Manual (EO-SAE 30)	10 50	Check oil level every 10 hours/ Change oil in accordance with engine manual.
15	Engine Oil Filter	N/A	Refer to Engine Manual	Refer to Engine Manual	Spin-off type replaceable cartridge.
16	Engine Coolant	Radiator Cap	Refer to Engine Manual	50	Check coolant level when engine is cold.
17	Hydraulic Fluid	Fill Cap	Sunco #2105 SAE 5W-20	10/1000	Check oil level every 10 hours/ Change oil every 1000 hours.
18	Hydraulic Oil Return Filters* (Racine Valve Only)	N/A	Initial Change 40 Hours	250	Check filter gauges for element condition every 10 hours/ Replace as necessary.
19	Hydraulic Oil Reservoir* Suction Filter	N/A	Initial Change 40 Hours	250	Replace filter element every 250 hours/Clean mesh as necessary.
20	Tie Rod Ends	2 Grease Fittings	MPG-Pressure Gun	100	N/A
21	Steer Spindle	2 Grease Fittings	MPG-Pressure Gun	50	N/A
22	Steer Cylinder (Rod End)	1 Grease Fitting	MPG-Pressure Gun	50	N/A
23	Steer Cylinder (Barrel End)	1 Grease Fitting	MPG-Pressure Gun	50	N/A
24	Wheel Bearings	N/A	MPG-Repack	500	N/A
25	Swing Drive Hub	Fill Plug	EPGL (SAE-90)	50/500	Check oil level every 50 hours/ Hub should be one-half full of lubricant. Change oil every 500 hours.
26	Swing Bearing Gear and Pinion Gear Teeth	N/A	MPG-Brush	500	N/A
27	Boom Chains	N/A	Chain Lube/Hot Oil Dip	500	Hot Oil Dip: 50° and up - SAE 40 30° to 50° - SAE 30 0° to 30° - SAE 20
28	Lift Cylinder (Rod End)	1 Grease Fitting	MPG-Pressure Gun	50	N/A
29	Door and Access Panel Hinges	N/A	SAE-10 Oil Can	200	N/A

Key to lubricants:

MPG - Multi-Purpose Grease
EPGL - Extreme Pressure Gear Lubricant
MoS_2 - Molybdenum Disulphide Dry Film Lubricant
EO - Engine Oil
Hydraulic Fluid - Sunco 2105 or equal

*JLG Industries recommends replacing the hydraulic tank filter after the first 40 hours of operation and every 250 hours thereafter. Inspect tank filter gauge daily for element condition and replace as necessary.

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

SIZE		BOLT DIAMETER D (IN.)	TENSILE STRESS AREA (SQ. IN.)	SAE GRADE 5 BOLTS			SAE GRADE 8 BOLTS			RECOMMENDED TORQUE WRENCH SIZE (PRODUCTION)		
				CLAMP LOAD P (LB.)	TIGHTENING DRY K = 0.20	TORQUE LUB. K = 0.15	CLAMP LOAD P (LB.)	TIGHTENING DRY K = 0.20	TORQUE LUB. K = 0.15	IN-OZS.	IN-LBS.	FT-LBS.
					LB. IN.	LB. IN.		LB. IN.	LB. IN.			
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*

NOTE: Tensile strength for bolt size 4 to 1 - 120,000 (min. psi), size 1 1/8 to 1 1/2 - 105,000 (min. psi).

*Torque multiplier. Torque specifications are usually given in foot-pounds - - - - lower ranges in inch-pounds or inch-ounces.

Grade 5

Grade 8

Figure 1-2. Torque Chart.

2-1. BOOM CHAINS. (See Figure 2-1.)

Note

Applies to 3 Section Booms only.

a. Adjusting Procedures.

WARNING

ENSURE MACHINE IS ON A FIRM AND LEVEL SURFACE.

(1). Fully retract boom in the horizontal position.

(2). Torque fly boom retract chain, adjust to 50 ft. lbs. (6.91 Kgm).

(3). Torque fly boom extend chain, adjust to 50 ft. lbs. (6.91 Kgm).

(4). Cycle boom (extend at least three feet and return to the fully retracted position).

(5). Recheck fly boom retract chain (50 ft. lbs. (6.91 Kgm) required).

(6). Recheck fly boom extend chain (50 ft. lbs. (6.91 Kgm) required).

(7). Repeat steps #2, #3 and #4 if necessary.

(8). Check for proper operation of boom.

b. Inspection Procedures.

WARNING

BOOM CHAINS TO BE INSPECTED AT TIME OF NEXT BOOM OVERHAUL AND WHEN DEEMED NECESSARY BY MACHINE OWNER, BUT NOT TO EXCEED 500 HOURS OF MACHINE OPERATION.

(1). Inspect boom chains for the following conditions.

(a). **Wear:** Always inspect that segment of chain that operates over a sheave. As the chain flexes over the extend/retract sheaves, joints and plate edges very gradually wear. Chain "stretch" can be measured using a manufacturers wear scale or steel tape. When chains have elongated 3% they must be removed and replaced. Refer to Table 2-1 for proper chain specifications and allowable stretch tolerances. Peening and wear of chain plate edges are caused by sliding over a chain worn contact face of a sheave, or unusually heavy loads. All of the above require replacement of the chain and correction of the cause. Chain side wear, noticeable when pin heads and outside plates show a definite wear pattern, is caused by misalignment of the sheave/chain anchors and must be corrected promptly. Do not repair chains: if a section of chain is damaged, replace the entire chain set.

Table 2-1. Chain Stretch Tolerances.

Chain Size	Pin To Pin Measurement	Allowable Stretch 15 In. Span
0.750 in. pitch	15 in. or 20 pitches	0.45 in.
0.625 in. pitch	15 in. or 24 pitches	0.45 in.

(b). **Rust and corrosion:** Rust and corrosion will cause a major reduction in the load-carrying capacity of the chain, because these are primary reasons for side plate cracking. The initial lubrication at the factory is applied in a hot dip tank to assure full penetration into the joint. Do not steam clean or degrease chains. At time of chain installation, factory lube must be supplemented by a maintenance program to provide a film of oil on the chains at all times. If chains are corroded, they must be inspected, especially the outside plates, for cracks in-line with the pins. If cracks are found, replace the chain; if no cracks are discovered, lubricate the chains by dipping in heated oil, and reinstall on the machine. Keep chains lubricated.

(c). **Fatigue cracks:** Fatigue is a phenomenon that affects most metals, and is the most common cause of chain plate failures. Fatigue cracks are found thru the link holes, perpendicular (90 degrees) from the pin in-line position. Inspect chains carefully after long time use and heavy loading for this type crack. If any cracks are discovered, replace all chains, as seemingly sound plates are on the verge of cracking. Fatigue and ultimate strength failures on JLG Lifts/Cranes are incurred as a result of severe abuse as design specs are well within the rated lifting capacity of these chains.

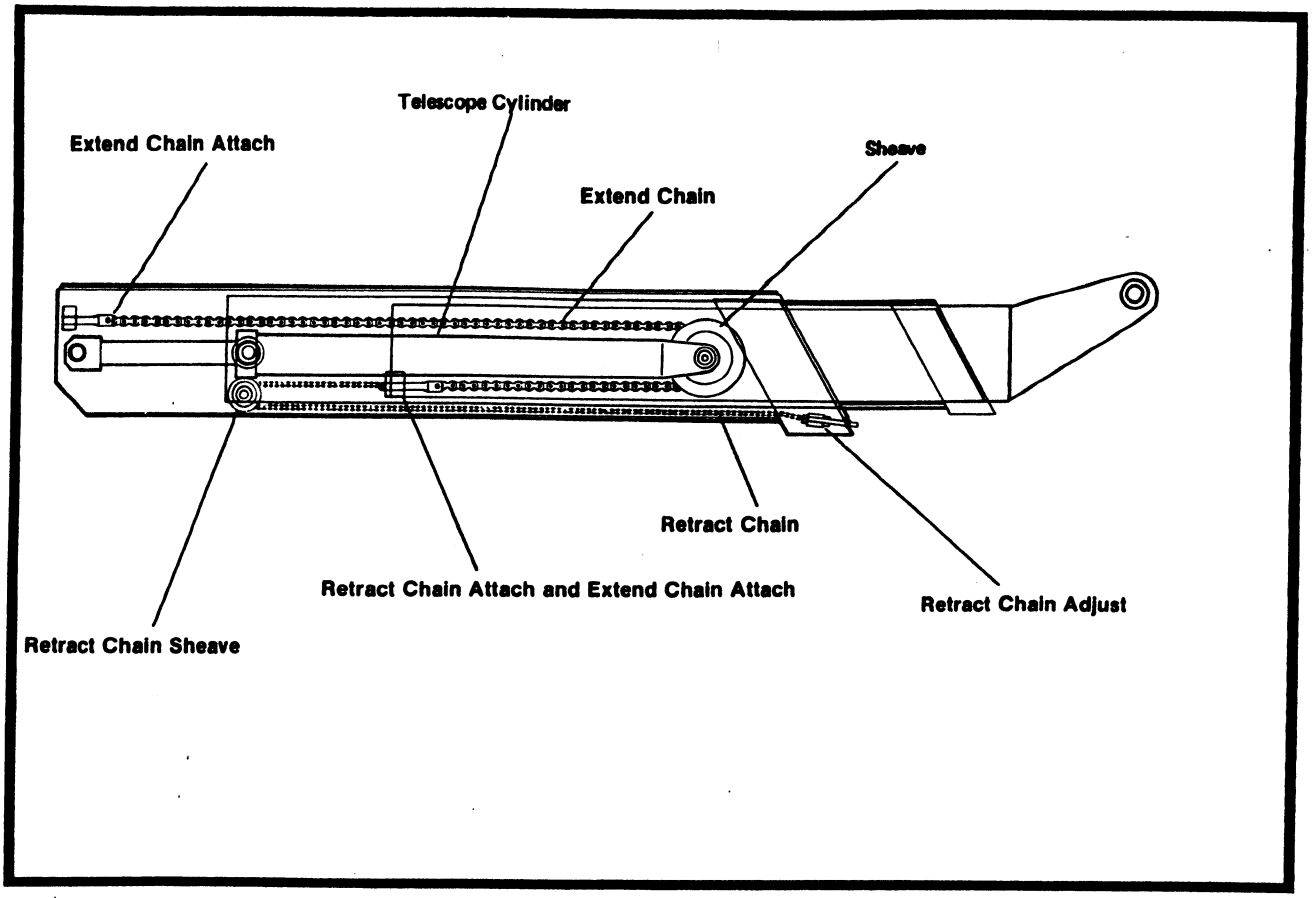


Figure 2-1. Typical 3 Section Boom Assembly.

(d). **Tight joints:** All joints in the chain should flex freely. On roller chain, tight joints are usually caused by rust/corrosion, or the inside plates "walking" off the bushing. Limber up rusty/corroded chains (after inspecting carefully) with a heavy application of oil (preferably a hot oil dip). Tap inside "walking" plates inward: if "walking" persists change the chain. This type problem is accelerated by poor lubrication maintenance practice, and most tight joints chains have been operated with little or no lubrication. Tight joints on leaf chain are generally caused by:

1. Bent pins or plates.
2. Rusty joints.
3. Peened plate edges.

Oil rusty chains and replace chains with bent or peened chain components. Keep chains lubricated.

(e). **Protruding or turned pins:** Chains operating with inadequate lube generate tremendous friction between the pin and plates (pin and bushing on roller chain). In extreme cases, this frictional torque can actually turn the pins in the outside press-fit plates. If this happens the pins will slowly work out of the plates. Inspect for turned pins, which can be easily spotted as the "V" flats on the pin heads are no longer in line. Replace all chains showing evidence of turned or protruding pins. Keep chains lubricated.

(f). **Chain anchors and sheaves:** An inspection of the chain must include a close examination of chain anchors and sheaves. Check chain anchors for wear breakage, and misaligment. Anchors with worn or broken fingers should be replaced, they should also be adjusted to eliminate twisting the chain for an even load distribution.

Sheaves should be inspected for worn flanges, which would indicate misalignment, and wear on the outside diameter of the sheave. A worn sheave can mean several problems as follows:

1. Chains too tight.
2. Sheave bearings/pin bad.
3. Bent/misaligned chains.

2-2. WEAR PADS.

a. Shim up wear pads to within 1/16" (1.59 mm) tolerance between wear pad and adjacent surface.

b. Replace wear pads when worn within 1/8" (3.18 mm) of insert.

2-3. DRIFT TEST.

a. Telescope Cylinder.

Note

Switches referenced in this procedure are located on the Ground Control Panel.

(1). Activate hydraulic system and position boom in stowed position; adhere to all safety precautions.

WARNING

DO NOT EXCEED MANUFACTURER'S RATED PLATFORM CAPACITY. (REFER TO PLACARD ADJACENT TO PLATFORM.)

(2). Place capacity load on platform; secure load.

WARNING

BEFORE RAISING AND EXTENDING BOOM, ENSURE THAT AREAS ABOVE AND BELOW BOOM AND PLATFORM AND AHEAD OF PLATFORM ARE CLEAR OF ALL OBSTRUCTIONS AND PERSONNEL.

(3). Position LIFT control switch to UP and hold until boom reaches horizontal.

(4). Position TELESCOPE control switch to OUT and hold until boom extends approximately four (4) feet; measure from end of base section to end of mid section.

(5). Position LIFT control to UP and hold until boom reaches maximum elevation (70 degrees).

(6). Shut down hydraulic system by positioning IGNITION switch to OFF. After engine stops, return switch to ON position.

(7). Position TELESCOPE control switch to OUT; if boom starts to retract, counterbalance valve is defective and requires replacement.

(8). If boom does not retract, complete steps (9) through (12).

CAUTION

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID THE ENTRY OF CONTAMINANTS INTO THE SYSTEM.

(9). Tag and carefully disconnect the hydraulic lines to telescope cylinder. Do not remove manual descent line. Use a suitable container to retain any residual hydraulic fluid. Immediately cap lines and ports.

(10). Leave boom elevated in test position for approximately one hour.

WARNING

BEFORE LOWERING BOOM, ENSURE THAT AREAS BELOW BOOM AND PLATFORM ARE CLEAR OF ALL PERSONNEL AND OBSTRUCTION.

(11). Position LIFT control switch on DOWN and hold until boom reaches horizontal; check boom length against original measurement. If boom has retracted more than one inch and oil is leaking around rod-end of telescope cylinder (check with light and inspection mirror), seals are defective and require replacement, or cylinder rod is scored and cylinder requires overhaul or replacement. If boom has retracted and oil is leaking from counterbalance valve, the valve is either improperly adjusted, or defective and requires replacement.

(12). Connect hydraulic lines to telescope cylinder.

b. Lift Cylinder.

Note

Switches referenced in this procedure are located on Ground Control Panel.

(1). Activate hydraulic system and position boom in stowed position; adhere to all safety precautions.

Note

Tape measure or cord should be at least seven (7) feet long for use in this test.

(2). Attach tape measure or cord to bottom of platform.

WARNING

DO NOT EXCEED MANUFACTURER'S RATED PLATFORM CAPACITY. (REFER TO PLACARD ON BOOM, ADJACENT TO PLATFORM.)

(3). Position capacity load on platform; secure load.

WARNING

BEFORE RAISING BOOM, ENSURE THAT AREAS ABOVE AND BELOW BOOM AND PLATFORM ARE CLEAR OF ALL OBSTRUCTIONS AND PERSONNEL.

(4). Place LIFT control switch to UP and hold until platform is approximately six (6) feet above ground level.

(5). Shut down hydraulic system by positioning IGNITION switch to OFF. After engine stops return switch to ON position. DO NOT START ENGINE.

(6). Position LIFT control switch to UP; if boom starts to lower counterbalance valve is defective and requires replacement.

(7). If boom does not lower, complete steps (8) through (10).

(8) Leave boom elevated in test position for approximately one (1) hour.

(9). With tape measure or cord used for reference, check to see whether boom has lowered (crept) more than six (6) inches.

(10). If boom has lowered and oil is leaking around rod-end cap of cylinder, seals in cylinder are defective and require replacement. If boom has lowered and oil is leaking from the counterbalance valve, the valve is either improperly adjusted or defective and requires replacement.

CAUTION

ENSURE THAT HYDRAULIC LINES ARE CONNECTED AS MARKED PRIOR TO BEING DISCONNECTED.

(11). Connect hydraulic lines to lift cylinder.

2-4. TILT ALARM SWITCH LEVELING.

CAUTION

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

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

Note

Ensure switch mounting bracket is level and securely attached.

b. 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.

c. With the electrical connections complete, slowly tighten one of the "Y" nuts until the circuit is closed and the light on the Plaform Control Console illuminates.

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

e. Divide the number of turns determined in step **d** in half. Tighten the nut this many turns. The line determined by this nut and the "X" nut is now parallel to the ground.

f. Repeat steps **c** through **e** for the remaining "Y" nut. The switch is now level.

g. 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 **c** through **g**.

2-5. TELESCOPE CYLINDER REMOVAL AND INSTALLATION.

a. Removal.

(1). Be sure boom is in fully retracted and at horizontal position.

(2). Shut down engine.

(3). Remove boom end-cover.

CAUTION

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID THE ENTRY OF CONTAMINENTS INTO THE SYSTEM.

(4). Tag and disconnect hydraulic lines to telescope cylinder. Use suitable containers to retain any residual hydraulic fluid. Immediately cap lines and ports.

(5). Remove the two snap rings that retain the telescope cylinder pin to the base boom.

(6). Using a suitable brass drift, carefully drive the telescope cylinder pin from base boom.

(7). Remove the telescope cylinder trunnion pin covers from each side of the boom.

(8). Remove the capscrews securing the trunnion pins from each side of the boom.

(9). Using a suitable slide hammer, remove the trunnion pins attaching the telescope cylinder to the mid boom.

(10). Attach a suitable sling to the telescope cylinder rod. Support with an overhead crane or other suitable lifting device.

(11). Remove the two (2) extension chain adjusting nuts from the eye bolt through the chain adjust block.

(12). Remove the four (4) bolts and lockwashers attaching the chain attach block to the base boom section and remove block.

(13). Using the lifting equipment, raise cylinder to obtain sufficient clearance for removal of the telescope cylinder rod support bracket.

(14). Remove cylinder rod support bracket.

(15). Attach a suitable lifting device to the extension chain adjusting eye bolt above cylinder rod.

Note

The extension chain will come out of the boom twice as far as the telescope cylinder.

(16). Using both lifting devices, carefully pull the cylinder from the boom assembly.

(17). As the cylinder is removed from the boom, lay the extension chain on top of the base boom.

(18). Using another lifting device, support the sheave wheel end of the cylinder and remove the cylinder from the boom assembly.

(19). Carefully lift the cylinder clear of the boom assembly and lower to the ground or suitably supported work area.

b. Installation.

(1). Using suitable lifting equipment, carefully lower the cylinder to the boom assembly.

(2). Using another lifting device, support the sheave wheel end of the cylinder and install the cylinder into the boom assembly.

(3). Slide the cylinder into the boom, sliding the extension chain in place as the cylinder is moving in.

(4). Attach a suitable lifting device to the extension chain adjusting eye bolt.

(5). Attach the cylinder rod support bracket to the rod support block on the telescope cylinder.

(6). Install chain adjust block with four (4) lockwashers and bolts to base boom section.

(7). Install the two (2) extension chain adjusting nuts that attach the eye bolt to the chain adjust block.

(8). Remove the sling attached to the telescope cylinder rod.

(9). Using a suitable brass drift, install the trunnion pins attaching the telescope cylinder to the mid boom section.

(10). Install the capscrews securing the trunnion pins to each side of the boom. Note that Loctite #242 is required on the capscrew threads.

(11). Install trunnion pin covers on each boom side.

(12). Carefully install the telescope cylinder rod attach pin into base boom.

(13). Install the snap rings that retain the telescope rod attach pin to the base boom.

(14). Remove applicable hydraulic line and port caps and correctly connect the hydraulic lines to the telescope cylinder. Ensure all hoses are correctly routed.

(15). Install boom end cover.

(16). Activate hydraulic system.

(17). Using all applicable safety precautions operate the boom functions. Check for correct operation and hydraulic leaks. Secure as necessary.

(18). Cycle boom several times and torque boom chains to 50 ft. lbs. Retract boom fully and place in stowed position.

(19). Check fluid level of hydraulic tank and adjust as necessary.

2-6. 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 so equipped, remove the cartridge-type holding valve and fittings from the cylinder port block. Discard o-rings.

Note

Step (4) applies only to the telescope cylinder.

(4). Remove the nuts which attach the cylinder rod support block, and withdraw the rods from the forward end of the telescope cylinder.

(5). Place the cylinder barrel or cylinder barrel trunnion (telescope cylinder) into a suitable holding fixture.

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

(7). Attach a suitable pulling device to the cylinder rod port block end 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.

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

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

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

(11). Remove the piston rings.

(12). Remove and discard the piston o-rings, seal rings, and back-up 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 and remove the cylinder head gland, retainer, if applicable, and rod support, 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-ring 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 and 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 seal grooves in thread ring for burrs and sharp edges. Dress applicable surfaces as necessary.

(14). If applicable, inspect rod and barrel bushings for signs of correct lubrication and excessive wear. Replace as necessary.

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

(16). Inspect port block fittings and holding valve. Replace as necessary.

Note

Step (17) applies to telescope cylinder only.

(17). Inspect the cylinder rod support block and wear ring inside diameter for scoring or other damage. Repair or replace as necessary.

(18). If applicable, inspect the oil ports in both the cylinder rod and piston spacer for blockage or the presence of dirt or other foreign material. Repair as necessary.

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

Note

Steps (20) through (23) apply to the telescope cylinder only.

(20). Inspect chain sheave bushings for scoring, tapering, ovality, and for excessive wear and evidence of correct lubrication. Replace bushings as necessary.

(21). Inspect sheave chain groove for damage. Replace sheave assembly as necessary.

(22). Inspect sheave attach pin for scoring or other damage and for evidence of correct lubrication. Dress pin surface with Scotch Brite or equivalent or replace pin as necessary.

(23). Inspect sheave pin lubrication drilling and fitting for blockage or the presence of dirt or other foreign material. Repair as necessary.

c. Assembly.

Note

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

Note

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

Note

Step (1) applies to the telescope cylinder only.

(1). Place the new rod seals in the rod support block. Support the cylinder rod and install the assembled rod support on the rod shaft. Push the support along the rod to the port block end.

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

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

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

(5). If applicable, correctly place new o-ring and back-up rings in the inner piston diameter groove.

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

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

WARNING

WHEN REBUILDING THE MASTER AND SLAVE LEVEL CYLINDERS, APPLY LOCTITE #242 TO PISTON NUT THREADS AND TIGHTEN SECURELY.

(8). Push the piston onto the rod until it abuts the spacer end and install the attaching nut.

WARNING

WHEN REBUILDING THE TELESCOPE, LIFT, AXLE AND STEER CYLINDERS, APPLY LOCTITE #242 TO PISTON NUT AND SETSCREWS, THEN TIGHTEN BOTH SECURELY.

Note

These cylinders use nylon point setscrews which should be discarded and replaced whenever they are removed.

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

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

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

(12). 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.

(13). 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.

Note

Step (14) applies to the telescope cylinder only.

(14). Place the support rods in the tubes provided on the barrel assembly. They will bottom out on the attached stops. Thread them through the rod support block and (using loctite) tighten the rod nuts down on the support.

IMPORTANT

THE SUPPORT RODS MUST BE INSTALLED SO THAT THEY BOTTOM OUT SIMULTANEOUSLY ON THE STOPS.

(15). 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.

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

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

(18). Install the cartridge-type holding valve and fittings in the rod port block using new o-rings as applicable.

Note

Steps (19) through (22) apply to the telescope cylinder.

(19). Elevate the barrel end of the cylinder to a workbench or other suitable device.

(20). Plug the retract port and supply hydraulic power to the extend port.

(21). Open the bleeder port plug venting all trapped air to atmosphere. Retighten the bleeder port plug. Disconnect the hydraulic power source and remove plug from retract port.

(22). An alternative to steps (19) through (21) is to position the barrel horizontally in a suitable holding device, attach a hydraulic power source to both extend and retract ports, while supporting the cylinder rod, cycle the cylinder a minimum of five times with the bleeder port unplugged venting all trapped air to atmosphere. A suitable hose may be attached to the bleeder port with the end in a container suitable to contain the hydraulic fluid. After all air is vented remove all attached hoses, and install the bleeder port plug. Also plug the extend and retract ports until cylinder is installed in boom.

