Service and Maintenance Manual

Model(s)

SSV Series

P/N - 3121187

February 15, 2012

ANSI

MAINTENANCE SAFETY PRECAUTIONS

A. GENERAL

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.

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.

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

⚠ WARNING

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

B. HYDRAULIC SYSTEM SAFETY

1. It should be particularly noted that the machines hydraulic systems operate at extremely high and potentially dangerous pressures. Every effort should be made to relieve any system pressure prior to disconnecting or removing any portion of the system.
2. Relieve system pressure by activating the lift DOWN control with the platform completely lowered to direct any line pressure back into the return line to the reservoir. Pressure feed lines to system components can then be disconnected with minimal fluid loss.

C. MAINTENANCE

⚠ WARNING

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

- 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 DANGER, WARNING, CAUTION AND OTHER INSTRUCTIONS ON MACHINE AND IN SERVICE MANUAL.
- KEEP STANDING SURFACES AND HAND HOLDS FREE OF OIL, GREASE, WATER, ETC.
- NEVER WORK UNDER AN ELEVATED PLATFORM UNTIL PLATFORM 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.

REVISION LOG

Original Issue of Manual . . . . . July 15, 2004

Manual Revised. . . . . October 25, 2004

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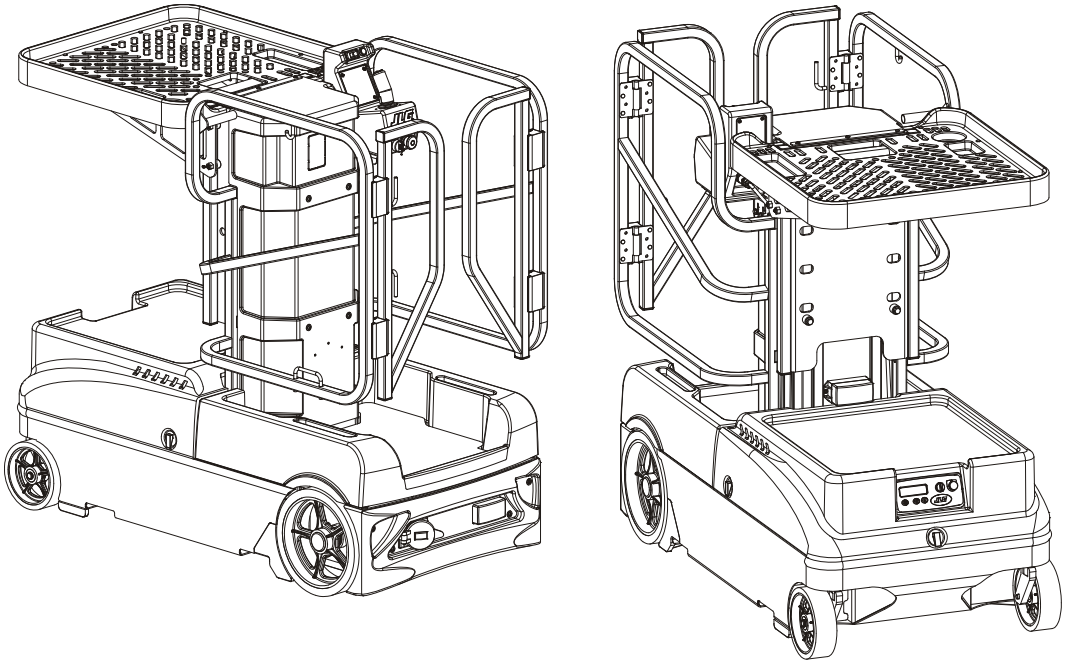

Table 1-1. SSV10 - Machine Operating Specifications

	SSV10
Maximum Occupants:	1
Maximum Work Load (Capacity):	See Table 1-2 on Page 1-2
Maximum Travel Grade (Gradeability): (Platform STOWED ONLY)	15%
Maximum Travel Grade (Side Slope): (Platform STOWED ONLY)	5°
Tilt Alarm Cut Out Limit: (Any Direction) (Platform ELEVATED)	1.5°
Machine Height (Platform Stowed)	57 in. (1.44m)
Maximum Vertical Platform Height:	10 ft. (3.09m)
Maximum Wheel Load (Per Wheel):	650 lb. (295 kg)
Maximum Drive SpeedsOperator Variable: Platform Elevated:	0.5 - 3.7 mph - (0.8 - 5.95 kph) .7 mph (1.13kph)
Max. Platform Speeds (w/Max. Load):Platform Up:	13 sec.
Platform Down:	11 sec.
Gross Machine Weight (Standard Equipment/Platform Empty):	1000 lb. (454 kg)

1.1 CAPACITIES

System Voltage

24 Volt DC

Hydraulic System

5 qts. U.S. (4.7 L)

Drive Motor GearBox (Gear Oil)

6 oz. (175cc)

1.2 COMPONENT DATA

Hydraulic Pump/Pump Motor Assembly

Pump Motor - 24 Volt DC motor, Standard Duty

Pump Displacement - .098 cu. in./rev. (1.6cc/rev.)

Pump Output (Max.) - 2.25 gpm @ 1400 psi @ 24 volts and 105 amps @ 43 centistrokes (200 SSU)

Reservoir Capacity - 1 Gallon (3.78 L)

Rear Wheel Drive Motors

Drive Motors - 1/2 HP, 24 Volt DC, Variable
15/16" Parallel Drive Shaft
Sealed Gear Box
32:1 Gear Ratio
Brake Shaft and Drive Shaft - Integral to Motor

Brakes - Friction Disk - Spring Applied - Electrically Released

Batteries/Battery Charger

Batteries - 12 Volt DC (2 in series @ 24 volt)

Nominal Capacity - 100 Amp Hour

Type - M2 Marine Combination (AGM)/Valve Regulated/ Leak Proof/NonCorrosive/Maintenance Free

Weight - 65.7 lb. (29.8 Kg) - Per Battery

Battery Charger -
Microprocessor Controlled/SCR Circuit Monitor
120/240 Volt A.C. Selectable / 50/60 Hz input
24 volt, 20 amp output - with 2 amp finish
Reset Circuit Breaker
Automatic Charge Circuit
Plug Interlock Circuit
Wet/VRLA Battery Switch

NOTE: *The SSV-10 batteries require approximately five (5) hours to fully charge when drained to 80% discharge - (Only the RED LEDS on platform console lit).*

1.3 PERFORMANCE DATA

Platform Capacity

Table 1-2. Platform Maximum Capacity

SPECIFICATION	MAXIMUM CAPACITY				Max. Wind Speed
	Platform Load	Material Tray Load	Carry Deck	Total Capacity	
ANSI/CSA	350 lb. (160kg)	250 lb. (115kg)	250 lb. (115kg)	850 lb. (390kg)	28 mph (12 m/s)
CE (Indoor Use Only)					0 m/s
Australia (Indoor Use Only)					0 m/s

1. Operators Platform
2. Platform Load (Operator)
3. Platform Swing-In Entry Gate
4. Material Handling Tray
5. Storage Hook
6. Ext. Cord Wrap Hooks
7. Lanyard Attach Point
8. Carry Deck - Hood

NOTE: *Distribute weight evenly in platform and material tray when loading. Reference the capacity decal located on the machines mast cover in the operators platform.*

Platform Size

19.5 in.-W x 27 in.-L (49.5cm) x (68.5cm)

Material Tray Size

26.3 in.-W x 25.6 in.-L (67cm) x (65cm)

Platform Height - (Fully Elevated)

10 ft. (3.09m) (To floor of platform)

Platform Maximum (Working) Height (Platform fully elevated + Operator height)

16 ft. (4.92m) approximately

Machine Height

Platform Elevated - 13.74 ft. (4.19m)(Top of platform rails)
Platform Stowed - 57 in. (1.44m)

Machine Overall

Length - 60 in. (1.52m)
Width - 29.5 in. (74.93cm)

Platform Entry Height (Floor to Platform Floor)

13.5 in. (34.3cm)

Machine Underclearance

1.875 in. (47.6mm)

Machine Turning Radius (Outside)

65 in. (165cm)

1.4 TORQUE REQUIREMENTS

When maintenance becomes necessary or a fastener has loosened, refer to the applicable Torque Chart *(Figure 1-4., Figure 1-5. and Figure 1-6.)* in this section of the manual to determine proper torque values for various size fasteners.

1.5 LUBRICATION

Hydraulic Oil

Hydraulic oils must have anti-wear qualities at least to API Service Classification GL-3, and sufficient chemical stability for mobile hydraulic system service. JLG Industries, recommends Mobilfluid 424 hydraulic oil, which has an SAE viscosity of 10W-30 and a viscosity index of 152.