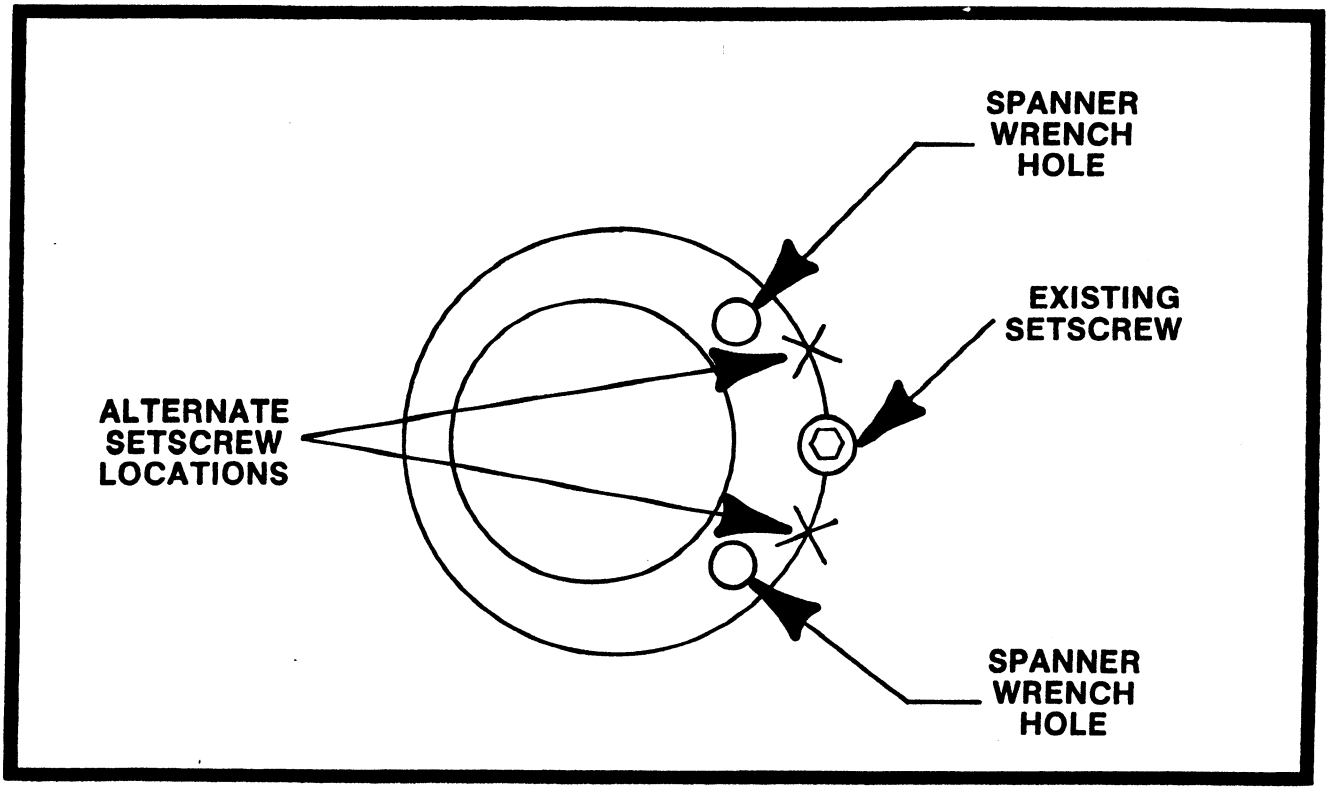


Figure 2-2. Telescope Cylinder Eccentric Bushing.

2-7. TELESCOPE CYLINDER ECCENTRIC BUSHING. (Figure 2-2.)

When replacing eccentric bushings, drill 5/16" diameter x 3/4" deep, tap 3/8-16NC x 9/16" deep for new setscrew (bushing to boom) either above or below original holes. Allow enough room between holes for strength while staying on the thick side of the bushing.

2-8. THROTTLE CHECKS AND ADJUSTMENTS, LSG-423. (Figure 2-3.)

a. Checks.

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

(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. To accomplish this the throttle rod must first be disconnected.

b. Choke Adjustments.

Note

Automatic choke and vacuum pulloff adjustment procedure to be made only on a cold engine.

(1). Make sure choke body and mounting bracket are positioned so that choke rod moves freely with no binding anywhere through its stroke.

(2). The choke spring should hold the choke plate firmly closed but require only slight finger pressure to open at 70° F. (7.2° C.)

(3). Retract pulloff shaft until it bottoms (as if under engine vacuum). Bend pulloff rod until a 3/8" (9.53 mm) rod just fits between choke plate and carburetor body.

(4). The above procedure outlines the correct choke system adjustment for most conditions. Some environments such as high altitude, very warm or very cold temperatures may require that the choke cover be set richer or leaner, or the amount of pulloff may need to be varied somewhat.

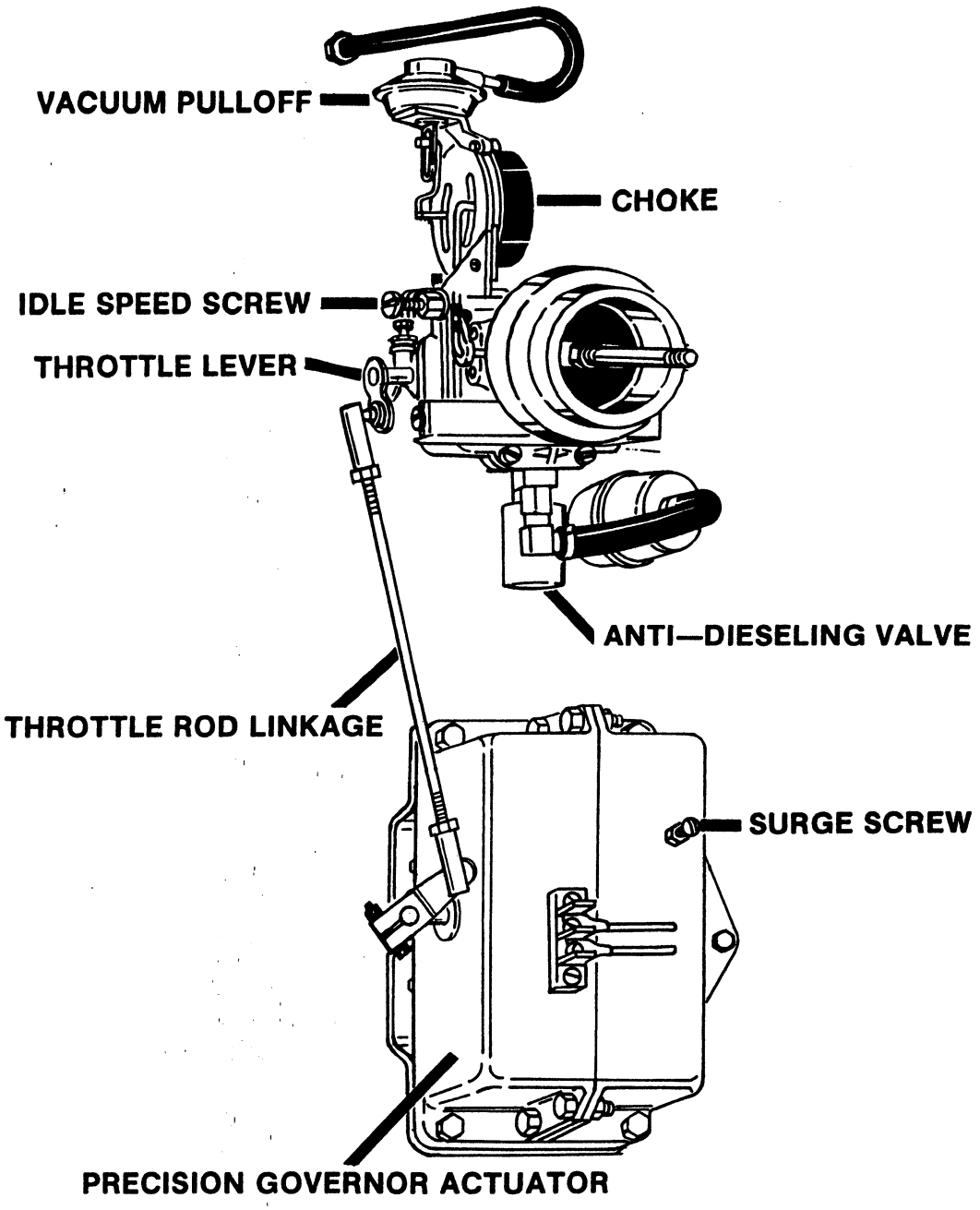


Figure 2-3. Throttle Checks and Adjustments (LSG-423).

c. Carburetor and Governor Adjustments.

(1). With the aid of an assistant, start the engine at platform console and allow it to come up to operating temperature with air cleaner installed. Adjust carburetor idle screw until engine idles at 1000 RPM. Shut down engine.

Note

Steps (2), (3) and (4) are preliminary settings.

(2). With engine shut down, open ground control box. Turn 'low (mid) engine' adjusting screw CCW to the stop. Do not turn past stop, this breaks pot disabling the governor.

(3). On controller (in ground control box) turn 'high engine' (P1) adjusting screw 25-30 turns CCW, then 10 turns CW.

(4). On controller (in ground control box) turn 'gain' (P2) adjusting screw CCW to the stop, then CW until screw slot is vertical (approximately 1/4 turn).

(5). On controller (in ground control box) turn 'droop' (P3) adjusting screw CCW to the stop, then CW until screw slot is vertical (approximately 1/4 turn). No further adjustment should be necessary to 'droop' (P3).

(6). With the aid of an assistant at platform console start the engine and allow to come up to operating temperature. Then have assistant depress footswitch and place engine speed switch to HIGH ENGINE.

(7). If engine surging occurs at this point, turn 'gain' (P2) adjusting screw CCW until surging ceases. Turn 'high engine' (P1) adjusting screw until engine runs at 3000 RPM. Turning the screw CW increases RPM. Turning the screw CCW decreases RPM.

(8). While your assistant continues to depress the footswitch, have him place engine speed switch to LOW ENGINE. Turn low (mid) engine adjusting screw until engine runs at 1800 RPM. Turning the screw CW increases RPM. Turning the screw CCW decreases RPM. Shut down engine.

Note

If engine surges under no load and you cannot get enough response from adjusting 'gain' (P2), try adjusting surge screw on actuator. Loosen surge screw locknut. Disconnect throttle linkage. Turn surge screw CW until linkage arm moves. Manually stroke the linkage fully and allow to return slowly until it stops, try to move linkage towards return position. If linkage moves, turn surge screw CCW 1/2 turn. Again stroke linkage and allow to return slowly until it stops. Try to move linkage towards return position. If linkage moves, turn surge screw CCW 1/2 turn. Again stroke linkage and allow to return slowly until it stops. Try to move linkage towards return position. If linkage moves, turn surge screw CCW 1/2 turn. Repeat this procedure until linkage does not move after stroking. This will set buffer spring tension properly. Reconnect throttle linkage.

(9). With engine speed switch set to LOW ENGINE, when footswitch is depressed, engine should immediately respond. If response time lags, turn 'gain' (P2) adjusting screw CW to improve response time. Turn adjusting screw in small increments only until response time is correct. Turning adjusting screw too far CW can cause surging. See (7) above.

2-9. THROTTLE ADJUSTMENTS, F4L912.

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 instruction manual for procedure.

a. Disconnect actuator cable from throttle lever on injection pump. 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 1800 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 1800 RPM. Shut down engine.

b. With the aid of an assistant, start engine from basket and allow to come up to operating temperature. Disconnect proportional dump valve wire. Activate footswitch. Turn on HIGH ENGINE switch. Hold drive controller in full drive position. Adjust slide pin to contact high engine limit switch at 2500 RPM. Shut off all switches and controllers. Reconnect proportional dump valve wire.

Note

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

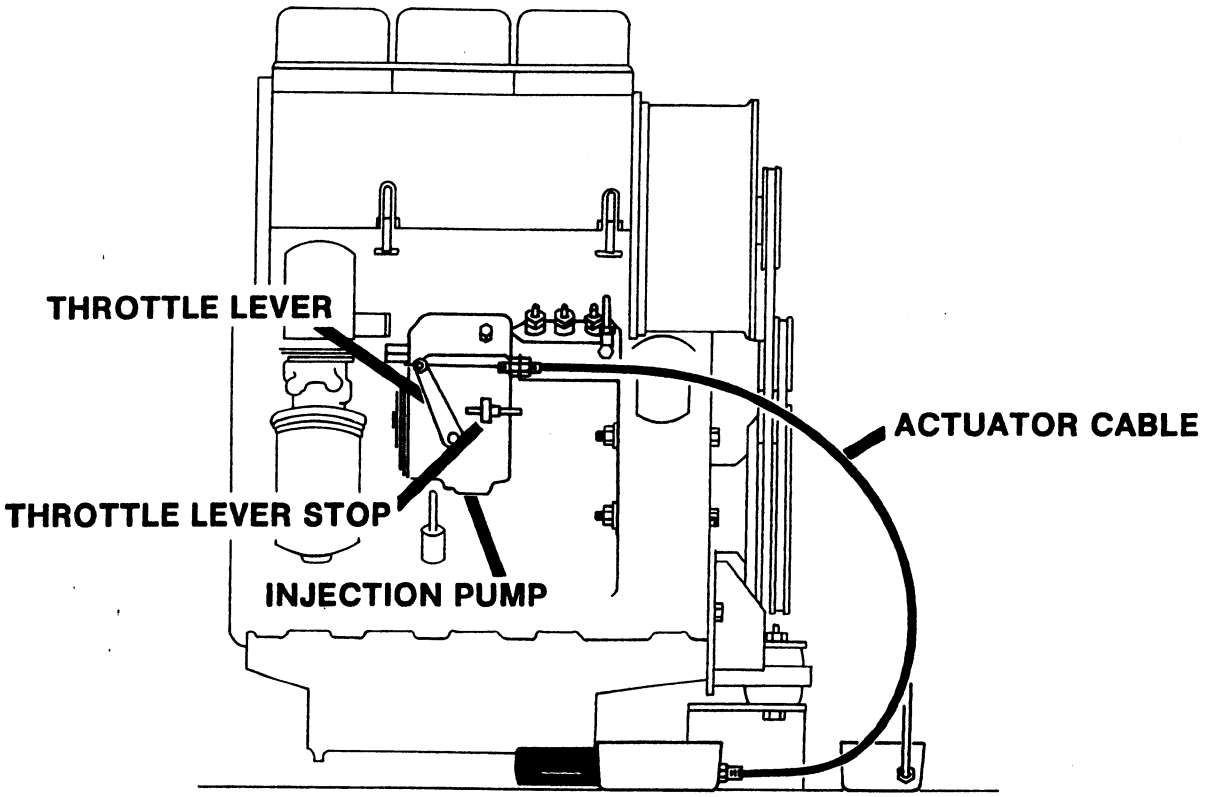


Figure 2-4. Throttle Adjustments (F4L912) Typical.

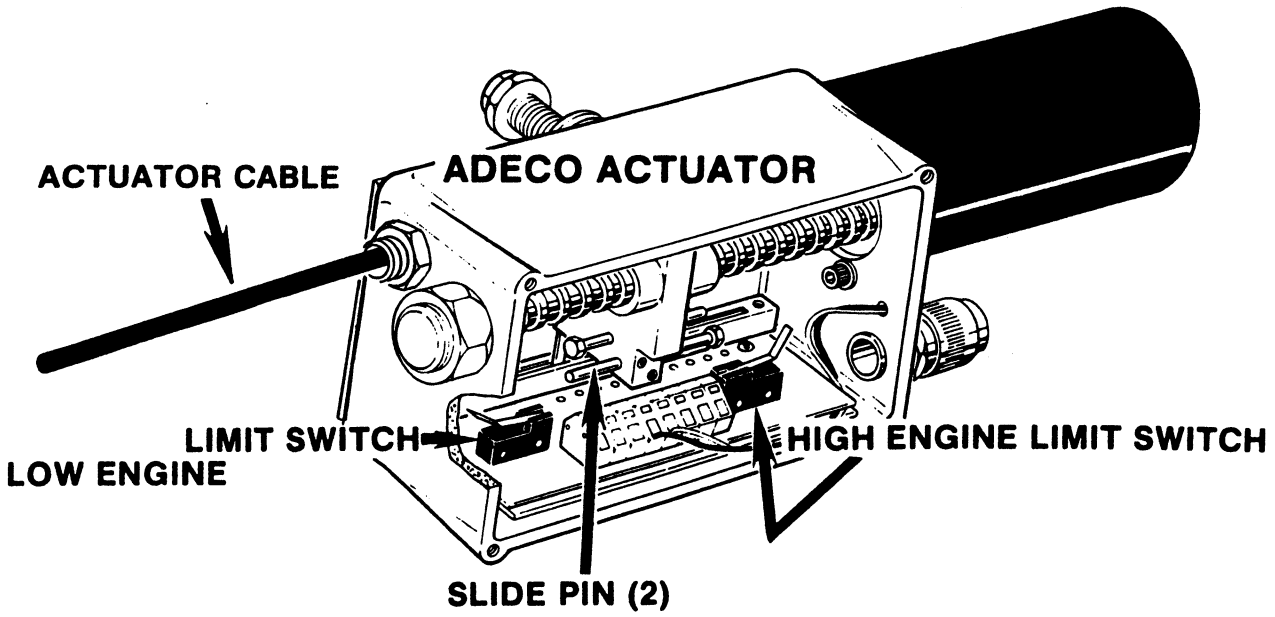


Figure 2-5. Adeco Actuator Adjustments (F4L912).

2-10. THROTTLE CHECKS AND ADJUSTMENTS, V465 D. (Figure 2-6, 2-7)

a. Checks. (Refer to Figure 2-6.)

(1). Check that carburetor throttle link is located at top of governor arm.

(2). Check that spring is located at first or second springhole from top of governor arm. First hole is preferable. Second hole can be used when trying to stop surging.

b. Adjustments. (Refer to Figures 2-6 and 2-7.)

(1). Disconnect the actuator rod from the arm. With the aid of an assistant, start the engine from the basket and allow it to come up to operating temperature. Adjust carburetor idle screw until engine runs at 1600 RPM. Shut down engine. Reattach actuator rod to arm making sure that low engine setting remains the same. If necessary, adjust slide pin to contact low engine limit switch at 1600 RPM. Shut down engine.

(2). With the aid of an assistant, start engine from basket and allow to come up to operating temperature. Disconnect proportional dump valve wire. Activate footswitch. Turn on high engine switch. Hold drive controller in full drive position. Adjust slide pin to contact high engine limit switch at 2400 PRM. Shut off all switches and controllers. Reconnect proportional dump valve wire.

(3). If the engine hunts or surges in the maximum speed no load condition, shut off engine. Disconnect carburetor throttle link from governor arm. Turn carburetor throttle link (clockwise) one turn. Start engine and activate high engine as in step (2) above. Be sure to disconnect proportional dump valve wire.

(4). If surging continues, repeat step (3) above. Do not turn carburetor throttle link in any further than necessary or governor performance will be affected.

(5). When surging is under control, check high engine RPM. If necessary reset to 2400 RPM as in step (2) above. Shut down engine.

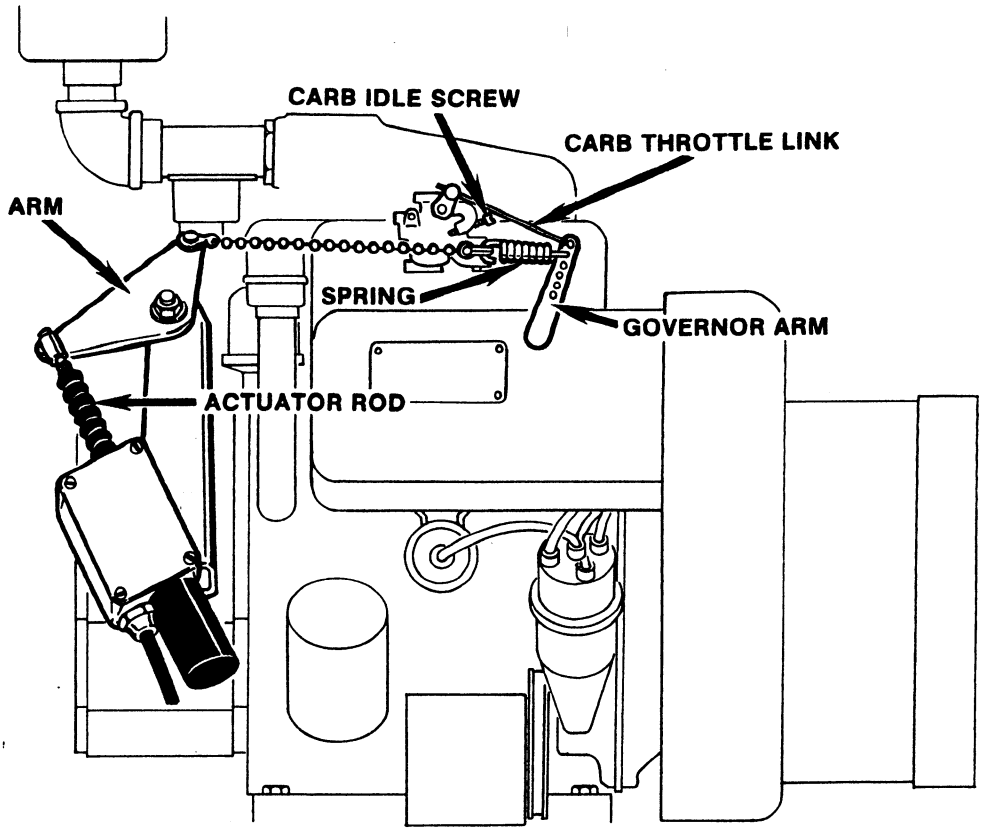


Figure 2-6. Throttle Adjustments (V465D) Typical.

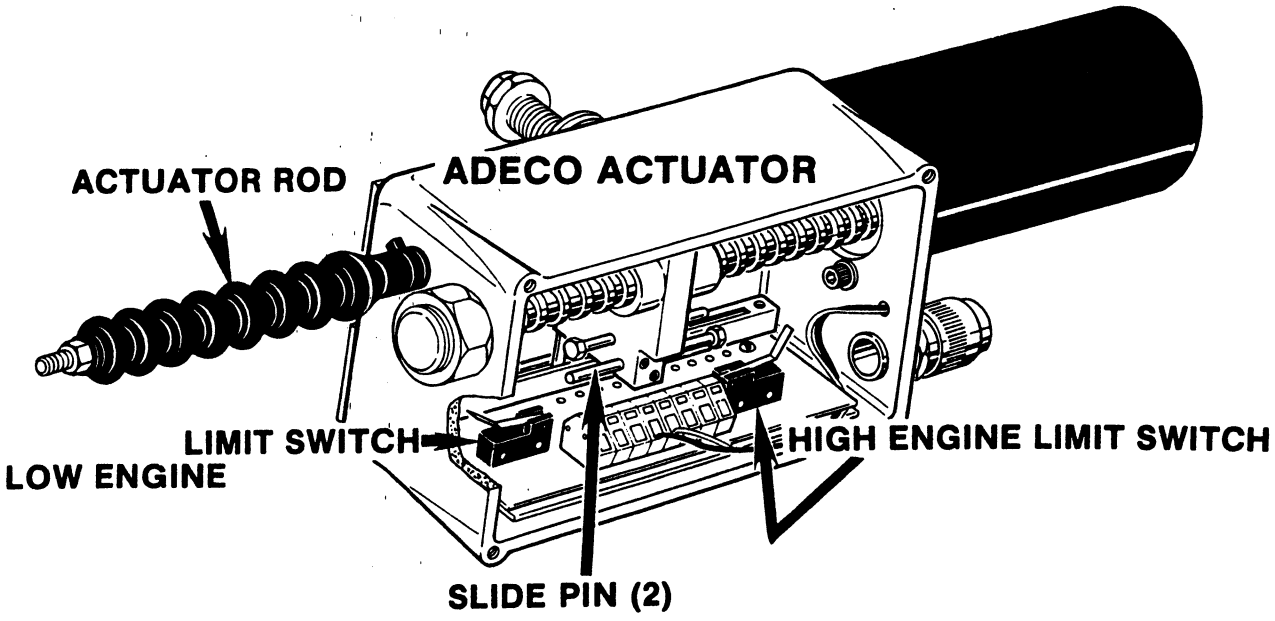


Figure 2-7. Adeco Actuator Adjustments (V465D).

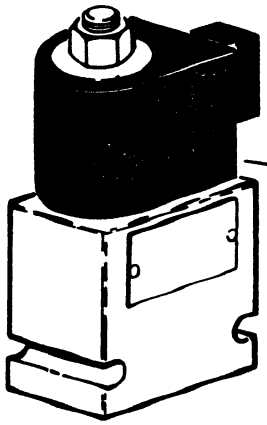
2-11. PRESSURE SETTING PROCEDURES.

a. Proportional Valve pressure setting procedures for machines with or without a steering wheel are shown in Figure 2-8.

b. Solenoid Valve pressure settings for machines without a steering wheel are shown in Figure 2-9.

c. Pressure and flow adjustment points for machines with steering wheels are shown in Figure 2-10.

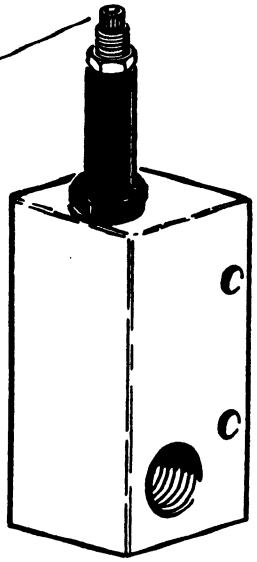
To Be Performed in Sequence, Step 1, Step 2, etc.



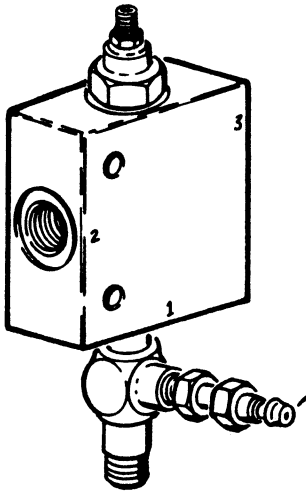
DUMP VALVE

Connect 12 V.D.C. jumper wire to dump valve coil.

Adjust to 400 PSI (± 50 PSI). Monitor pressure gauge at relief valve. Remove jumper wire.



SEQUENCE VALVE

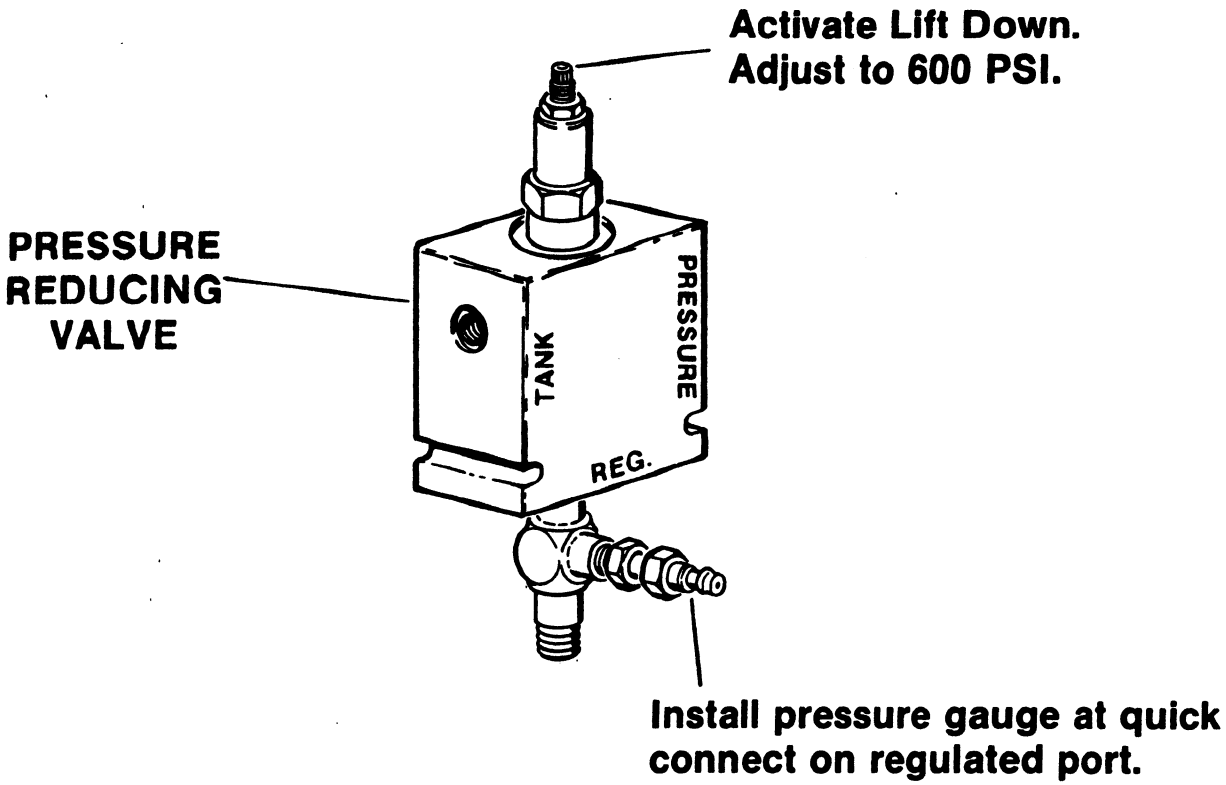


RELIEF VALVE

Install pressure gauge at quick disconnect.

SEQUENCE VALVE ADJUST (STEP 1)

Figure 2-8. Vickers Proportional Valve Pressure Setting (Sheet 1 of 4).



PILOT PRESSURE ADJUST
(STEP 2)

Figure 2-8. Vickers Proportional Valve Pressure Setting (Sheet 2 of 4).

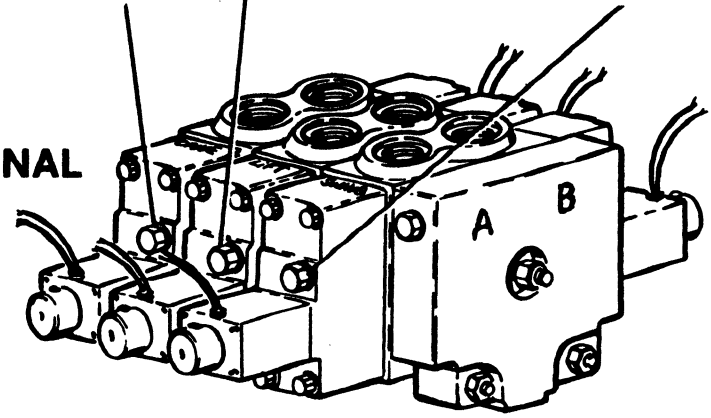
Lift Down Adjust - 1200 PSI ("A" Side)

Lift Up Adjust - 2500 PSI ("B" Side) Plus 150 PSI, Minus 0

Drive Adjust - 3200 PSI

Swing Adjust - 1100 PSI

PROPORTIONAL VALVE



Note: All Pressures Plus Or Minus 150 PSI (Except Where Noted).

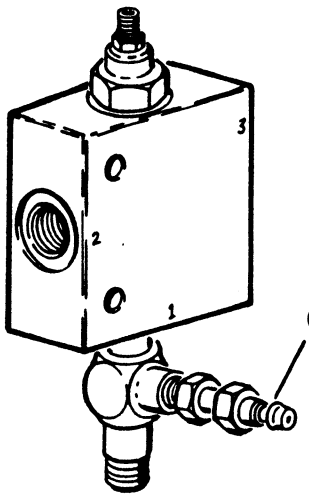
Swing Adjust - Right and Left - Monitor gauge at quick connect on relief valve. Lock turntable and activate Swing Right. Add shims to increase pressure, remove shims to decrease. Same procedure applies to Swing Left.

Lift Adjust - Lift Down - Monitor gauge at quick connect on relief valve. Bottom out Lift Down. Add shims to increase pressure, remove shims to decrease.

Lift Up - Bottom out Lift Up, add shims to increase pressure, remove shims to decrease.

Drive Adjust - Disconnect and cap hose to drive motor, also plug port in valve. Have assistant activate drive forward. Monitor gauge at relief valve. Add shims to increase pressure, remove shims to decrease. Same procedure applies to drive reverse.

RELIEF VALVE

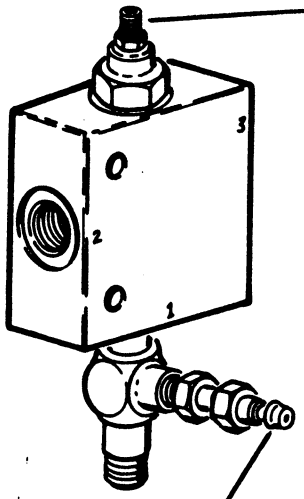


Install pressure gauge at quick disconnect.

PROPORTIONAL VALVE ADJUST (STEP 3)

Figure 2-8. Vickers Proportional Valve Pressure Setting (Sheet 3 of 4).

RELIEF VALVE



Install pressure gauge at quick disconnect.

Note: This adjustment to be made after all proportional functions are set.

Disconnect and cap hoses to drive motor, also plug ports on drive section of proportional valve. Back out adjustment 2 turns (counter-clockwise). Have assistant activate drive. Slowly turn adjustment in (clockwise) and watch pressure gauge. Continue turning until gauge stops moving (approximately 3200 PSI). Turn adjustment in an additional ½ turn, this will result in approximately 200 PSI higher than Drive relief setting.

MAIN RELIEF ADJUST (Proportional Functions) (STEP 4)

Figure 2-8. Vickers Proportional Valve Pressure Setting (Sheet 4 of 4).

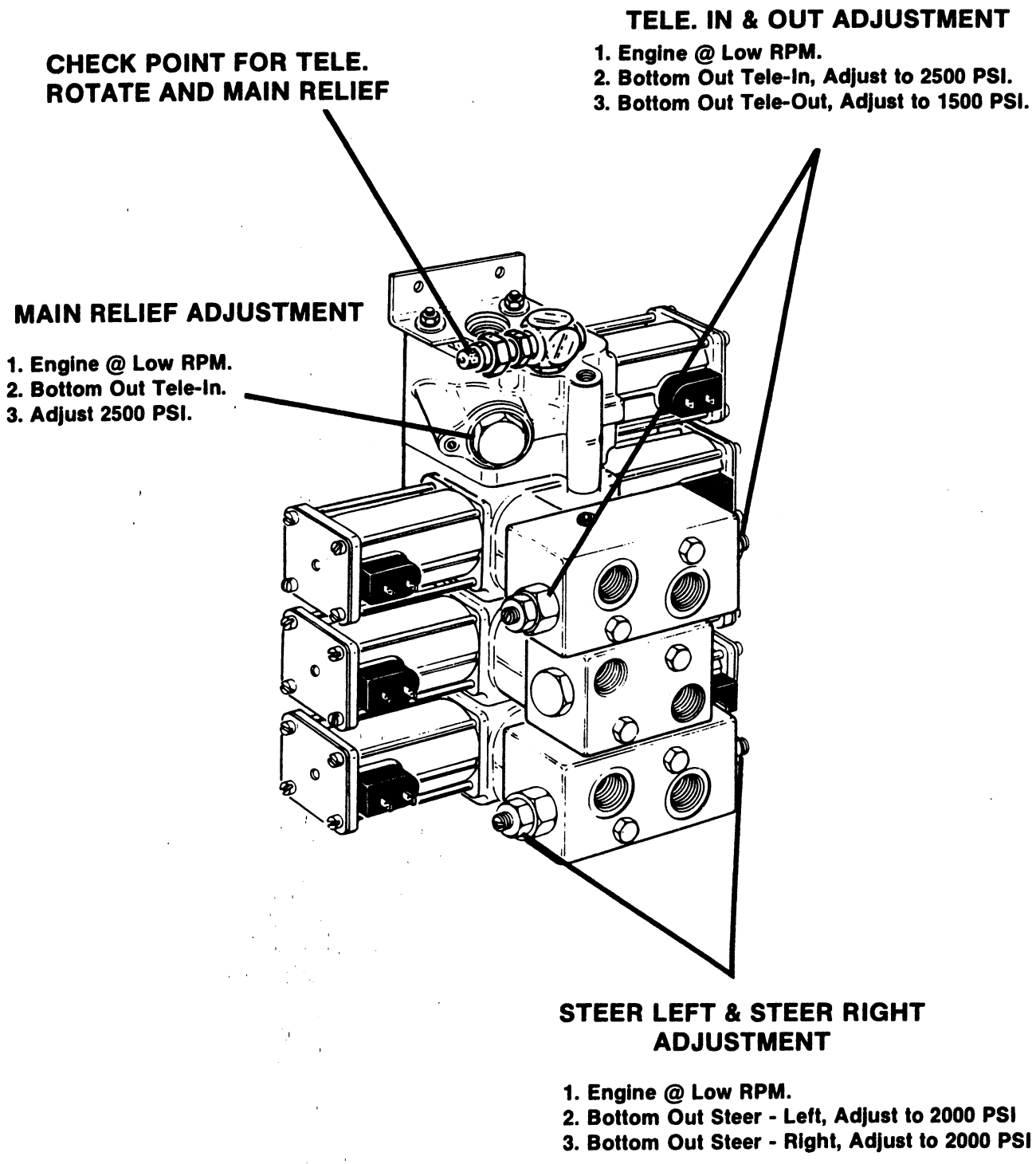


Figure 2-9. Solenoid Valve Pressure Settings (without Steering Wheel).

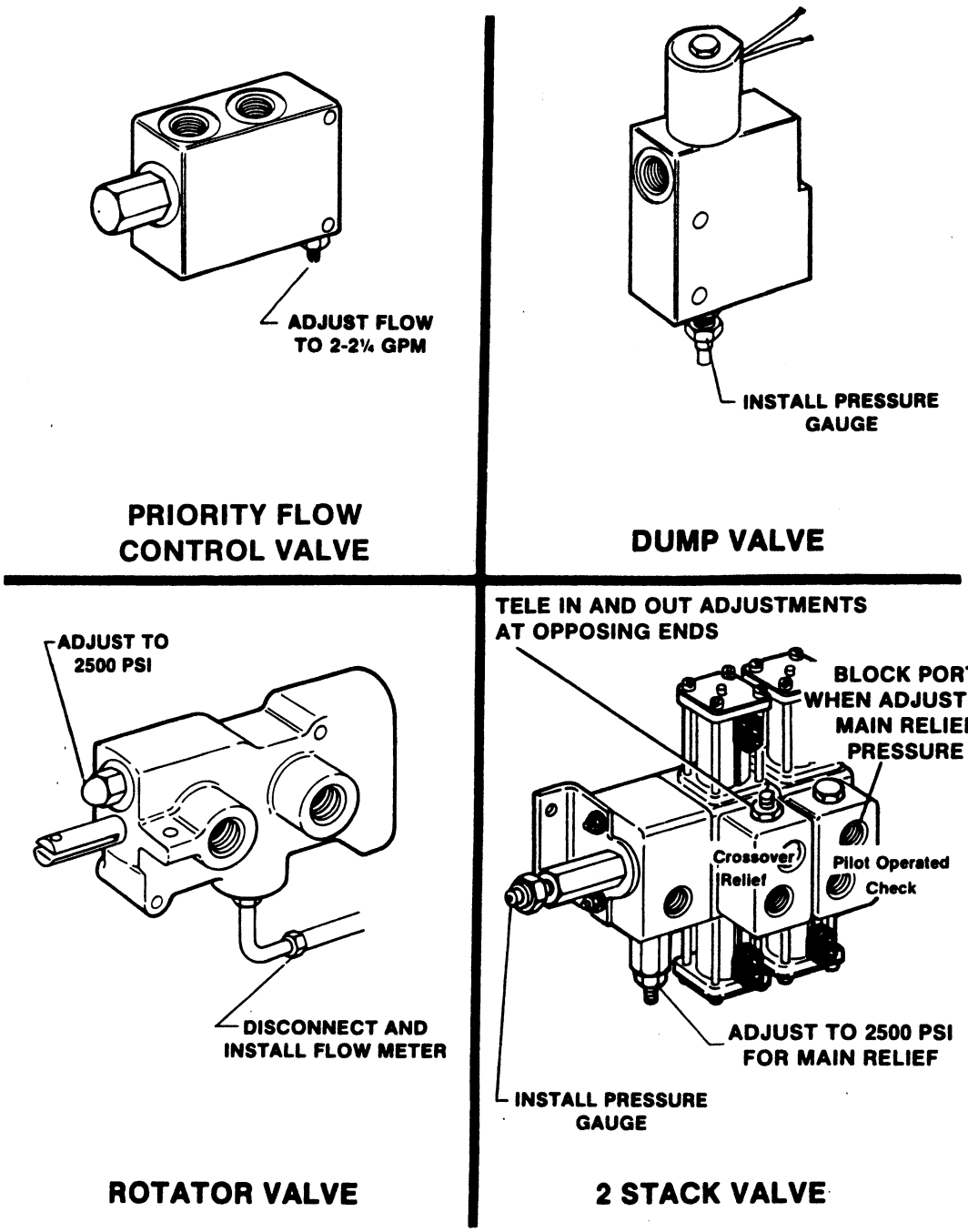


Figure 2-10. Pressure and Flow Settings (with Steering Wheel).

1. ROTATE AND STEERING.

a. TO SET FLOW. Install a flow gauge inline at rotator valve. With the aid of an assistant, make adjustments at the priority flow control valve for 2-2¼ G.P.M.

b. TO SET PRESSURE. Install pressure gauge at quick connect on dump valve. With the aid of an assistant, make adjustments at rotator valve to 2500 PSI. Set with engine at low RPM and bottom out rotate left or right.

2. TELESCOPE AND MAIN RELIEF.

a. TO SET MAIN RELIEF PRESSURE. Install pressure gauge at quick connect on 2 stack valve. Disconnect level hose, plug hose and block port on valve. Make adjustments at 2 stack to 2500 PSI, with engine at low RPM, activate level function.

b. TO SET TELESCOPE PRESSURE. With a pressure gauge at the quick connect, and the engine at low RPM, bottom out tele-in and adjust to 2000 PSI. Then bottom out tele-out and adjust to 1500 PSI.

2-12. SWING BEARING.

a. Wear Tolerance.

(1). From the underside of the machine, at rear center, with the boom fully elevated and fully retracted (See Figure 2-11a), using a magnetic base dial indicator, measure and record the distance between the swing bearing and frame. (See Figure 2-12.)

(2). At the same point, with the boom at horizontal and fully extended (See Figure 2-11b), using a magnetic base dial indicator, measure and record the distance between the swing bearing and frame. (See Figure 2-12.)

(3). If you determine a difference greater than .064" (1.63 mm) the swing bearing needs replacing.

IMPORTANT

THE SWING BEARING IS ONE OF THE MOST CRITICAL POINTS ON AN AERIAL LIFT. IT IS HERE THAT THE STRESSES OF LIFTING ARE CONCENTRATED, AT THE CENTER OF ROTATION. BECAUSE OF THIS, PROPER MAINTENANCE OF THE SWING BEARING BOLTS IS A MUST FOR SAFE OPERATION.

b. Replacement and Devcon Application Procedures.

(1). **Removal.**

(a). From the ground control station, operate the boom lift control and raise the boom adequately to provide access to the rotary coupling.

WARNING

NEVER WORK BENEATH THE BOOM WITHOUT FIRST PROVIDING ADEQUATE OVERHEAD SLING SUPPORT AND/OR BLOCKING.

(b). Attach an adequate support sling to the boom and draw all slack from the sling. Block the boom if feasible.

(c). From the under side of the machine frame, remove the bolts and lockwashers which attach the retaining yoke of the rotary coupling to the coupling housing.

CAUTION

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID THE ENTRY OF CONTAMINANTS INTO THE SYSTEM.

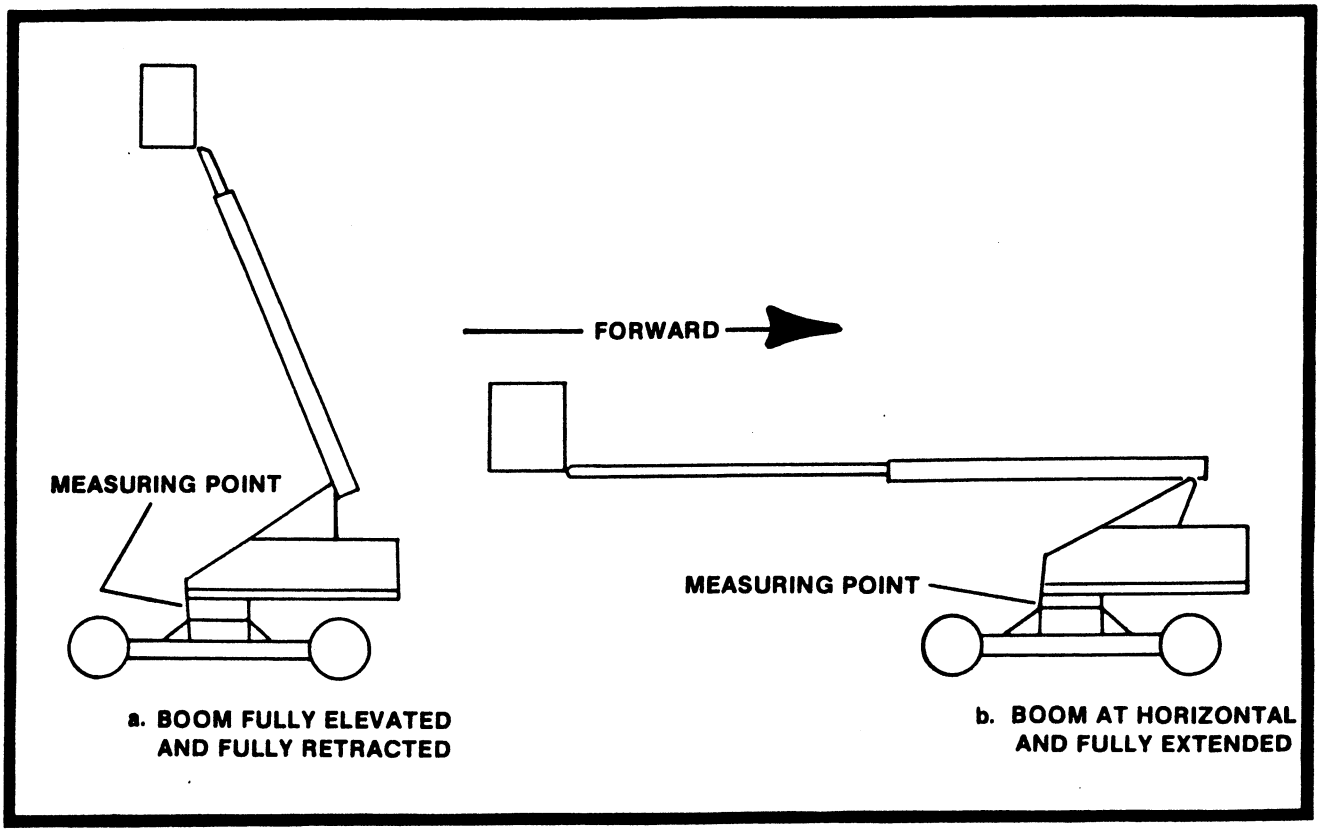


Figure 2-11. Swing Bearing Tolerance Boom Placement.

(d). Tag and disconnect the hydraulic lines from the fittings on the top and sides of the rotary couping. Use a suitable container to retain any residual hydraulic fluid. Immediately cap lines and ports.

(e). Attach suitable overhead lifting equipment to the base of the turntable weldment.

(f). Use a suitable tool to scribe a line on the inner race of the swing bearing and on the underside of the turntable. This line will aid in aligning the bearing upon installation. Remove the bolts, nuts and washers which attach the turntable to the bearing inner race. Discard the nuts and bolts.

(g). Use the lifting equipment to carefully lift the complete turntable assembly from the bearing. Ensure that no damage occurs to the turntable, bearing or frame-mounted components.

(h). Carefully place the turntable on a suitably supported trestle.

(i). Use a suitable tool to scribe a line on the outer race of the swing bearing and the frame. This line will aid in aligning the bearing upon installation. Remove the bolts and washers which attach the outer race of the bearing to the frame. Discard the bolts. Use suitable lifting equipment to remove the bearing from the frame; move the bearing to a clean suitably supported work area.

(2). **Installation.**

Note

Manufacturing tolerances of frames and turntables are inspected prior to the factory installation of swing bearings to determine the need for use of Devcon filler. When servicing machine swing bearing, apply Devcon filler only to those machines having Devcon previously applied at the factory. If new turntable or frame is being installed contact manufacturer for procedures to determine the need for Devcon application.

(a). Use suitable standard tools and equipment to carefully remove any hardened epoxy residue from the bearing mounting area of frame and turntable.

(b). Apply a layer of Devcon (or equivalent) filler approximately 0.125 inches (.318 cm) thick on the bearing mounting plate on the frame.