For cold weather applications, i.e. when temperatures remain consistently below +20°F (–7°C) JLG recommends using Mobil DTE 13 hydraulic oil.

Aside from JLG recommendations, it is not advisable to mix oils of different brands or types, as they may not contain the same required additives or be of comparable viscosities. If use of hydraulic oil other than Mobilfluid 424 is desired, contact JLG Industries for proper recommendations.

Table 1-3. Hydraulic Oil Operating Range

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

Lubrication Specifications

Table 1-4. Lubrication Specifications

KEY	SPECIFICATIONS
MPG -	Multipurpose Grease having a minimum dripping point of 350° F. Excellent water resistance and adhesive qualities, and being of extreme pressure type. (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. ISO-Vg grade 32, 46.
CL -	Chain Lube. Use a good quality chain lubricant

1.6 HYDRAULIC PRESSURE SETTINGS AND ADJUSTMENT

Adjust system pressure so that platform will raise with maximum rated capacity in platform.

Perform pressure adjustment with oil at normal operating temperature. If pressure is set when oil is cold, platform may not raise rated load after oil has warmed.

The following pressure setting is the factory recommended (initial) setting;

MODEL	PRESSURE SETTING
SSV-10	1800 PSI

Turning adjustment screw **clockwise increases system pressure**, turning screw **counterclockwise decreases system pressure**. *(See Figure 1-1., Hydraulic Pressure Adjustment Screw. (Machine Front Cover Removed)*

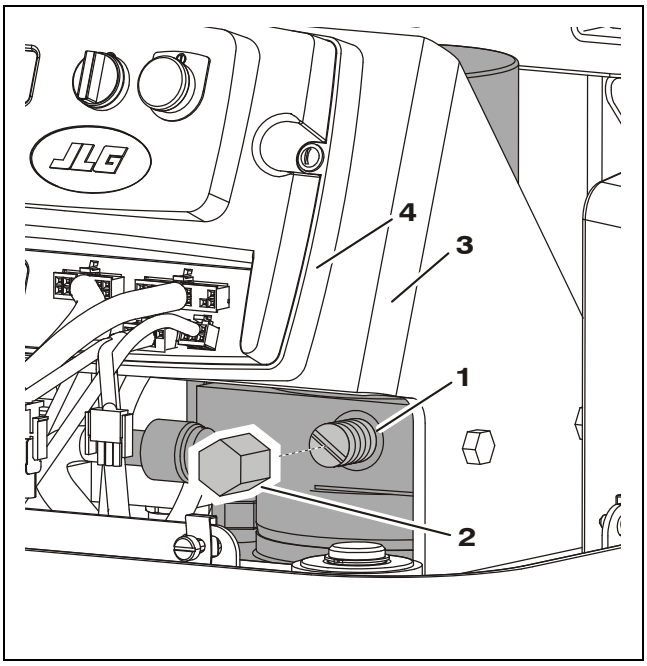

Figure 1-1. Hydraulic Pressure Adjustment Screw. (Machine Front Cover Removed)

1. Pressure Adjustment Screw
2. Remove Adjust Screw Cap
3. Pump/Ground Station Mounting Bracket
4. Ground Control Station

NOTE: *Machine front cover must be removed to access pump motor.*

Hydraulic Pressure Gauge Connection

⚠ CAUTION

ONLY OPEN HYDRAULIC SYSTEM LINES WITH THE MAST FULLY LOWERED TO RELIEVE PRESSURE IN THE SYSTEM. CAREFULLY LOOSEN REQUIRED FITTINGS, WEAR SAFETY PROTECTION EQUIPMENT WHEN WORKING WITH HYDRAULIC SYSTEMS.

NOTE: *See Section 5.5, Hydraulic Line - Disconnect - Special Tool, for hydraulic line removal procedure.*

Remove the hydraulic oil filter and install a t-fitting between the pump and the extend line to connect a hydraulic pressure gauge as shown in Figure 1-2., Typical Hydraulic Pressure Gauge Installation (Hydraulic Filter Removed).

CHECK, and if necessary, ADJUST the hydraulic pressure to initial settings shown in table at the beginning of this section. Cycle the hydraulic system several times with the maximum load capacity in the platform, then recheck pressure setting. When pressure has stabilized continue to "After Filter Pressure Check" following.