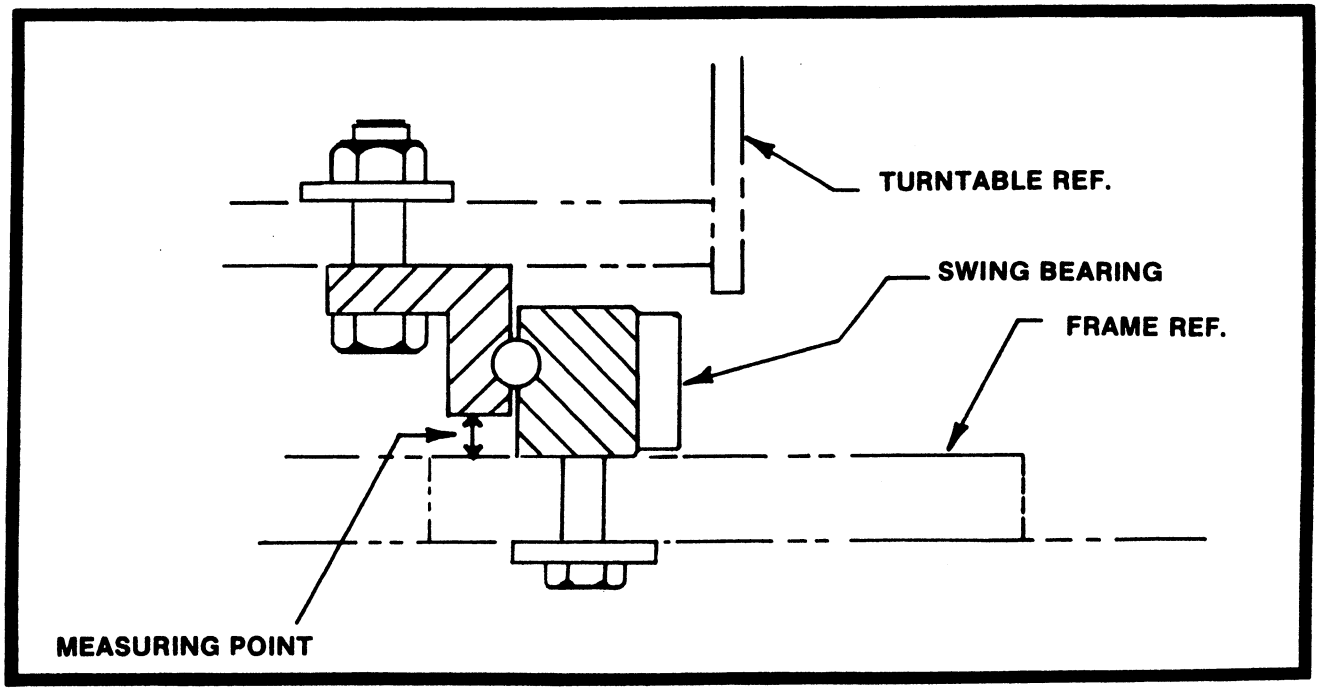


Figure 2-12. Swing Bearing Tolerance Measuring Point.

(c). Use suitable lifting equipment to carefully lower the swing bearing into position on the frame. Ensure that the scribed line of the outer race of the bearing aligns with the scribed mark on the frame (if a new swing bearing is used, ensure that the filler plug fitting is at 90 degrees from the fore and aft centerline of the frame).

(d). Ensure that all frame and bearing attachment holes are aligned, and install four diametrically opposed bolts or clamps to secure the bearing to the frame. Tighten the bolts or clamps evenly in a diametrical pattern to a torque of 20 ft. lbs.

(e). Allow Devcon filler to cure at room temperature (approximately 70 degrees F., 21 degrees C.) for 10 to 16 hours.

(f). After the appropriate interval, release the clamps or remove the bolts. Use a suitable lifting device to carefully remove the bearing from the frame.

(g). Carefully remove any excess filler from the frame mounting area, from the bearing attachment holes, and from between the gear teeth.

WARNING

ENSURE THAT TURNTABLE IS ADEQUATELY SUPPORTED WHILE APPLYING DEVCON AND WHILE INSTALLING THE BEARING. EXTREME CARE MUST BE TAKEN DURING THE FOLLOWING SIX (6) STEPS TO AVOID SERIOUS OR FATAL INJURY TO PERSONNEL.

(h). Apply a layer of Devcon (or equivalent filler) approximately 0.125 inches (.318 cm) thick to the underside of the bearing mounting area of the turntable base plate.

(i). Use suitable hydraulic jacks to carefully raise the swing bearing to the underside of the turntable mounting plate. Ensure that the scribed line of the inner race of the bearing aligns with the scribed mark on the turntable (if a new swing bearing is used, ensure that the filler plug fitting is at 90 degrees from the fore and aft centerline of the turntable).

(j). Ensure that all turntable and bearing attachment holes are aligned, and install four (4) diametrically opposed clamps or bolts and nuts to secure the bearing to the turntable. Tighten the nuts and bolts or clamp evenly in a diametrical pattern to a torque of 20 ft. lbs. (2.78 Kgm).

(k). Allow the Devcon filler to cure to room temperature (approximately 70 degrees F., 21 degrees C.) for 10 to 16 hours.

(l). After the appropriate interval, place a suitable hydraulic jack under the bearing and release the clamps or remove the nuts and bolts; use the hydraulic jack to carefully remove the bearing from the turntable.

(m). Carefully remove excess filler from the turntable mounting area, from the bearing attachment holes and from between the gear teeth.

(n). Position the bearing on the machine frame in the same position as noted in step (c) above.

CAUTION

JLG INDUSTRIES RECOMMENDS THAT ALL REMOVED BEARING NUTS AND BOLTS BE DISCARDED AND REPLACED WITH NEW NUTS AND BOLTS. SINCE THE SWING BEARING IS A STRUCTURAL LINK BETWEEN THE FRAME AND TURNTABLE, IT IS IMPERATIVE THAT SUCH REPLACEMENT HARDWARE MEETS JLG SPECIFICATIONS. USE OF JLG HARDWARE IS REQUIRED.

(o). Apply a light coating of Loctite #277 to the new bearing bolts, and loosely install the bolts, nuts and washers through the frame and outer race of bearing.

CAUTION

IF COMPRESSED AIR OR ELECTRICALLY-OPERATED IMPACT WRENCH IS USED FOR TIGHTENING THE BEARING ATTACHMENT BOLTS THE TORQUE SETTING ACCURACY OF THE TOOL SHOULD BE CHECKED PRIOR TO USE.

(p). Following the Torque Sequence diagram shown in Figure 2-13, tighten the bolts to an initial torque of 127.5 foot pounds (17.72 Kgm). Then following the same sequence tighten the bolts to a final torque of 170 foot pounds (23.63 Kgm).

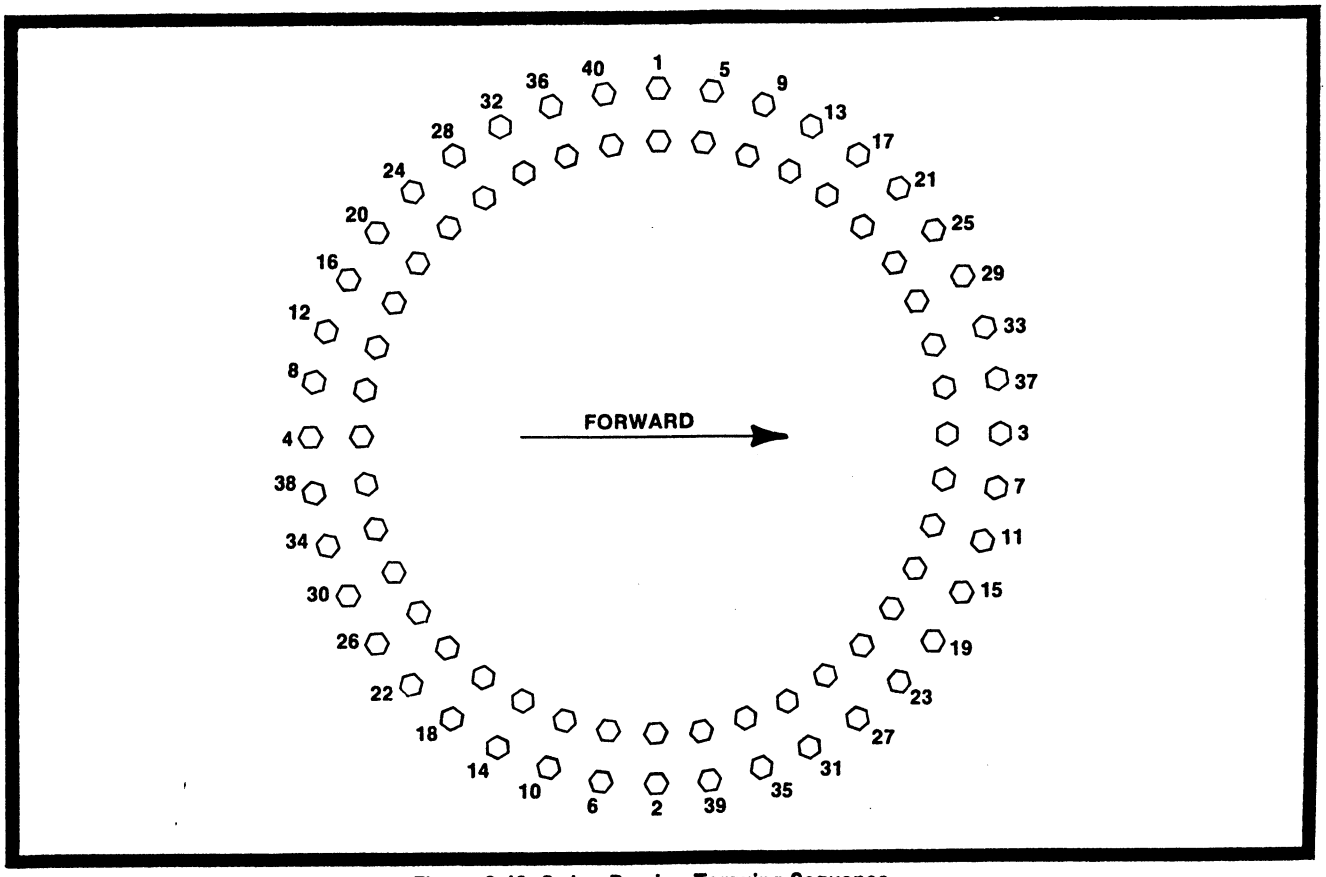


Figure 2-13. Swing Bearing Torquing Sequence.

(q). Remove the lifting equipment from the bearing.

(r). Use suitable lifting equipment to carefully position the turntable assembly above the machine frame.

(s). Carefully lower the turntable onto the swing bearing, ensuring that the turntable and bearing align as noted in step (i) above.

CAUTION

IF COMPRESSED AIR OR ELECTRICALLY-OPERATED IMPACT WRENCH IS USED FOR TIGHTENING THE BEARING ATTACHMENT BOLTS, THE TORQUE SETTING ACCURACY OF THE TOOL SHOULD BE CHECKED PRIOR TO USE.

(t). Apply a light coating of Loctite #277 to the new bearing bolts, and install the bolts, washers and nuts through the turntable and inner race of the bearing.

(u). Following the Torque Sequence diagram shown in Figure 2-13, tighten the bolts to an initial torque of 127.5 foot pounds (17.72 Kgm). Then following the same sequence tighten the bolts to a final torque of 170 foot pounds (23.63 Kgm).

(v). Remove the lifting equipment.

(w). Install the rotary coupling retaining yoke; apply a light coating of Loctite Sealant Number TL277-41 to the attaching bolts and secure the yoke to the rotary coupling with the bolts and lockwashers.

(x). Connect the hydraulic lines to the rotary coupling as tagged prior to removal.

(y). Use the manual descent valves to lower the platform to the stowed position.

(z). Using all applicable safety precautions, activate the hydraulic system and functionally check the swing system for proper and safe operation.

c. Swing Bearing Torquing Procedures.

(1). Outer Race - 170 FT LB (23.63 Kgm) Wet, 220 FT LB (30.58 Kgm) Dry.

(2). Inner Race - 170 FT LB (23.63 Kgm) Wet, 220 FT LB (30.58 Kgm) Dry.

(3). Swing Bearing Torquing Sequence, see Figure 2-13.

WARNING

RETORQUE INNER AND OUTER SWING BEARING BOLTS TO 220 FT LB AFTER FIRST 200 HOURS OF OPERATION AND EVERY 500 HOURS THEREAFTER.

2-13. DRIVE HUB TIMING.

a. When repairing or rebuilding the swing or wheel drive hub it is necessary to time the cluster gears.

b. Prior to placing ring gear over cluster gears, rotate the cluster gears until the timing marks are at the 12 o'clock position. See Figure 2-14.

2-14. CONTROLLERS.

a. PQ.

Refer to separate publication p/n (3120304) for complete troubleshooting, wiring and replacement parts.

b. OEM.

Refer to separate publications (OEM Bulletin 106HL, 107HL and 109HL) for description, troubleshooting and field adjustment.

2-15. SPARK ARRESTOR MUFFLERS.

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).

2-16. OSCILLATING AXLE BLEEDING PROCEDURES.

a. Make a hydraulic hose using approximately 6 feet of 1/4" wire braid hose with a quick connect fitting on one end and a 1/4" JIC female fitting on the other.

b. Swing the boom over the front of the machine and engage the turntable lock. Using ground control raise the boom up out of the way.

c. Remove the cover between frame slabs through which the cam valve wheel protrudes.

d. Remove cap from fitting on cam valve and connect your hose (see **a** above) at this point.

e. Attach the other end of hose to the quick connect on the swing brake.

f. Using a foot jack (or overhead crane) raise one front wheel approximately 6" off the ground.

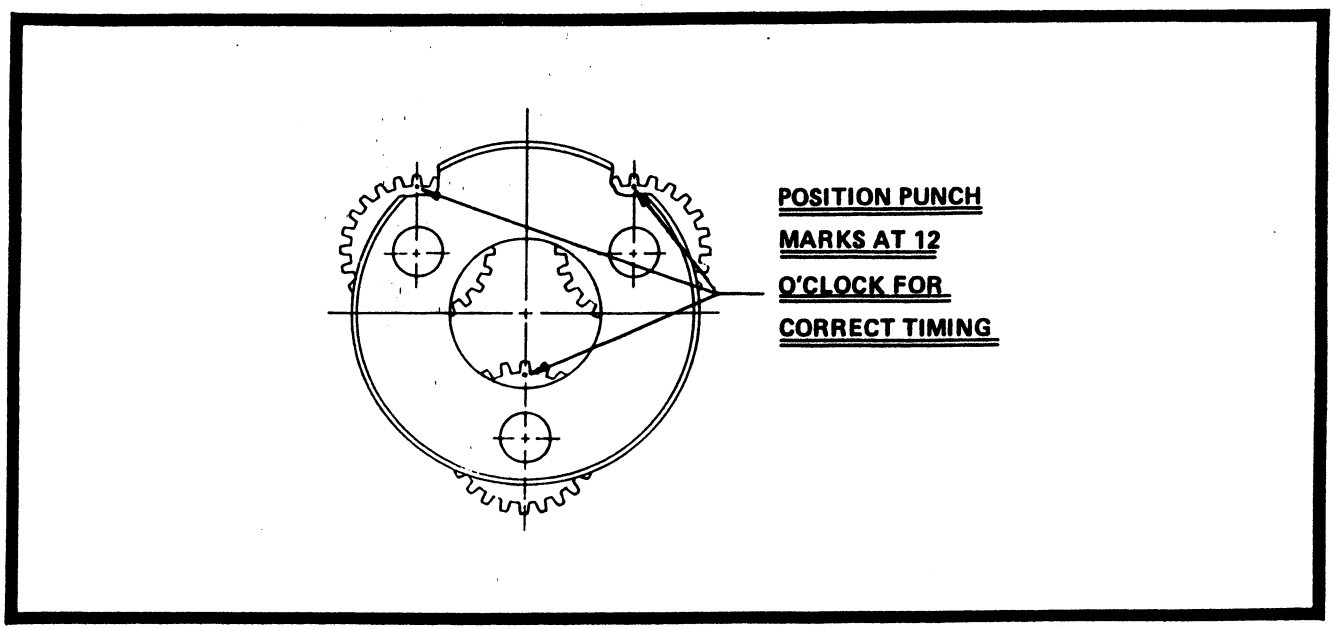


Figure 2-14. Drive Hub Carrier Timing.

g. Use a bar as a lever to press down on the cam valve plunger which will allow the axle to fully oscillate against the stop.

h. With the aid of an assistant, start the engine from ground control.

WARNING

ENSURE TURNTABLE LOCK IS ENGAGED.

i. While your assistant activates swing from ground control, depress plunger on cam valve and open both bleeders on the lockout cylinder of the elevated wheel purging any air. Next open the bleeders to the lockout cylinder on the opposite side purging any air.

j. Remove the jack from the elevated wheel and using the bar again press down on the cam valve plunger allowing the axle to center.

k. Next raise the other front wheel as you did in step **f** and repeat steps **g** through **j**.

l. Shut down the engine, remove the hose, and replace the cap on the cam valve fitting. Install frame cover over cam valve and disengage turntable lock.

m. The boom can now be returned to its normal position.

2-17. DRIVE MOTOR (Vickers).

a. No periodic adjustments are required.

b. The best check if you suspect a problem is measuring case drain flow using a flowmeter. More than 1.5 gpm (5.68 lpm) indicates extreme wear.

c. Scratches on wafer plate (7009310) indicates contaminated hydraulic oil. Determine source of contamination and make corrections. Drain hydraulic oil, clean system, and refill with new clean oil. Replace wafer plate.

d. To avoid failure of new or rebuilt motors, always fill case with hydraulic fluid prior to startup.

2-18. 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 respresent 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.

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 movement.

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 condition of element; replace as necessary.

15. Check for proper inflation.

16. Clean or replace suction screen.

PREVENTIVE MAINTENANCE AND INSPECTION SCHEDULE

AREA	INTERVAL				
BOOM	(10 HRS) DAILY	(50 HRS) WEEKLY	(200 HRS) MONTHLY	(500 HRS) 3 MONTH	(1000 HRS) 6 MONTH
1. Basket Door	1,4	12			
2. Basket	1,4				
3. Basket Rotator (If so equipped)	12	5,11	8		
4. Footswitch	1,11				
5. Controllers	1,11				
6. Switches	1,11				
7. Capacity Indicator	2,7				
8. Placards and Decals	1,2				
9. Control Tags	1,2				
10. Steering Wheel (If so equipped)	1,11	5	8		
11. Valves		5,6			
12. Carrier (Hose and Cable)	1	4,8			
13. Hydraulic Hoses and Tubing	1	5			
14. Pins		12	8		
15. Bushings		12	8		
16. Wear Pads			8		
17. Chains			8	12	
18. Chain Adjusters			9		
19. Sheaves		12	8		
20. Cylinders	12	1,5,6,13			

PREVENTIVE MAINTENANCE AND INSPECTION SCHEDULE (CONTINUED).

AREA	INTERVAL				
TURNTABLE	**(10 HRS) DAILY**	**(50 HRS) WEEKLY**	**(200 HRS) MONTHLY**	**(500 HRS) 3 MONTH**	**(1000 HRS) 6 MONTH**
1. Engine Oil (Refer to mfr. manual for detailed maint. schedule)	3	5			
2. Battery	1,3	5			
3. Radiator (If so equipped)		3,5			
4. Air Cleaner	1	14			
5. Exhaust System	1		1,5		
6. Engine Mounts			1		
7. Gauges/Ground Controls	1,2,11				
8. Main Hydraulic Pump	1	5			
9. Auxiliary Power Pump	1	5			
10. Valves	1	5			
11. Hydraulic Filters	14	5			
12. Hydraulic Hoses and Tubing	1	5			
13. Hydraulic Oil Tank *	3	5	4		16
14. Breather Hydraulic Tank		6,14			
15. Fuel Tank	3,5		4		
16. Cylinders	12	1,5,6,13	4		
17. Shields	1				
18. Turntable Locking Pin	1,7		4		
19. Horizontal Limit Switch	1,7				
20. Oil Coupling		5			
21. Placards and Decals	1,2				
22. Swing Bearing		1,12		9	
23. Swing Torque Hub		1,3,5,6		10	
24. Swing Brake		1,5,6	8		

*Inspection and Maintenance Code 10 to be performed annually.

CHASSIS	**(10 HRS) DAILY**	**(50 HRS) WEEKLY**	**(200 HRS) MONTHLY**	**(500 HRS) 3 MONTH**	**(1000 HRS) 6 MONTH**
1. Wheel and Tire Assembly	1	8,15,9			
2. Drive Motors		1,5,6			
3. Drive Torque Hubs		1,3,5,6		10	
4. Drive Brakes		1,5,6	8		
5. Steer Cylinder	1	5,6,12,13			
6. Steer Components	1	4,6,12	8		
7. Lockout Cylinders (If so equipped)	1	5,12,13			
8. Front Axle Pin (If so equipped)	1	12	8		
9. Hydraulic Hoses and Tubing	1	5			
10. Placards and Decals	1,2				
11. Shields	1				
12. Wheel Bearings			8	12	
13. Swing Bearing/Pinion Gear				9,12	

*Inspection and Maintenance Code 10 to be performed annually.

3-1. GENERAL.

a. This section 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 section 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 this manual are contained in the applicable engine maintenance manual.

3-2. TROUBLESHOOTING INFORMATION.

a. The troubleshooting procedures are listed and defined in Tables 3-1 through 3-6. As an aid to table use, the aerial platfrom is divided into six major groups, each covered separately within this section. These groups are as follows: platform assembly, boom assembly, turntable assembly, frame assembly, 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 action should, where possible, be checked in 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.

d. It should also 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 of 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 section.

e. The first rule for troubleshooting any circuit that is hydraulically operated and electrically controlled is to determine if the circuit is lacking hydraulic oil or electrical control power. This can be ascertained by overriding the bypass valve (mechanically or electrically) so that oil is available to the function valve, then overriding the function valve mechanically. If the function performs satisfactorily, the problem exists with the control circuit.

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 problems 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 control would follow. For aid in troubleshooting, refer to the illustrated parts manual for hydraulic diagrams of the various circuits.

Table 3-1. Platform Assembly Troubleshooting.

TROUBLESHOOTING CHART		
TROUBLE	**PROBABLE CAUSE**	**REMEDY**
Platform Leveling System.		
Automatic leveling inoperative.	Hydraulic system oil low.	Replenish oil as necessary.
	Dual pilot check valves dirty/inoperative.	Clean or replace as necessary.
	Restricted or broken hydraulic line or fitting on slave cylinder or master leveling cylinder.	Clean, repair, or replace line or fitting.
	Spit valve(s) leaking.	Clean, repair, or replace spit valve(s).
	Worn seal(s) in slave or master leveling cylinder.	Replace seal(s).
	Slave or master leveling cylinder not functioning properly.	Repair or replace cylinder.
Platform will not maintain level attitude.	Counterbalance valve on slave leveling cylinder improperly adjusted or not functioning properly.	Replace valve.
	Spit valve leaking.	Clean or replace valve.
	Worn seal(s) in slave cylinder or master leveling cylinder.	Replace seal(s).
No response to platform leveling controls.	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 or fitting.	Clean, repair, or replace line or fitting.
	Control valve not functioning properly.	Repair or replace valve.
	Slave cylinder not functioning properly.	Repair or replace cylinder.
Platform will not adjust "up" to level.	Damaged wiring on control switch or solenoid valve.	Repair or replace wiring.
	Restricted or broken hydraulic line or fitting.	Clean, repair, or replace line or fitting.
	Slave cylinder not functioning properly.	Repair or replace cylinder.
Platform will not adjust "down" to level.	(See: Platform will not adjust "up" to level.)	

Table 3-2. Boom Assembly Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Boom Elevation System.		
No response to control.	Lift control inoperative.	Repair or replace control lever.
	Dump valve (bypass) not operating.	Determine cause and repair/replace valve.
	Hydraulic system oil low.	Replenish oil as necessary.
	Restricted or broken supply line on valve bank or hydraulic pump.	Clean or replace line.
	Control valve not functioning properly.	Repair or replace valve.
	Lift cylinder not functioning properly.	Repair or replace cylinder.
	Hydraulic pump not functioning properly.	Repair or replace pump.
Boom will not raise.	Load capacity exceeded (personnel or equipment on platform).	Reduce load.(Refer to capacity placard.)
	Hydraulic system oil low.	Replenish oil as necessary.
	Restricted or broken hydraulic line or fitting.	Clean, repair, or replace line or fitting.
	Control valve not functioning properly.	Repair or replace valve.
	Pressure relief valve not functioning properly.	Re-adjust or replace valve.
	Bypass valve (dump) not functioning.	Repair or replace valve.
	Lift cylinder not functioning properly.	Repair or replace cylinder.
Boom will not lower.	(See: Boom will not raise.)	
	Pressure relief valve not functioning properly.	Re-adjust or replace valve.
Boom 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 shafts and/or boom pivot.	Lubricate as required. (Refer to Lubrication Chart.)

Table 3-2. Boom Assembly Troubleshooting.

TROUBLESHOOTING CHART		
TROUBLE	**PROBABLE CAUSE**	**REMEDY**
Boom raises and lowers erratically (continued).	Counterbalance valve on lift cylinder improperly adjusted or not functioning properly.	Replace valve.
	Control valve not functioning properly.	Repair or replace valve.
	Worn seals in lift cylinder.	Replace seals.
	Cylinder not functioning properly.	Repair or replace cylinder.
Boom drifts down.	Manual lowering valve not functioning properly.	Repair or replace valve.
	Worn seals in lift cylinder.	Replace seals.
	Holding valve on cylinder not functioning properly.	Repair or replace valve.
High engine does not operate below horizontal.	Damaged wiring on whisker switch.	Repair or replace wiring.
	Damaged whisker switch.	Replace switch, repair or replace holder.
	Pin #2 (on drive controller) does not have +12V available when drive controller is activated.	Replace drive controller.
Telescope 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 or control valve not functioning properly.	Replace switch or valve.
	Restricted or broken supply line on valve bank or hydraulic pump.	Clean or replace line.
	Telescope cylinder not functioning properly.	Repair or replace cylinder.
	Hydraulic pump not functioning properly.	Repair or replace pump.

Table 3-2. Boom Ass y Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Telescope System. (Continued)		
Boom will not extend.	Damaged wiring on control switch or solenoid valve.	Repair or replace wiring.
	Solenoid valve not functioning properly.	Repair or replace valve.
	Control switch not functioning properly.	Replace switch.
	Restricted or broken hydraulic line or fitting.	Clean, repair, or replace line or fitting.
	Pressure setting incorrect.	Check pressure/re-adjust as necessary.
	Telescope cylinder not functioning properly.	Repair or replace cylinder.
Boom extends and retracts erratically.	Hydraulic system oil low.	Replenish oil as necessary.
	Wear pads not adjusted or worn.	Adjust or replace pads as required.
	Control switch not functioning properly.	Replace switch.
	Restricted or broken hydraulic line or fitting.	Clean, repair, or replace line or fitting.
	Control valve not functioning properly.	Repair or replace valve.
	Worn seals in telescope cylinder.	Replace seals.
	Cylinder not functioning properly.	Repair or replace cylinder.
	Distorted boom section(s).	Replace distorted section(s).
	Chain sprockets/sheaves worn.	Replace worn/damaged components.
	Counterbalance valve not functioning properly.	Replace counterbalance valve.
Fly section inoperative.	Broken drive chain.	Repair or replace chain.
	Broken drive sprocket or bent sprocket shaft.	Replace shaft assembly.
Fly section extends and retracts erratically.	Drive chain out of adjustment.	Adjust chain as required.
	Wear pads out of adjustment or worn.	Adjust or replace pads as required.
	Damaged/worn drive sprocket or chain links.	Repair or replace chain or sprocket as required.
	Fly section distorted.	Replace fly section.

Table 3-2. Boom Assembly Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Boom Swing System.		
No response to control.	Hydraulic system oil low.	Replenish oil as necesary.
	Swing control switches not functioning.	Repair or replace swing switches.
	Restricted or broken supply line on valve bank or hydraulic pump.	Clean or replace line.
	Control valve not functioning properly.	Repair or replace valve.
	Swing motor not functioning properly.	Repair or replace motor.
	Swing brake not releasing.	Repair or replace brake.
	Speed reducer not functioning properly.	Repair or replace speed reducer.
	Foreign object(s) wedged between speed reducer pinion and swing gear.	Remove objects, check for damage, and repair or replace component(s) as required.
	Sheared shaft on swing motor/brake.	Repair or replace motor/brake.
Boom will swing in only one direction.	Restricted or broken hydraulic line or fitting.	Clean, repair, or replace line or fitting.
	Control valve not functioning properly.	Repair or replace valve.
	Foreign object(s) wedged between speed reducer pinion and swing gear.	Remove object(s), check for damage and repair or replace component(s) as requried.
	Swing control switch not functioning properly.	Ascertain cause and repair or replace swing switch.
	Brake shuttle valve defective.	Replace shuttle valve.

Table 3-2. Boom Assembly Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Boom Swing System (Cont'd)		
Boom swings erratically in either direction.	Hydraulic system oil low.	Replenish oil as necessary.
	Lack of lubricant on swing gear or speed reducer pinion.	Lubricate as required. (See Lubrication Chart.)
	Swing motor not functioning properly.	Repair or replace motor.
	Speed reducer not functioning properly.	Repair or replace speed reducer.
	Worn or broken teeth on swing gear or speed reducer pinion.	Replace gear(s) as required.
	Swing brake not functioning properly.	Repair or replace swing brake.

Table 3-3. Turntable Assembly Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Power Plant.		
Engine will not start.	Station power selector switch not in required position.	Actuate switch as required.
	Circuit breaker open.	Determine and correct cause; reset circuit breaker.
	Defective starter motor.	Replace starter motor.
	Damaged wiring in ignition circuit (broken wire on starter).	Replace or repair wiring.
	Ignition switch not functioning properly.	Replace switch.
	Defective start solenoid.	Replace start solenoid.
	Ignition circuit shorted to ground.	Repair circuit as required.
	Battery cable(s) not making contact.	Clean and tighten cable(s).
Engine will not start. (Ignition O.K.)	No fuel.	Replenish fuel as necessary.
	Restricted or broken fuel line.	Clean or replace.
	Battery defective or requires charging.	Replace or charge battery, as required.
Engine will not accelerate above low/idle speed.	Damaged wiring on speed control switch or governor solenoid.	Repair or replace wiring.
	Speed control Adeco not functioning properly.	Replace switch.
	Governor not functioning properly.	Repair or replace governor.
	Boom whisker switch not functioning properly or improperly adjusted.	Adjust, repair, or replace boom whisker switch.
	Control handle not funtioning properly.	

Table 3-3. Turntable / mbly Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Control Valves.		
Valve spool sticking.	Dirt in oil causing excessive temperature build-up.	Change oil using recommended viscosity and flush system.
	Incorrect valve mounting causing warping of the unit.	Loosen valve and check mounting. Repair as necessary.
	Valve spool scored.	Remove valve and repair or replace as necessary.
	Return spring weak or broken.	Remove valve and repair or replace as necessary.
	Relief valve malfunctioning causing excessive pressure within valve.	Check pressure delivery to and from valve and repair or replace as necessary.
Valve leaking.	Dirt or other foreign material under seal.	Remove and repair valve as necessary.
	Valve spool scored.	Remove valve and repair or replace as necessary.
	Excessive back pressure caused by restricted return line to reservoir.	Remove line and clear obstruction or replace line as necessary.
	Damaged valve seals.	Remove valve and repair or replace as necessary.
Fuel System.		
Strong fuel odor during machine operation.	Fuel tank overfilled.	Check fuel tank and immediately wipe up any spilled fuel.
	Fuel tank damaged.	Drain all fuel from tank and remove tank for replacement or repair.
	Fuel line from tank damaged.	Replace fuel line.

Table 3-4. Chassis Assembly Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Front Frame Axle Area.		
One or both front wheels will not steer.	Steering link or tie rod broken or attaching hardware missing.	Replace steering link, tie rod or hardware as necessary.
One or both front wheels will not rotate or rotate erratically.	Wheel hub or bearings damaged or not lubricated.	Replace hub or bearings as necessary and repack bearings with approved grease.
	Hub attachment nut loose or missing.	Secure or replace hub attachment nut cotter pin as necessary.
Rear Frame Axle Area		
Difficulty encountered when moving machine	Load capacity exceeded.	Reduce load. Apply loads only in accordance with load capacity indicator.
	Machine being moved up too steep a grade.	Remove machine from grade and check that drive system operates correctly.
	Drive wheel tire treads worn smooth.	Replace tires as necessary and inflate to specified pressure.
	System pressure too low.	Re-adjust pressure.
Drive System.		
No response to control.	Hydraulic system oil low.	Replenish oil as necessary.
	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 or rotary coupling.	Clean, repair or replace line.
	Rotary coupling leaking internally. (Seals worn.)	Repair or replace coupling.
	Drive motor(s) not functioning properly.	Repair or replace motor(s).

Table 3-4. Chassis Assembly Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
No response to control (continued).	Air in wheel brake circuit.	Bleed circuit, determine and correct cause.
	Damaged wiring on control switch.	Repair or replace wiring.
	Control switch not functioning properly.	Replace switch.
	Brake(s) not releasing.	Determine cause and repair or replace.
Machine drives erratically.	Microswitch on controller improperly adjusted.	Adjust microswitch on controller for proper operation.
Cessna 2 Speed Drive Circuit (if so equipped)		
Machine will not travel in forward.	Hydraulic system oil low.	Replenish oil as necessary.
	Restricted or broken hydraulic line or fitting.	Clean, repair or replace line or fitting.
	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.
	Counterbalance valve sticking on return side.	Adjust return counterbalance out 3 turns - cycle drive - return to original position.
Machine overspeeds when descending a grade.	Counterbalance valve improperly adjusted or defective.	Adjust or replace valve.
Motor turns slowly in the direction of the last command.	Failed controller resulting in a command at neutral position.	Replace controller.
	Failed pilot valve.	Replace pilot valve.
	Sticking spool due to contamination	Remove end cap and check spool freedom. Repair as necessary.

Table 3-4. Chassis Assembly Troubleshooting.

TROUBLESHOOTING CHART		
TROUBLE	**PROBABLE CAUSE**	**REMEDY**
Cessna 2 Speed Drive Circuit (Continued).		
Motor turns slowly at maximum	Valve spool is not traveling far enough due to:	
	Low pressure gain of pilot valve.	Check fitler in the inlet section for restriction.
	Low control pressure supply.	Replace pressure regulator if necessary.
	Plugged pilot valve.	Change pilot valve.
Poor response, function shuts off slowly when command is removed.	Restricted tank return line.	Check for restrictions in tank return line.
	Low spool spring preload	Check for correct spring and shims in end caps.
	Sticking spool due to contamination.	Remove end cap and check spool freedom.
	Ramp potentiometer adjustment improper.	Re-adjust ramping time on controller.

Table 3-4. Chassis Assembly Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Steering System.		
No response to control.	Circuit breaker open.	Determine and correct cause; reset circuit breaker.
	Steer/Tow selector in "tow" position.	Actuate control to "steer" position. (Valve knob "in".)
	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, hydraulic pump or rotary coupling.	Clean, repair or replace line.
	Swivel coupling leaking internally.(Seals defective.	Repair or replace coupling.)
	Control valve not functioning properly.	Repair or replace valve.
	Steer cylinder not functioning properly.	Repair or replace cylinder.
Machine hard to steer or steering is 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.	Clean or replace valve.
	Steer system pressure low.	Adjust pressures.
	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.

Table 3-4. Chassis Assembly Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Steering Systems (Continued).		
Steering inoperative.	Circuit breaker open.	Determine and correct cause; reset circuit breaker.
	Damaged wiring on control switch or solenoid valve.	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 valves as required.
	Steer cylinder not functioning properly.	Repair or replace cylinder.
Machine will not steer left or to the right.	Wiring on control switch is damaged.	Repair or replace wiring.
	Wiring on solenoid valve damaged.	Repair or replace wiring.
	Coil in solenoid damaged.	Replace coil.
	Bent cylinder rod.	Repair cylinder.
	Damaged tie rod.	Replace tie rod.
	Crossover relief valve sticking.	Repair crossover relief valve.
Machine wanders; steering not firm.	Crossover relief valve set too low or not functioning properly.	Reset, repair or replace valve as required.
	Steer linkages loose.	Tighten linkage.
	Steer wheel toe-in not set properly.	Adjust toe-in as described in Section 2.
	Spindle bushings badly worn.	Replace bushings.

Table 3-5. Hydraulic Sy· ·ns Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART 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.
	Oil filter(s) dirty.	Clean and/or replace filter(s) as necessary.
Pump cavitating. (Vacuum in pump due to oil starvation.)	Restricted suction line.	Clean, repair, or replace line.
	Restricted reservoir air vent.	Clean vent.
	Oil viscosity too high.	Drain system and replace with recommended oil. (Refer to Hydraulic Oils.)
System overheating.	Oil viscosity too high.	Drain system and replace with recommended oil. (Refer to Hydraulic Oils.)
	Bypass valve not operating properly.	Repair or replace valve.
	Main relief valve set too high.	Reset valve as required.
	Hydraulic system oil low.	Replenish oil as necessary.
Pump not delivering oil.	Restricted suction line.	Clean, repair, or replace line.
	Air entering system through broken line or fitting.	Repair or replace line or fitting.
	Broken pump drive shaft/pump coupling.	Repair or replace pump/pump coupling.

Table 3-5. Hydraulic Systems Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Hydraulic Systems - General (Continued).		
Function sluggish during operation. (System pressure too low.)	Main relief valve set too low.	Reset valve as required.
	Main relief valve stuck in open position.	Clean, repair, or replace valve. (Check system oil for contamination.)
	Oil viscosity too low.	Drain system and replace with recommended oil. (Refer to Hydraulic Oils.)
	Leak in component, line or fitting.	Repair or replace component, line or fitting.
	Scored valve spool; scored cylinder.	Replace valve; replace cylinder.
System(s) operate erratically.	Sticking or binding valve spools, pistons, rods, etc.	Clean, repair, or replace components as required.
Auxiliary Hydraulic System.		
Auxiliary hydraulic pump inoperable.	Circuit breaker open.	Determine and correct cause; reset circuit breaker.
	Footswitch not depressed.	Depress footswitch.
	Battery requires charging or will not hold a charge.	Charge or replace battery as required.
	Damaged wiring on control switch or auxiliary pump	Repair or replace wiring.
	Control switch not functioning properly.	Replace switch.
	Restricted or broken hydraulic line or fitting.	Clean, repair or replace line or fitting.
	Pump motor solenoid not functioning properly.	Replace or repair solenoid.
	Pump motor not functioning properly.	Repair or replace motor.
	Low pilot pressure.	Adjust pilot pressure between 250 - 400 psi.

Table 3-6. Electrical S· ·ems Troubleshooting.

TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
P.Q. Hand Controller. **(Racine Valve)**		
Actuation of a function of the valve continues when the handle is in the center position.	Improper null of the valve with the control handle safety deadman switch failed.	Check the safety deadman switch and replace. Re-adjust the null of the valve.
	Improper null of the handle with the handle safety deadman switch failed.	Check the safety deadman switch and replace. Readjust the null of the potentiometer.
Regardless of which way the handle is moved, only one function occurs.	Improper wiring or loose wiring to the solenoids or potentiometer.	Check all wiring for proper connections.
	Printed circuit board failure.	Replace printed circuit board or use a handle assembly from the circuit that is presently working to check valve.
Functions occurs very rapidly when handle is moved in one direction and very slowly when moved in the opposite direction.	Improper null of the handle.	Check and re-adjust null.
Valve will not function when handle is moved in either direction.	Blown fuse.	Replace fuse.
	No electrical power to handle.	Check electrical input to handle (12 v).
	No electrical signal to valve.	Check electrical valve output of printed circuit board and electrical signal at the valve.
	Failed printed circuit board.	Replace square wave generator or use a handle assembly that is presently working in the system.
	Improper grouhd.	Check for proper grounding of handle.
Functions occur in the opposite direction than required in regard to handle movement.	Valve coils are reversed.	Reverse the control valve coils.

Table 3-6. Electrical Systems Troubleshooting.

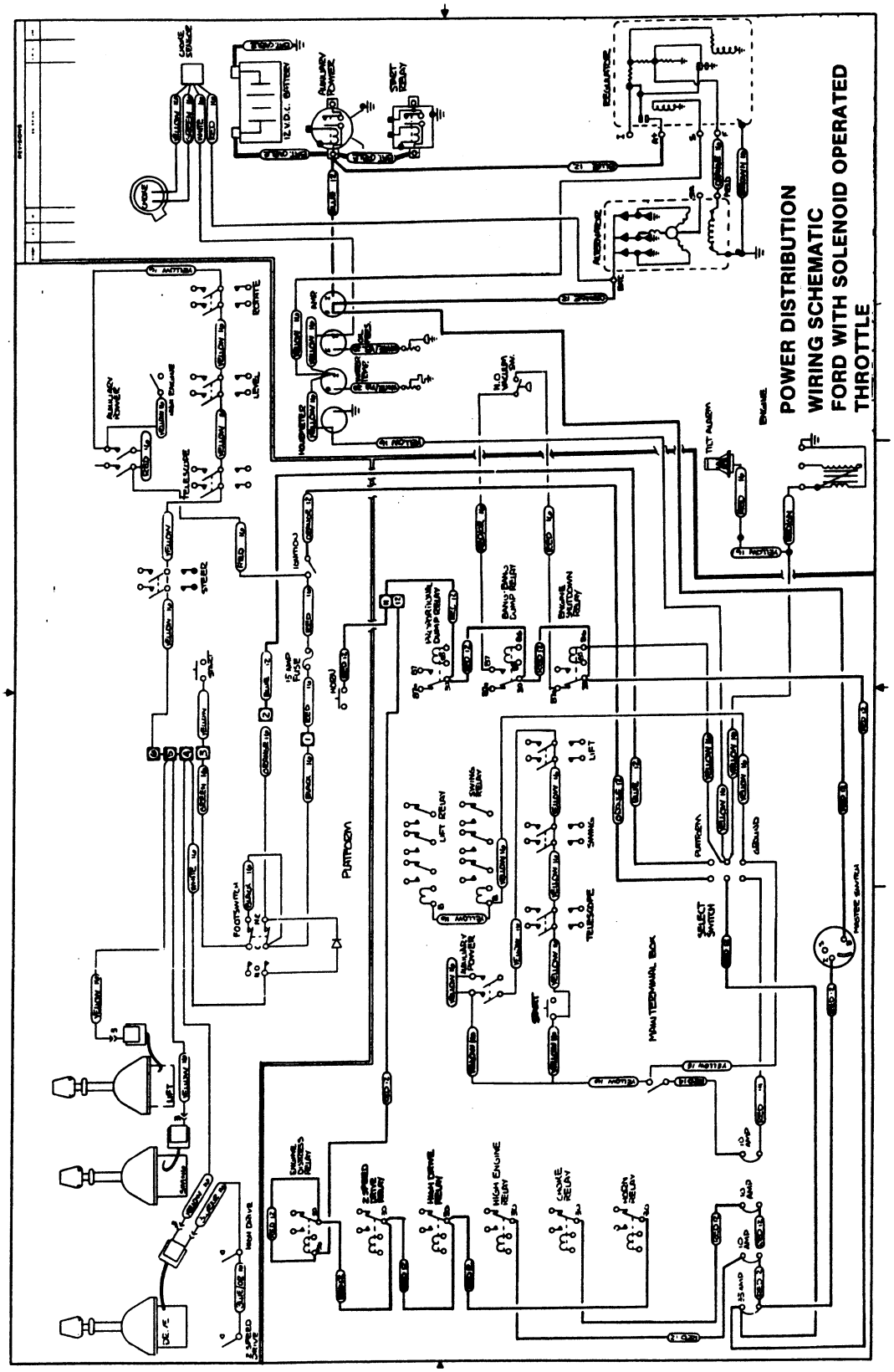
TROUBLESHOOTING CHART		
TROUBLE	**PROBABLE CAUSE**	**REMEDY**
P.Q. Hand Controller (Continued).		
Control valve does not respond to command.	Controller does not provide signal (60 ma maximum required).	Replace controller.
	Open wire in control cable.	Replace cable.
	Shorted terminal connector.	Check for terminal and contacting case or poor clamping of wire ends on terminal strip.
Cylinder drifts or drive motor slowly rotates when controller is returned to neutral (high null bias).	Controller with loose potentiometer resulting in a command at neutral position.	Adjust or replace potentiometer.
Boom Elevation System.		
No response to control.	Control lever inoperative.	Repair or replace control lever.
	Circuit breaker open.	Determine and correct cause; reset circuit breaker.
	Damaged wiring on control solenoid valve.	Perform continuity check and repair or replace control, wiring or solenoid.
	Valve coils improperly grounded.	Check and repair connections.

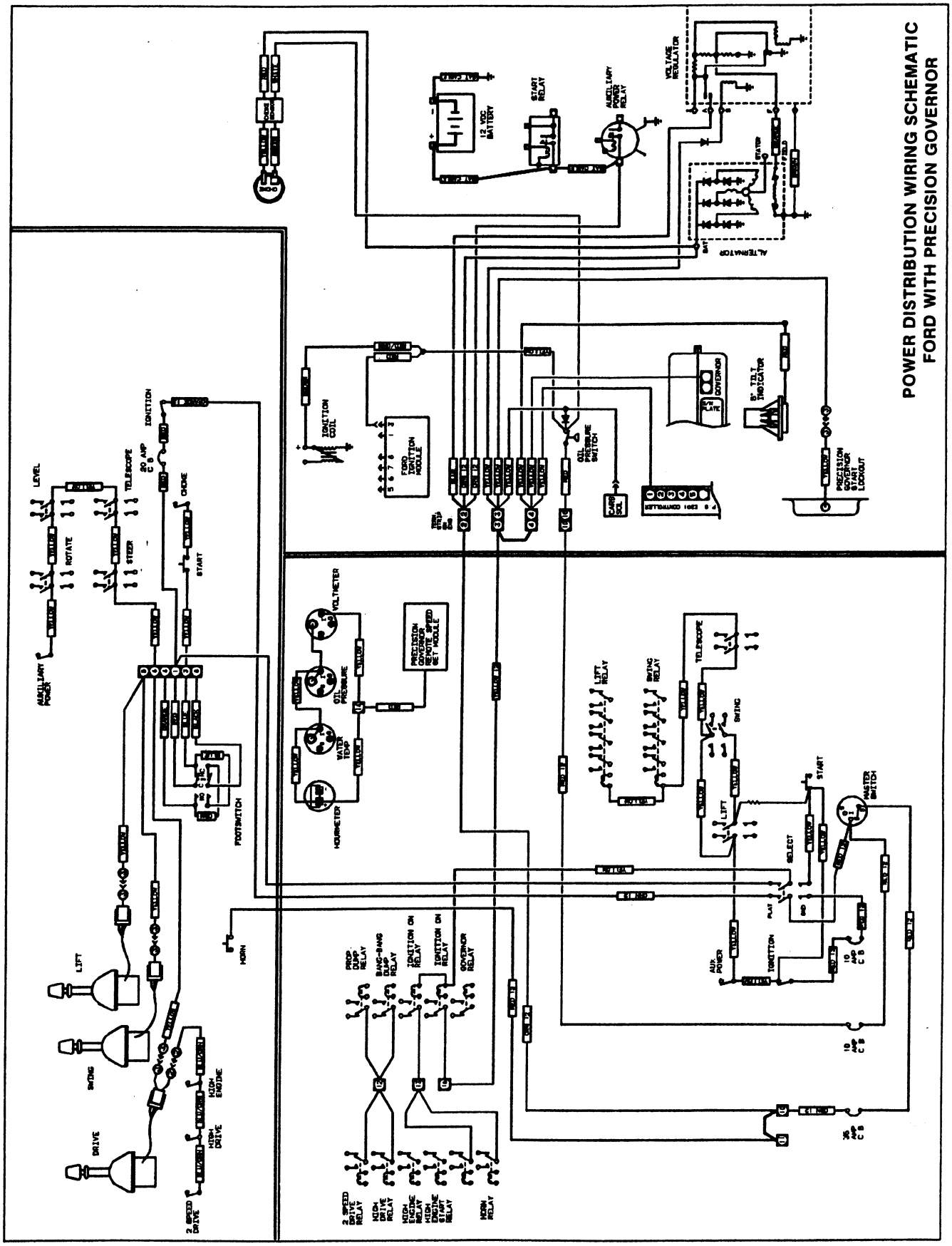
Table 3-6. Electrical Sy ms Troubleshooting.

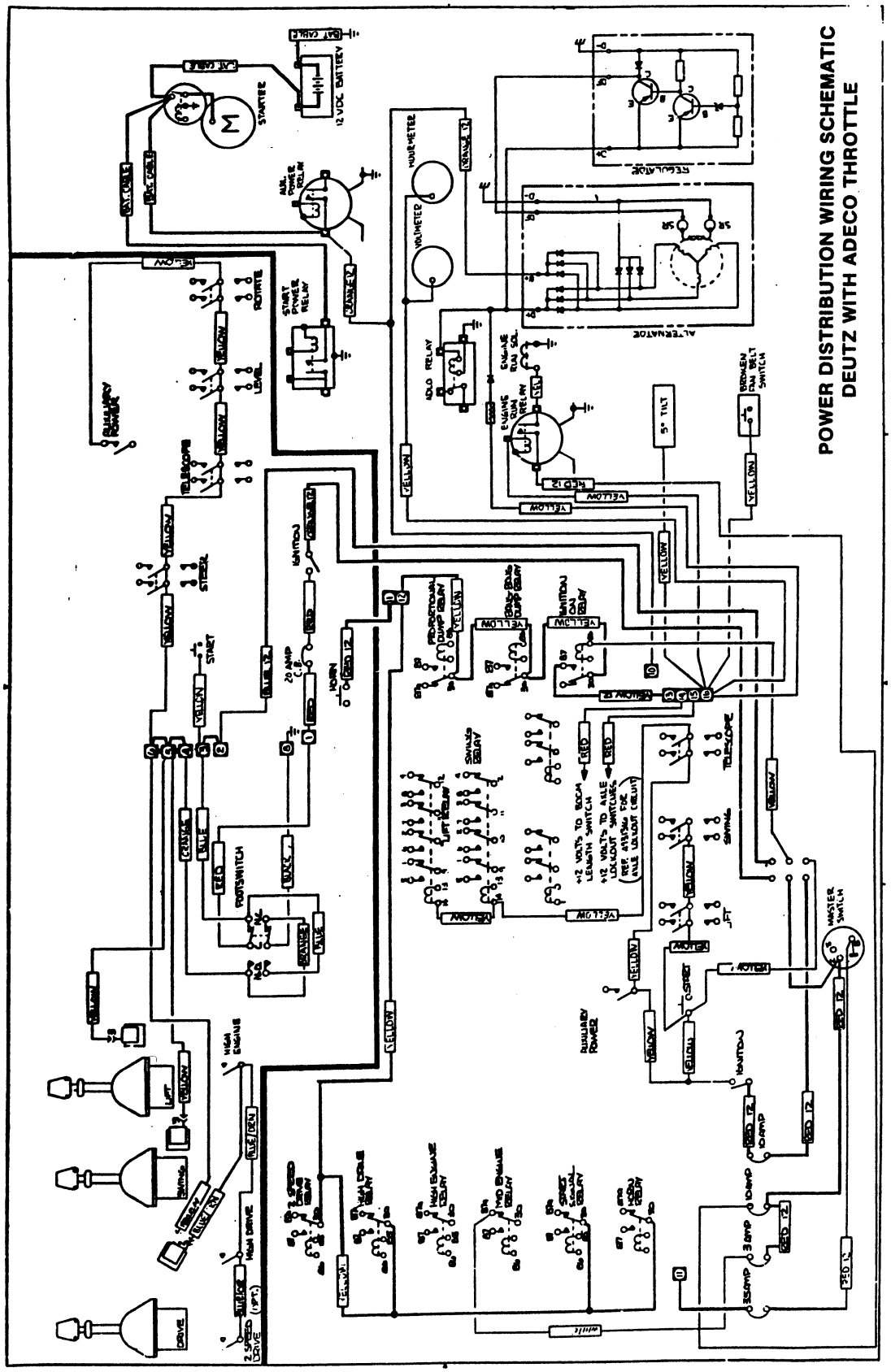
TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Engine Starter System.		
Engine will not crank.	Discharged battery or loose battery terminals.	Check and charge battry or replace battery as necessary. Clean and secure battery terminals.
	Starter relay faulty or faulty relay connections.	Using a test meter, check relay coil terminals for presence of electrical power and for energization of relay coil. Also check relay terminals for correct ing of contacts. Replace relay as necessary.
	Malfunctioning starter solenoid or motor.	Replace solenoid or motor in accordance with applicable manufacturer's manual.
	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 Chapter 5 for wiring diagram.

Table 3-6. Electrical Systems Troubleshooting.

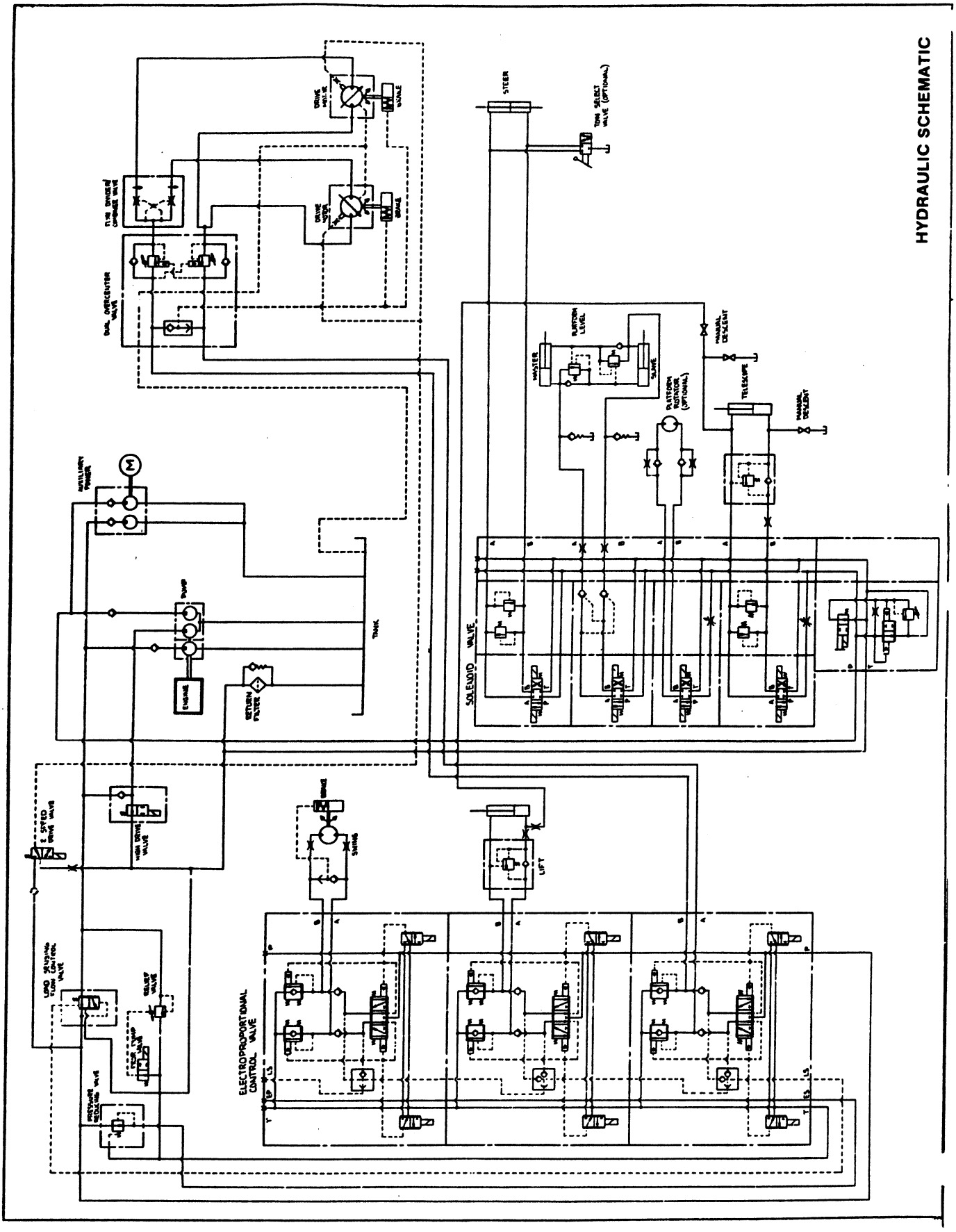
TROUBLE	TROUBLESHOOTING CHART PROBABLE CAUSE	REMEDY
Instruments and Indicators.		
Ammeter inoperative.	Damaged wiring in circuit.	Repair or replace wiring.
	Ammeter not functioning properly.	Replace ammeter.
	Defective charging circuit components.	Check charging system for correct output. Repair or replace as necessary.
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.
Hourmeter inoperative.	Damaged wiring in hourmeter circuit.	Repair or replace wiring.
	Defective vacuum switch.	Replace vacuum switch.
	Inoperative hourmeter.	Replace hourmeter.
Tilt alarm circuit.	Damaged wiring in tilt alarm circuit.	Repair or replace wiring.
	Tilt alarm inoperative.	Replace tilt alarm.
	Tilt alarm not adjusted properly.	Adjust tilt alarm as described in Section 2.
Hi-Low drive speed circuit (Cessna).	Switch damaged or inoperative.	Replace switch.
	Damaged or disconnected wiring in circuit.	Repair or replace wiring.

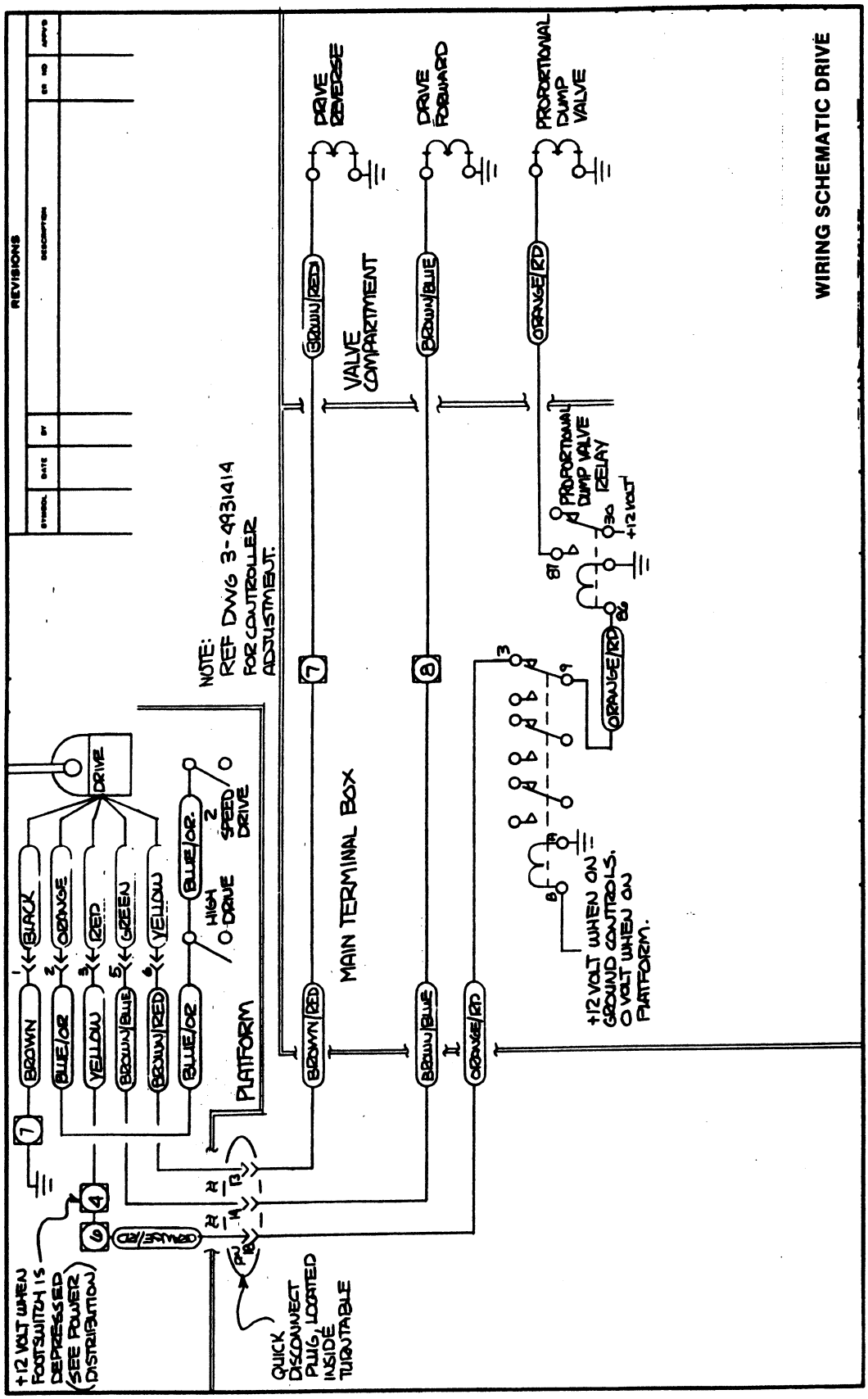

POWER DISTRIBUTION
WIRING SCHEMATIC
FORD WITH SOLENOID OPERATED
THROTTLE

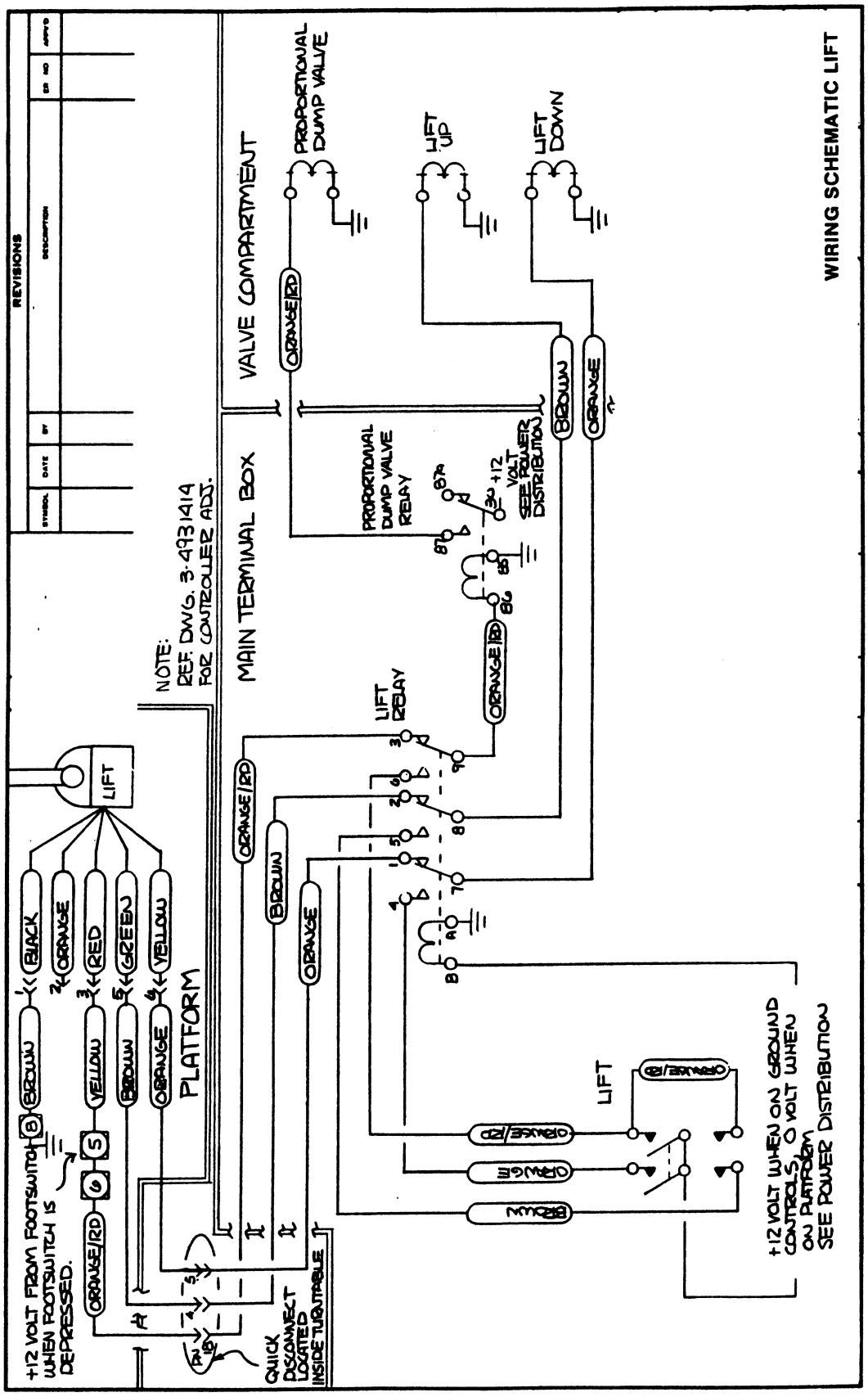

POWER DISTRIBUTION WIRING SCHEMATIC
FORD WITH PRECISION GOVERNOR
12 VDC BATTERY
START RELAY
AUXILIARY POWER RELAY
VOLTAGE REGULATOR
ALTERNATOR
STATOR
FIELD
BAT
IGNITION COIL
FORD IGNITION MODULE
OIL PRESSURE SWITCH
CARB SOL
KEYBOARD 1063
GOVERNOR
5" TILT INDICATOR
PRECISION GOVERNOR START LOCKOUT
VOLTMETER
OIL PRESSURE
WATER TEMP
HOURMETER
PRECISION GOVERNOR REMOTE SPEED SET MODULE
LIFT RELAY
SWING RELAY
TELESCOPE
SWING
LIFT
START
MASTER SWITCH
SELECT
PLAY
AUX POWER
IGNITION
10 AMP C.B.
35 AMP C.B.
LEVEL
ROTATE
STEER
TELESCOPE
20 AMP C.B.
IGNITION
CHOKE
START
AUXILIARY POWER
FOOTSWITCH
HORN
LIFT
SWING
DRIVE
HIGH ENGINE
HIGH DRIVE
2 SPEED DRIVE
PROP DUMP RELAY
BOOM-BANG BAR RELAY
IGNITION ON RELAY
IGNITION ON RELAY
GOVERNOR RELAY
2 SPEED DRIVE RELAY
HIGH DRIVE RELAY
HIGH ENGINE RELAY
HIGH ENGINE START RELAY
HORN RELAY

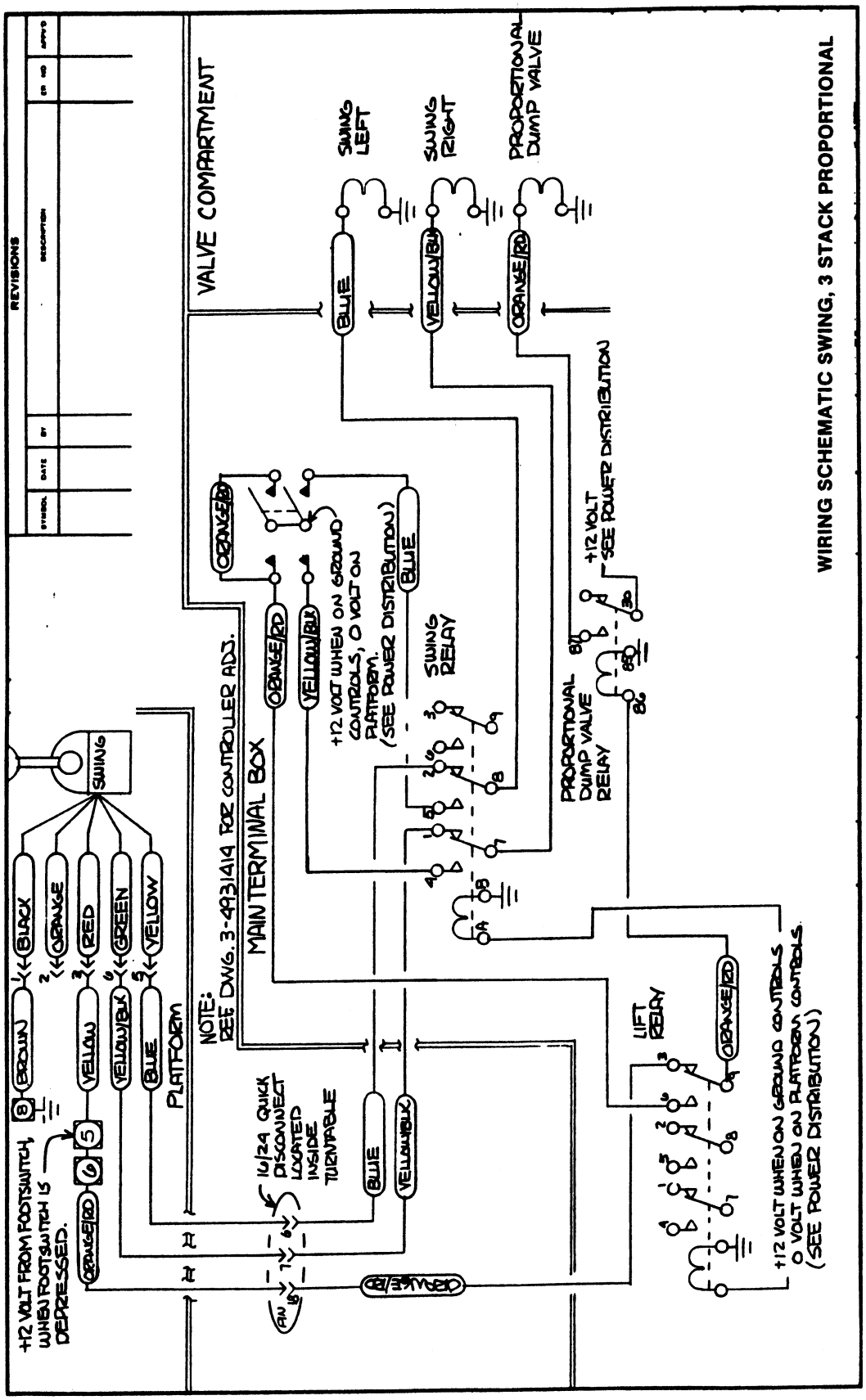

POWER DISTRIBUTION WIRING SCHEMATIC
DEUTZ WITH ADECO THROTTLE

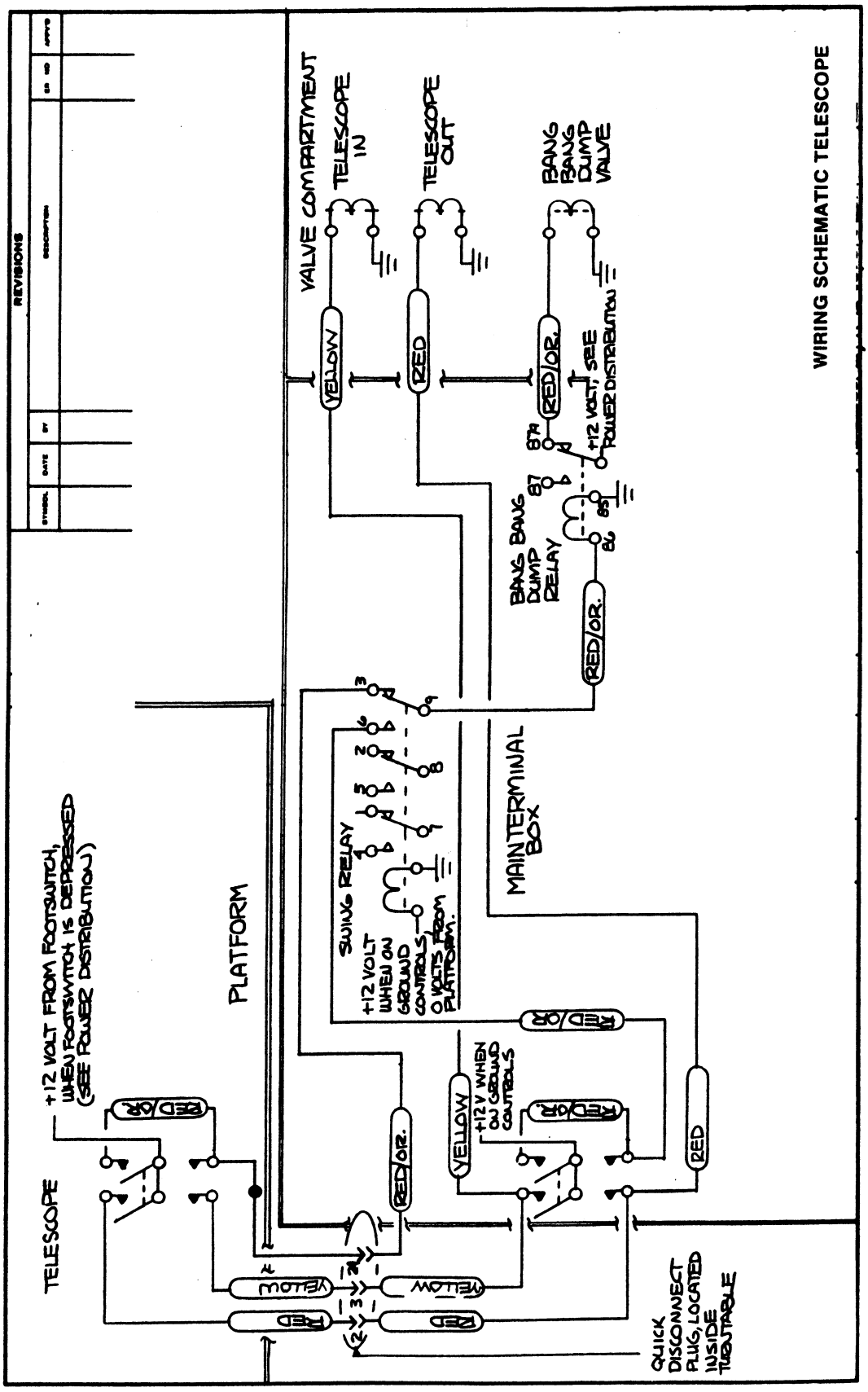
HYDRAULIC SCHEMATIC

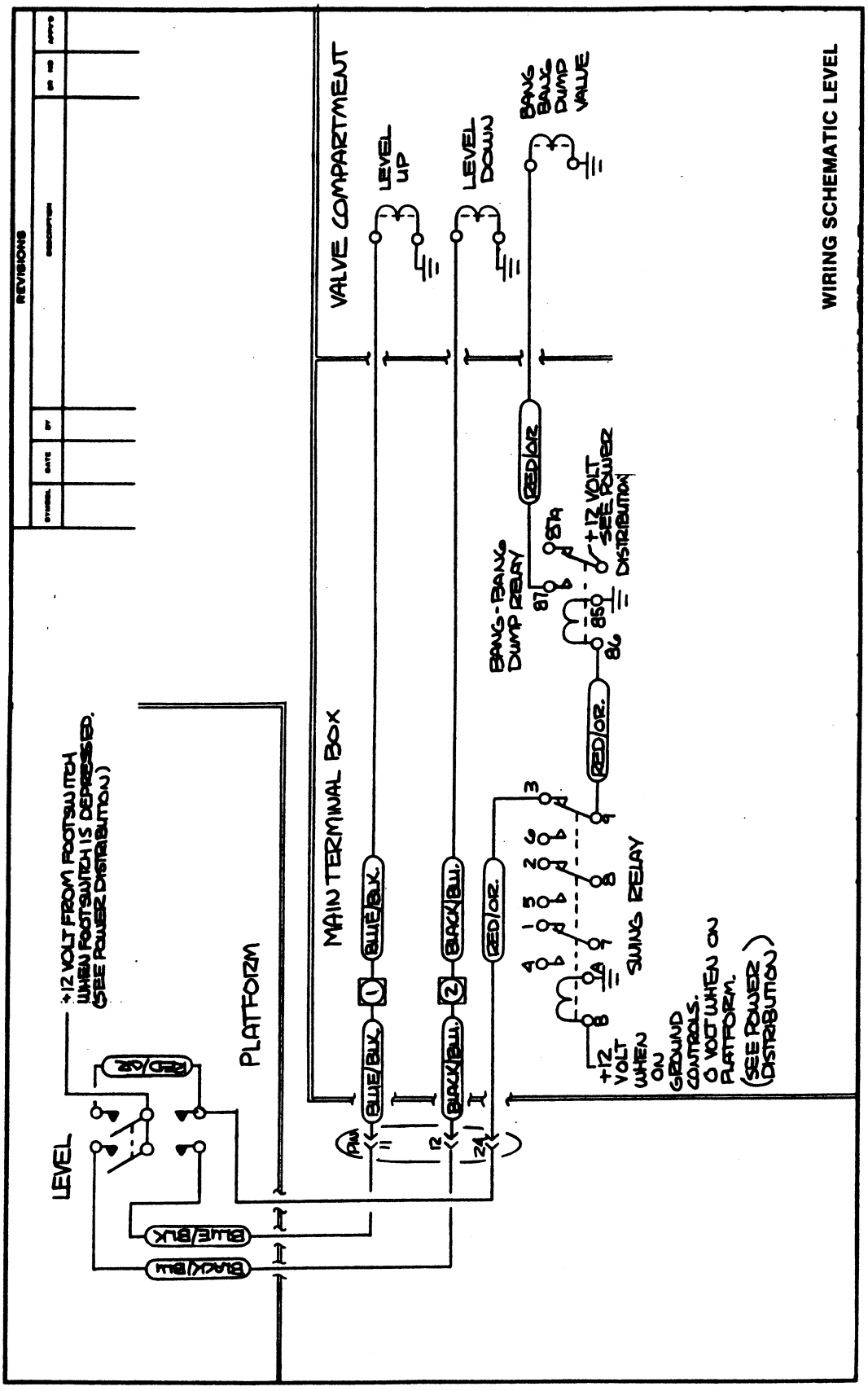


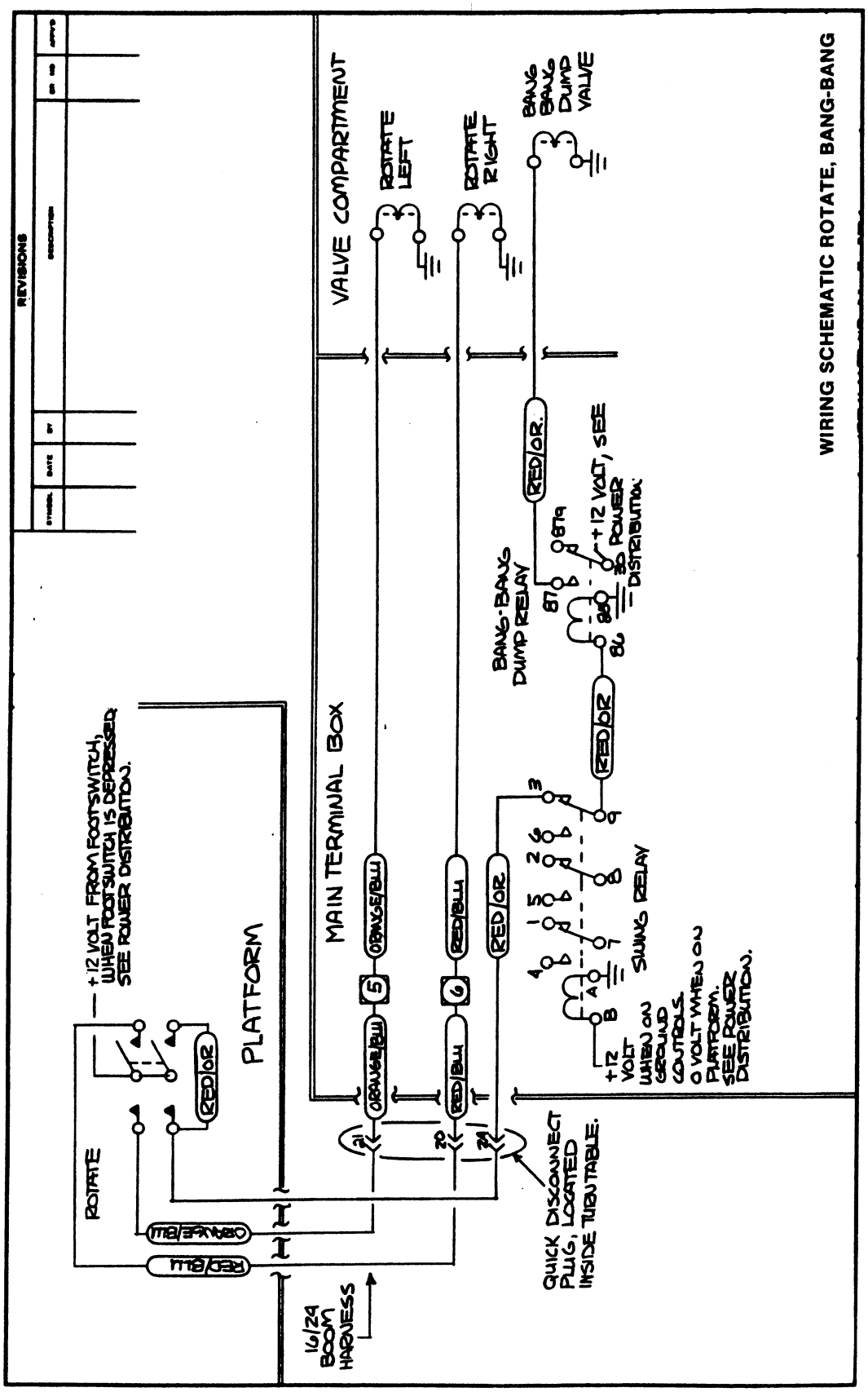

WIRING SCHEMATIC DRIVE
REVISIONS
DRIVE REVERSE
DRIVE FORWARD
PROPORTIONAL DUMP VALVE
VALVE COMPARTMENT
PROPORTIONAL DUMP VALVE RELAY
+12 VOLT
ORANGE/RD
BROWN/RED
BROWN/BLUE
NOTE: REF DWG 3-4931414 FOR CONTROLLER ADJUSTMENT.
MAIN TERMINAL BOX
PLATFORM
BLACK
ORANGE
RED
GREEN
YELLOW
BLUE/OR
BLUE/OR2
HIGH DRIVE SPEED
2 SPEED DRIVE
+12 VOLT WHEN ON GROUND CONTROLS. 0 VOLT WHEN ON PLATFORM.
+12 VOLT WHEN FOOTSWITCH IS DEPRESSED (SEE POWER DISTRIBUTION)
QUICK DISCONNECT PLUG, LOCATED INSIDE TURNTABLE

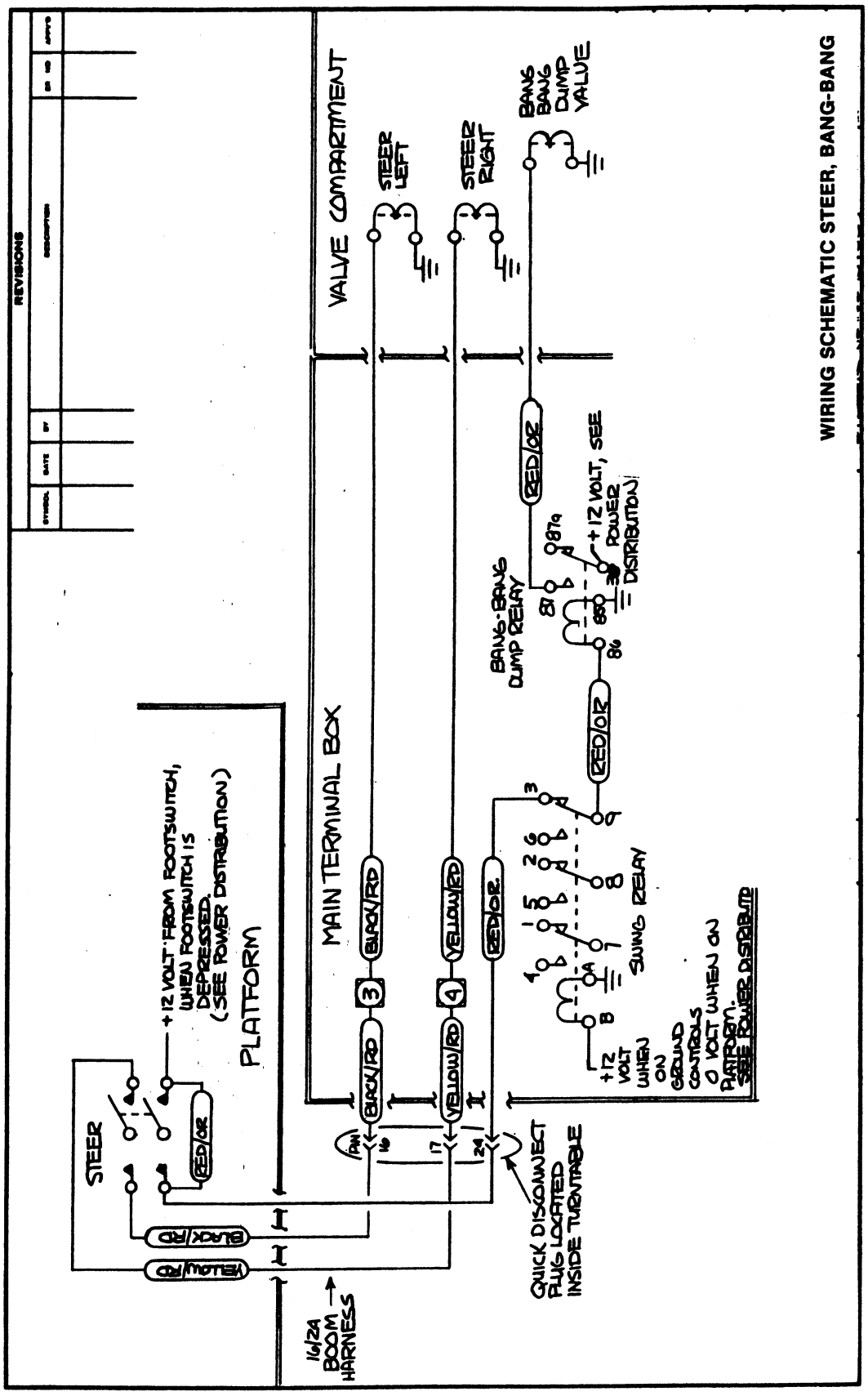

WIRING SCHEMATIC LIFT
REVISIONS
SYMBOL
DATE
BY
DESCRIPTION
ECN NO
APPD
VALVE COMPARTMENT
MAIN TERMINAL BOX
PROPORTIONAL DUMP VALVE
LIFT UP
LIFT DOWN
PROPORTIONAL DUMP VALVE RELAY
+12 VOLT SEE POWER DISTRIBUTION
LIFT RELAY
NOTE: REF. DWG. 3-4931414 FOR CONTROLLER ADD.
PLATFORM
LIFT
+12 VOLT FROM FOOTSWITCH WHEN FOOTSWITCH IS DEPRESSED.
QUICK DISCONNECT LOCATED INSIDE TURNTABLE
+12 VOLT WHEN ON GROUND CONTROLS, 0 VOLT WHEN ON PLATFORM SEE POWER DISTRIBUTION
BLACK
BROWN
ORANGE
RED
GREEN
YELLOW
ORANGE/RD

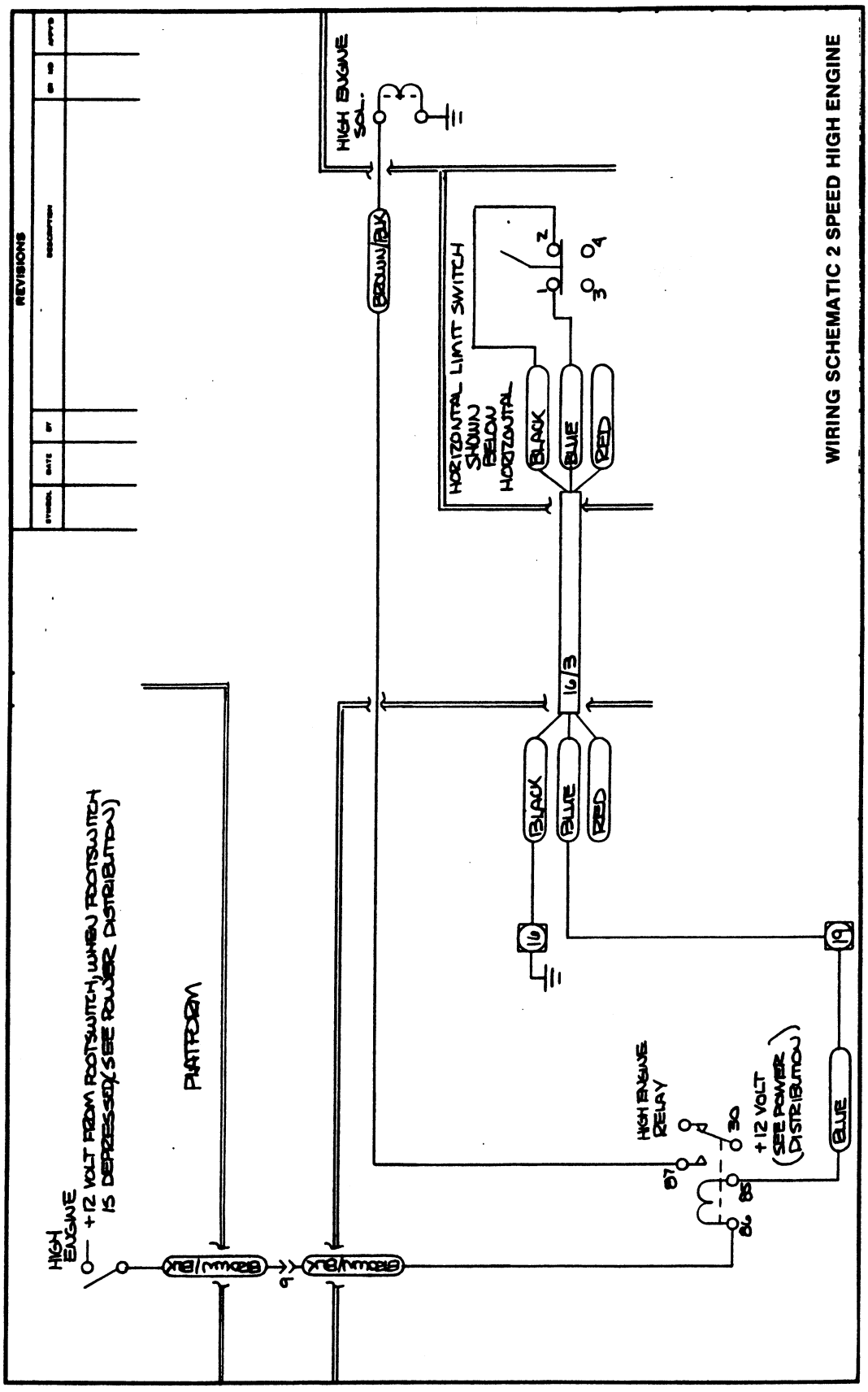

WIRING SCHEMATIC SWING, 3 STACK PROPORTIONAL
REVISIONS
SYMBOL
DATE
BY
DESCRIPTION
ECR NO
APPVD
VALVE COMPARTMENT
SWING LEFT
SWING RIGHT
PROPORTIONAL DUMP VALVE
BLUE
YELLOW/BLK
ORANGE/RED
MAIN TERMINAL BOX
NOTE: REF DWG. 3-4931414 FOR CONTROLLER ADD.
PLATFORM
SWING
BLACK
BROWN
ORANGE
RED
GREEN
YELLOW
+12 VOLT FROM FOOTSWITCH, WHEN FOOTSWITCH IS DEPRESSED.
16/24 QUICK DISCONNECT LOCATED INSIDE TURNTABLE
+12 VOLT WHEN ON GROUND CONTROLS, 0 VOLT ON PLATFORM. (SEE POWER DISTRIBUTION)
SWING RELAY
PROPORTIONAL DUMP VALVE RELAY
+12 VOLT SEE POWER DISTRIBUTION
LIFT RELAY
+12 VOLT WHEN ON GROUND CONTROLS 0 VOLT WHEN ON PLATFORM CONTROLS (SEE POWER DISTRIBUTION)

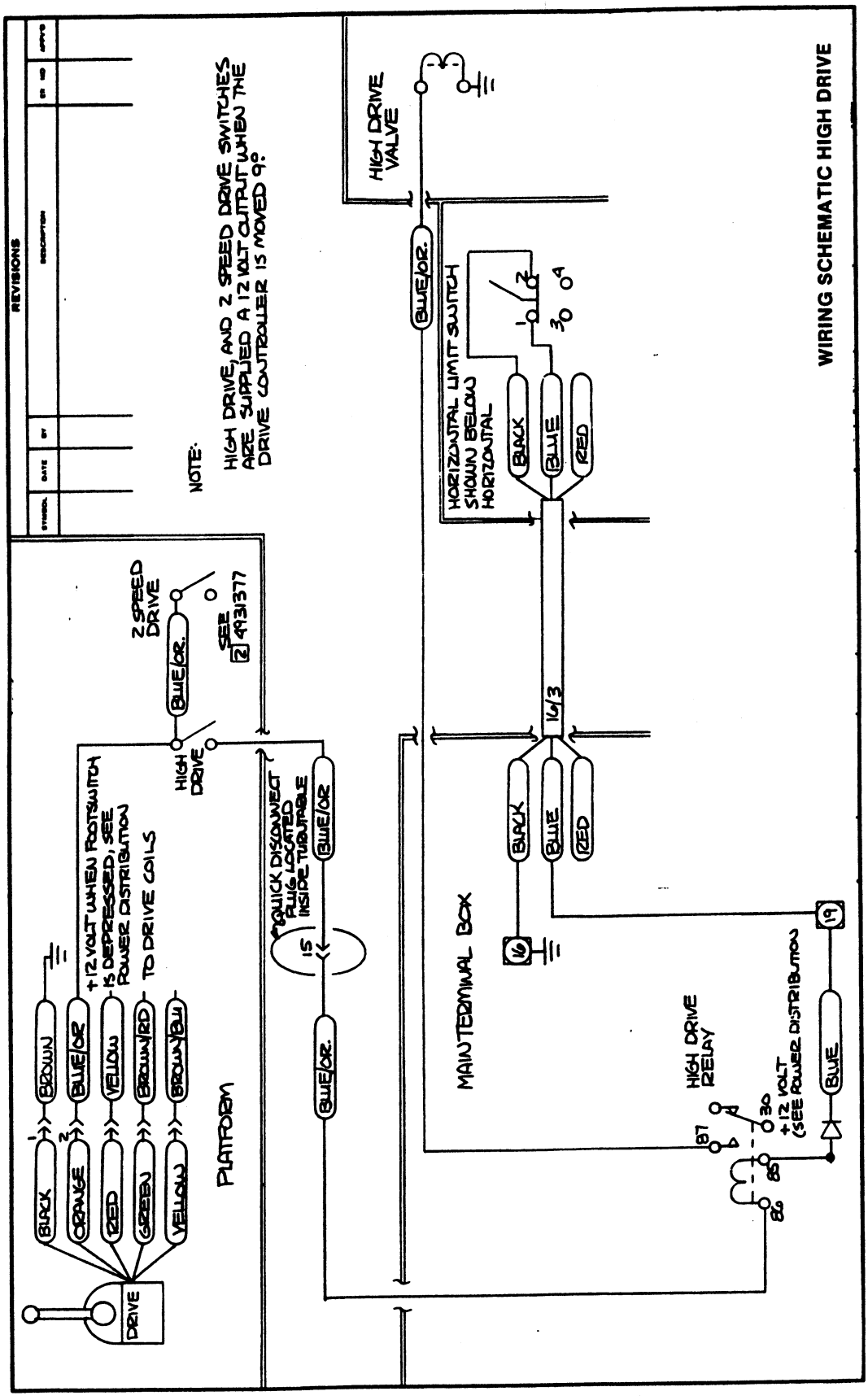

WIRING SCHEMATIC TELESCOPE
REVISIONS
VALVE COMPARTMENT
TELESCOPE IN
TELESCOPE OUT
BANG BANG DUMP VALVE
YELLOW
RED
RED/OR.
+12 VOLT, SEE POWER DISTRIBUTION
87a
87
85
86
BANG BANG DUMP RELAY
MAIN TERMINAL BOX
SWING RELAY
+12 VOLT WHEN ON GROUND CONTROLS
0 VOLTS FROM PLATFORM.
PLATFORM
+12 VOLT FROM FOOTSWITCH, WHEN FOOTSWITCH IS DEPRESSED (SEE POWER DISTRIBUTION)
TELESCOPE
+12 V WHEN ON GROUND CONTROLS
QUICK DISCONNECT PLUG, LOCATED INSIDE TURNTABLE

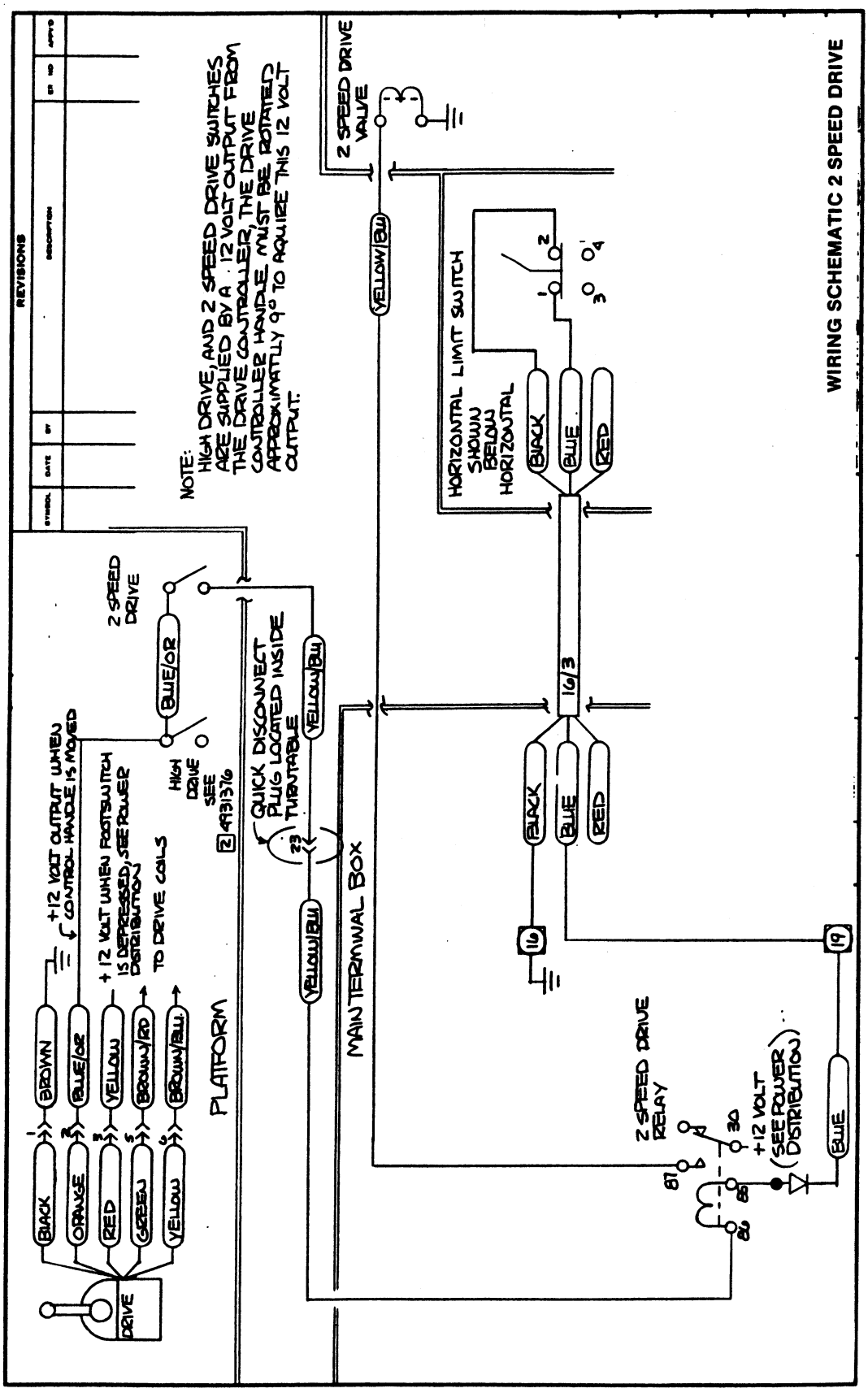

WIRING SCHEMATIC LEVEL
REVISIONS
VALVE COMPARTMENT
LEVEL UP
LEVEL DOWN
BANG BANG DUMP VALVE
MAIN TERMINAL BOX
PLATFORM
LEVEL
+12 VOLT FROM FOOTSWITCH WHEN FOOTSWITCH IS DEPRESSED. (SEE POWER DISTRIBUTION)
BLUE/BLK.
BLACK/BLU.
RED/OR.
BANG-BANG DUMP RELAY
+12 VOLT SEE POWER DISTRIBUTION
SWING RELAY
+12 VOLT WHEN ON GROUND CONTROLS. 0 VOLT WHEN ON PLATFORM. (SEE POWER DISTRIBUTION)

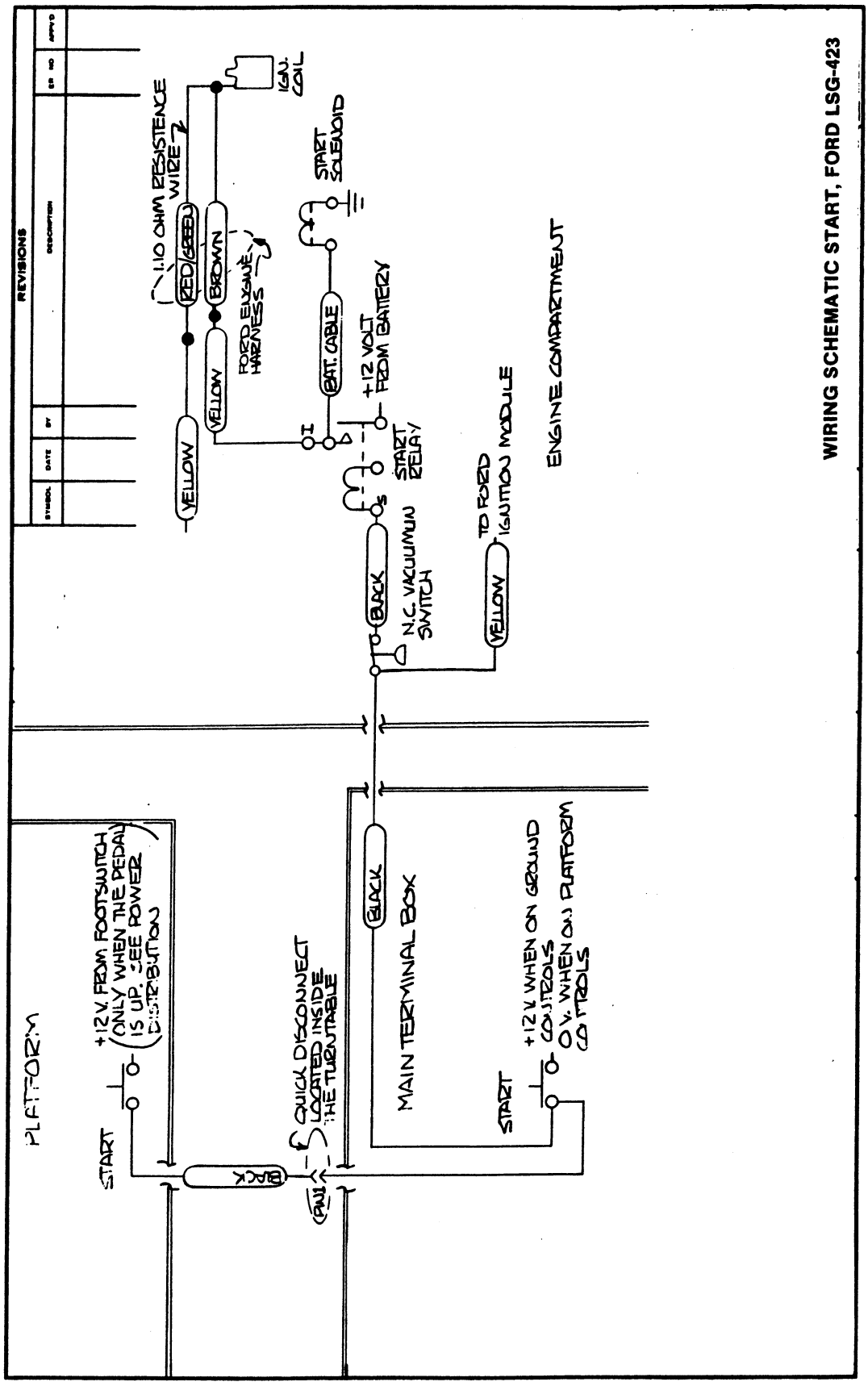

WIRING SCHEMATIC ROTATE, BANG-BANG
REVISIONS
VALVE COMPARTMENT
ROTATE LEFT
ROTATE RIGHT
BANG BANG DUMP VALVE
MAIN TERMINAL BOX
PLATFORM
ROTATE
+12 VOLT FROM FOOTSWITCH, WHEN FOOTSWITCH IS DEPRESSED. SEE POWER DISTRIBUTION.
RED/OR
ORANGE/BLU
RED/BLU
BANG-BANG DUMP RELAY
+12 VOLT, SEE POWER DISTRIBUTION
SWING RELAY
+12 VOLT WHEN ON GROUND CONTROLS. 0 VOLT WHEN ON PLATFORM. SEE POWER DISTRIBUTION.
QUICK DISCONNECT PLUG, LOCATED INSIDE TURNTABLE.
16/24 BOOM HARNESS

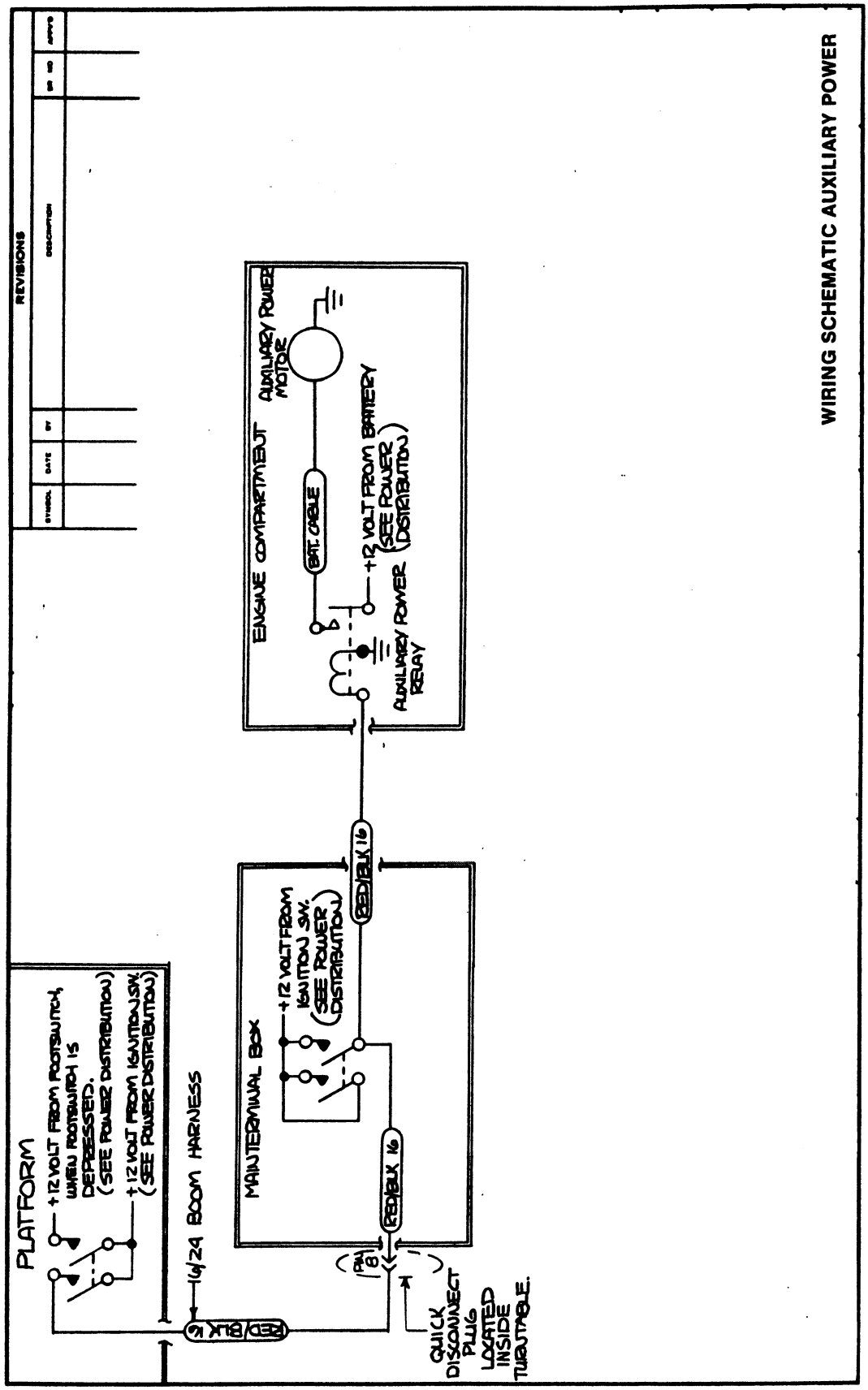

REVISIONS
WIRING SCHEMATIC STEER, BANG-BANG
VALVE COMPARTMENT
STEER LEFT
STEER RIGHT
BANG BANG DUMP VALVE
MAIN TERMINAL BOX
BLACK/RD
YELLOW/RD
RED/OR
RED/DR
BANG-BANG DUMP RELAY
+12 VOLT, SEE POWER DISTRIBUTION
SWING RELAY
+12 VOLT WHEN ON GROUND CONTROLS
0 VOLT WHEN ON PLATFORM. SEE POWER DISTRIB
QUICK DISCONNECT PLUG LOCATED INSIDE TURNTABLE
16/24 BOOM HARNESS
PLATFORM
STEER
+12 VOLT FROM FOOTSWITCH, WHEN FOOTSWITCH IS DEPRESSED. (SEE POWER DISTRIBUTION)

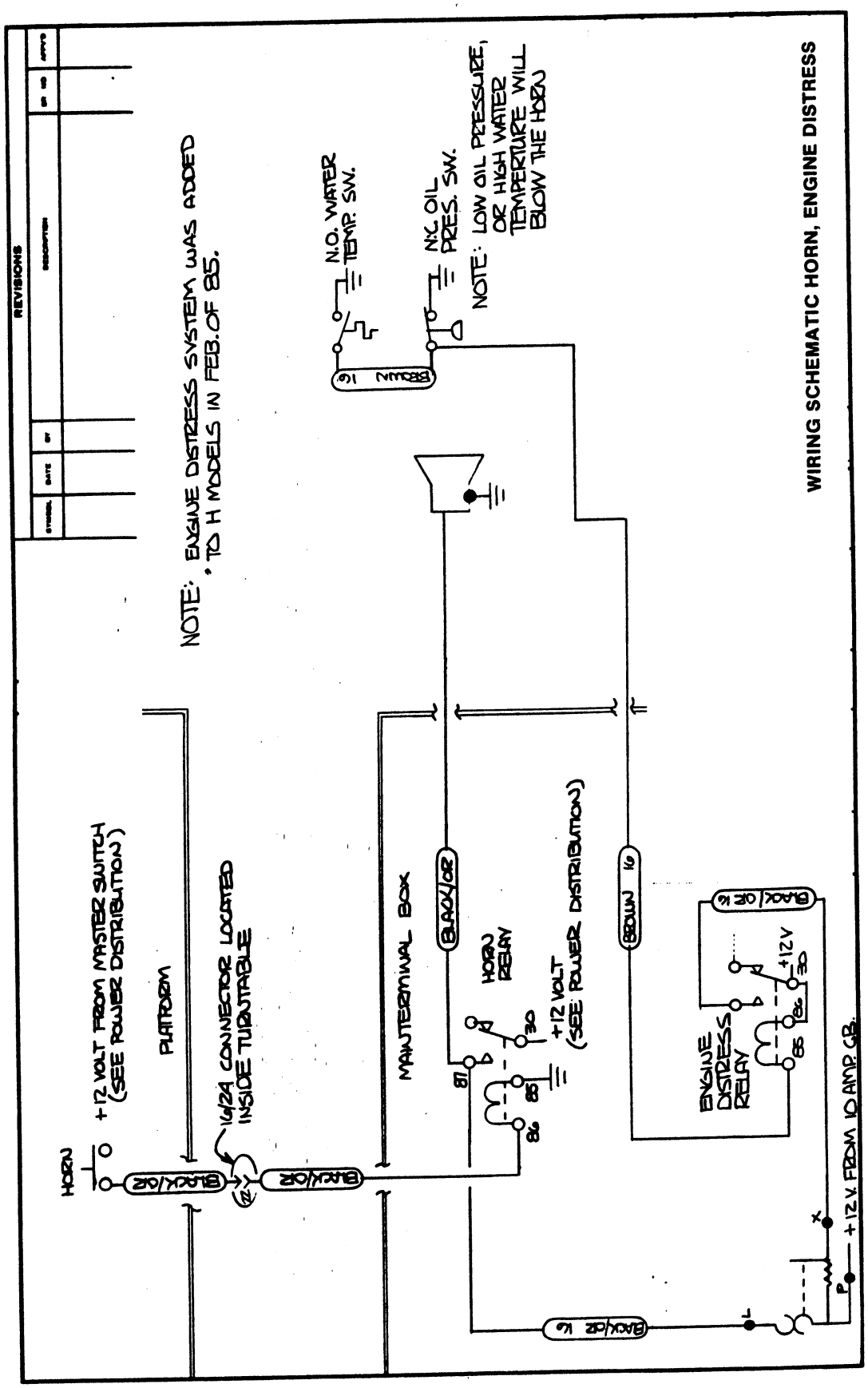

WIRING SCHEMATIC 2 SPEED HIGH ENGINE
REVISIONS
HIGH ENGINE SOL.
BROWN/BLK
HORIZONTAL LIMIT SWITCH SHOWN BELOW HORIZONTAL
BLACK
BLUE
RED
16/3
BLACK
BLUE
RED
16
19
BLUE
HIGH ENGINE RELAY
30
87
85
86
+12 VOLT (SEE POWER DISTRIBUTION)
PLATFORM
HIGH ENGINE — +12 VOLT FROM ROTSWITCH, WHEN ROTSWITCH IS DEPRESSED (SEE ROWER DISTRIBUTION)

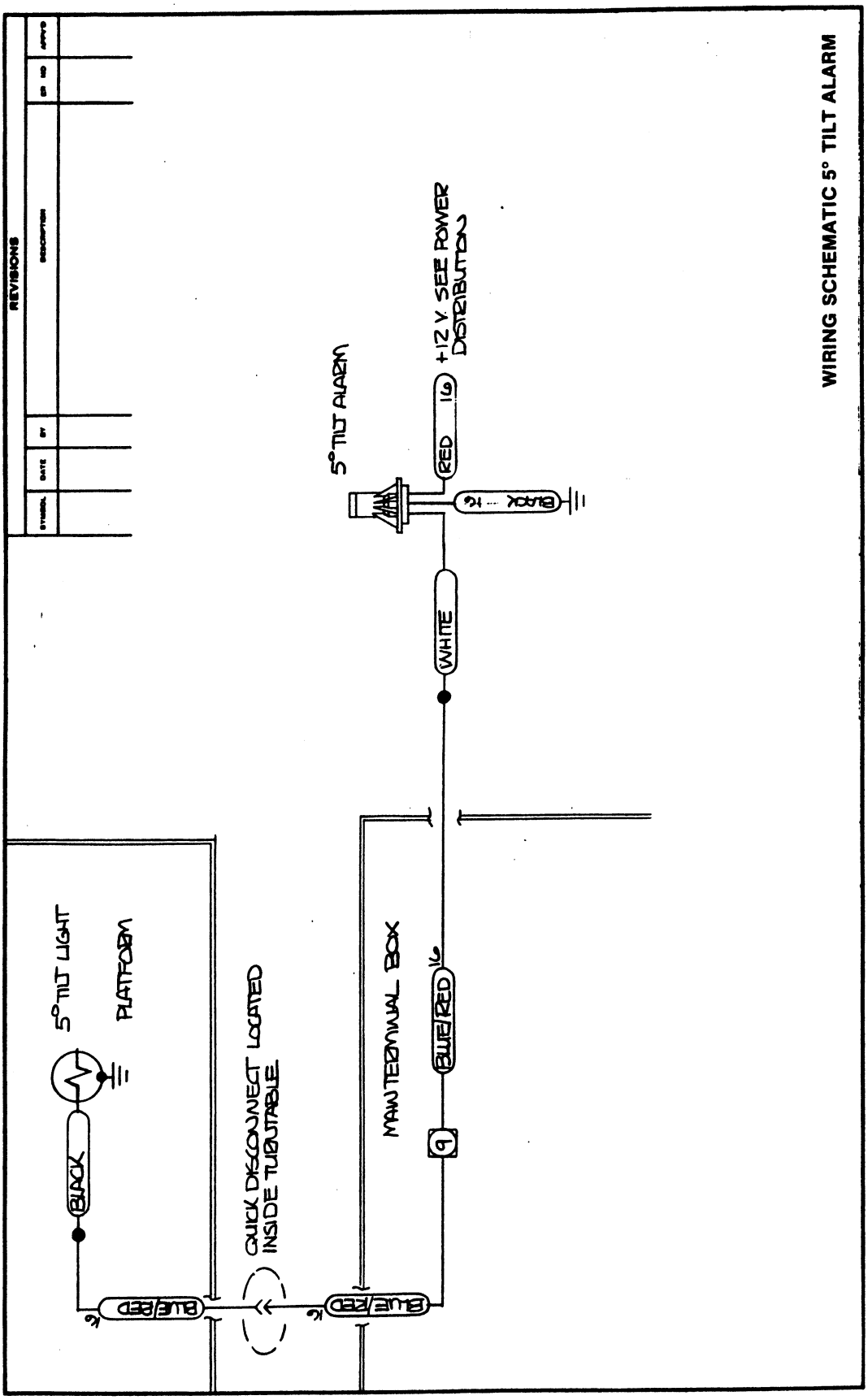

WIRING SCHEMATIC HIGH DRIVE
REVISIONS
SYMBOL
DATE
BY
DESCRIPTION
ECN NO.
APPVD
NOTE:
HIGH DRIVE AND 2 SPEED DRIVE SWITCHES ARE SUPPLIED A 12 VOLT OUTPUT WHEN THE DRIVE CONTROLLER IS MOVED 9°
HIGH DRIVE VALVE
BLUE/OR.
HORIZONTAL LIMIT SWITCH SHOWN BELOW HORIZONTAL
BLACK
BLUE
RED
16/3
MAIN TERMINAL BOX
16
19
HIGH DRIVE RELAY
87
30
+12 VOLT (SEE POWER DISTRIBUTION)
85
86
BLUE
PLATFORM
2 SPEED DRIVE
HIGH DRIVE
SEE 2 4931377
QUICK DISCONNECT PLUG LOCATED INSIDE TURNTABLE
15
BLUE/OR.
BROWN
BLUE/OR
YELLOW
BROWN/RD
BROWN/YEL
+12 VOLT WHEN FOOTSWITCH IS DEPRESSED, SEE POWER DISTRIBUTION
TO DRIVE COILS
BLACK
ORANGE
RED
GREEN
YELLOW
DRIVE


WIRING SCHEMATIC 2 SPEED DRIVE
REVISIONS
SYMBOL
DATE
BY
DESCRIPTION
APPVD
NOTE:
HIGH DRIVE, AND 2 SPEED DRIVE SWITCHES ARE SUPPLIED BY A 12 VOLT OUTPUT FROM THE DRIVE CONTROLLER, THE DRIVE CONTROLLER HANDLE MUST BE ROTATED APPROXIMATELY 9° TO AQUIRE THIS 12 VOLT OUTPUT.
2 SPEED DRIVE VALVE
YELLOW/BLU
HORIZONTAL LIMIT SWITCH SHOWN BELOW HORIZONTAL
BLACK
BLUE
RED
16/3
2 SPEED DRIVE
BLUE/OR
HIGH DRIVE SEE 2 4913176
QUICK DISCONNECT PLUG LOCATED INSIDE TURNTABLE
23
MAIN TERMINAL BOX
PLATFORM
+12 VOLT OUTPUT WHEN CONTROL HANDLE IS MOVED
+12 VOLT WHEN FOOTSWITCH IS DEPRESSED, SEE POWER DISTRIBUTION
TO DRIVE COILS
BROWN
BLUE/OR
YELLOW
BROWN/RD
BROWN/BLU
BLACK
ORANGE
RED
GREEN
YELLOW
DRIVE
16
19
2 SPEED DRIVE RELAY
87
30
86
+12 VOLT (SEE POWER DISTRIBUTION)
BLUE


REVISIONS
1.10 OHM RESISTENCE WIRE
RED/GREEN
BROWN
YELLOW
YELLOW
FORD EXHAUST HARNESS
IGN. COIL
START SOLENOID
BAT. CABLE
+12 VOLT FROM BATTERY
START RELAY
N.C. VACUUM SWITCH
BLACK
TO FORD IGNITION MODULE
YELLOW
ENGINE COMPARTMENT
MAIN TERMINAL BOX
BLACK
QUICK DISCONNECT LOCATED INSIDE THE TURNTABLE
BLACK
PLATFORM
+12 V. FROM FOOTSWITCH (ONLY WHEN THE PEDAL IS UP. SEE POWER DISTRIBUTION)
START
+12 V WHEN ON GROUND CONTROLS
0 V. WHEN ON PLATFORM CONTROLS
START
WIRING SCHEMATIC START, FORD LSG-423


WIRING SCHEMATIC AUXILIARY POWER
REVISIONS
SYMBOL
DATE
BY
DESCRIPTION
ENGINE COMPARTMENT
AUXILIARY POWER MOTOR
BAT. CABLE
+12 VOLT FROM BATTERY (SEE POWER DISTRIBUTION)
AUXILIARY POWER RELAY
RED/BLK 16
MAIN TERMINAL BOX
+12 VOLT FROM IGNITION SW. (SEE POWER DISTRIBUTION)
RED/BLK 16
PLATFORM
+12 VOLT FROM FOOTSWITCH, WHEN FOOTSWITCH IS DEPRESSED. (SEE POWER DISTRIBUTION)
+12 VOLT FROM IGNITION SW. (SEE POWER DISTRIBUTION)
16/24 BOOM HARNESS
RED/BLK 16
PIN 8
QUICK DISCONNECT PLUG LOCATED INSIDE TURNTABLE.


WIRING SCHEMATIC HORN, ENGINE DISTRESS
REVISIONS
NOTE: ENGINE DISTRESS SYSTEM WAS ADDED TO H MODELS IN FEB. OF 85.
N.O. WATER TEMP. SW.
N.C. OIL PRES. SW.
NOTE: LOW OIL PRESSURE, OR HIGH WATER TEMPERATURE WILL BLOW THE HORN
HORN
+12 VOLT FROM MASTER SWITCH (SEE POWER DISTRIBUTION)
PLATFORM
14/24 CONNECTOR LOCATED INSIDE TURNTABLE
MAIN TERMINAL BOX
HORN RELAY
+12 VOLT (SEE POWER DISTRIBUTION)
ENGINE DISTRESS RELAY
+12V
+12 V. FROM 10 AMP CB.
BLACK/OR
BROWN 16


WIRING SCHEMATIC 5° TILT ALARM
REVISIONS
5° TILT ALARM
+12 V. SEE POWER DISTRIBUTION
RED 16
BLACK 16
WHITE
MAN TERMINAL BOX
BLUE/RED 16
9
BLUE/RED
QUICK DISCONNECT LOCATED INSIDE TUBULABLE
BLUE/RED
9
5° TILT LIGHT
PLATFORM
BLACK