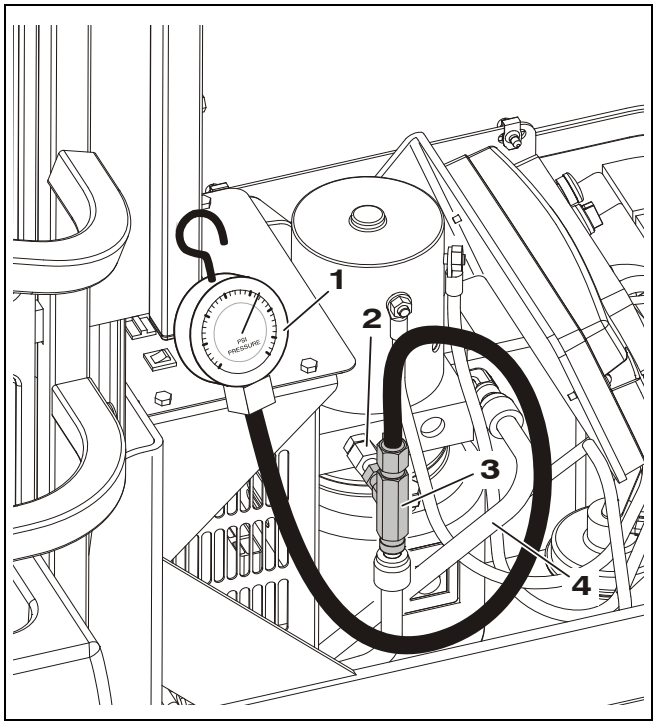

Figure 1-2. Typical Hydraulic Pressure Gauge Installation (Hydraulic Filter Removed).

1. Pressure Gauge Assembly
2. Cylinder Extend Line
3. T- Fitting
4. Cylinder Return Line

After Filter Pressure Check

Reinstall the hydraulic oil filter and install a t-fitting between the hydraulic filter and the extend line to the cylinder. Recheck the hydraulic pressure and compare with the previous readings when filter was removed. If a significant drop in pressure reading has occurred, replace the hydraulic filter and recheck the "after filter" pressure reading.

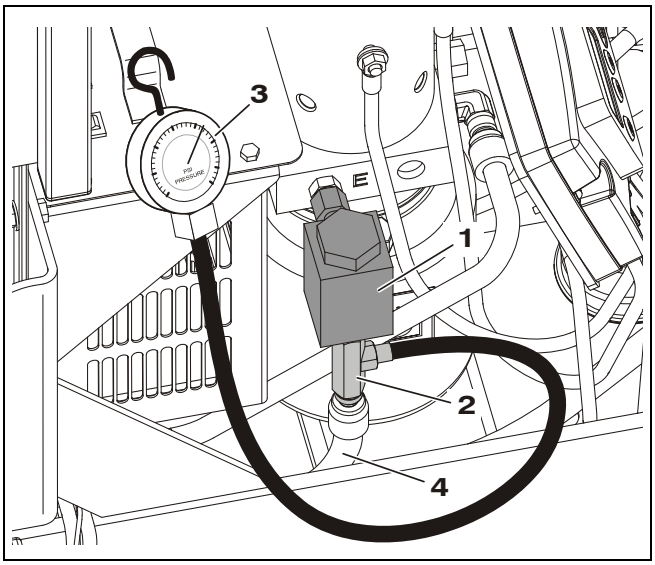

Figure 1-3. Typical Hydraulic Pressure Gauge Installation (After Hydraulic Filter).

1. Hydraulic Oil Filter
2. T- Fitting
3. Pressure Gauge Assembly
4. Cylinder Extend Line

1.7 CYLINDER SPECIFICATIONS

NOTE: *All dimensions are given in inches (in), with the metric equivalent, centimeters (cm), given in parentheses.*

Table 1-5. Cylinder Specifications

DESCRIPTION	BORE in./(cm)	STROKE in./(cm)	ROD DIA. in./(cm)
SSV-10 - Lift Cylinder	1.63 (4.10)	41.50 (105.4)	1.375 (3.49)

1.8 SERIAL NUMBER LOCATIONS

For machine identification, a serial number plate is affixed to the machine. The plate is mounted on the base frame between the front caster wheels under the front cover. The serial number is also stamped on the front of the mast assembly near the amber beacon.

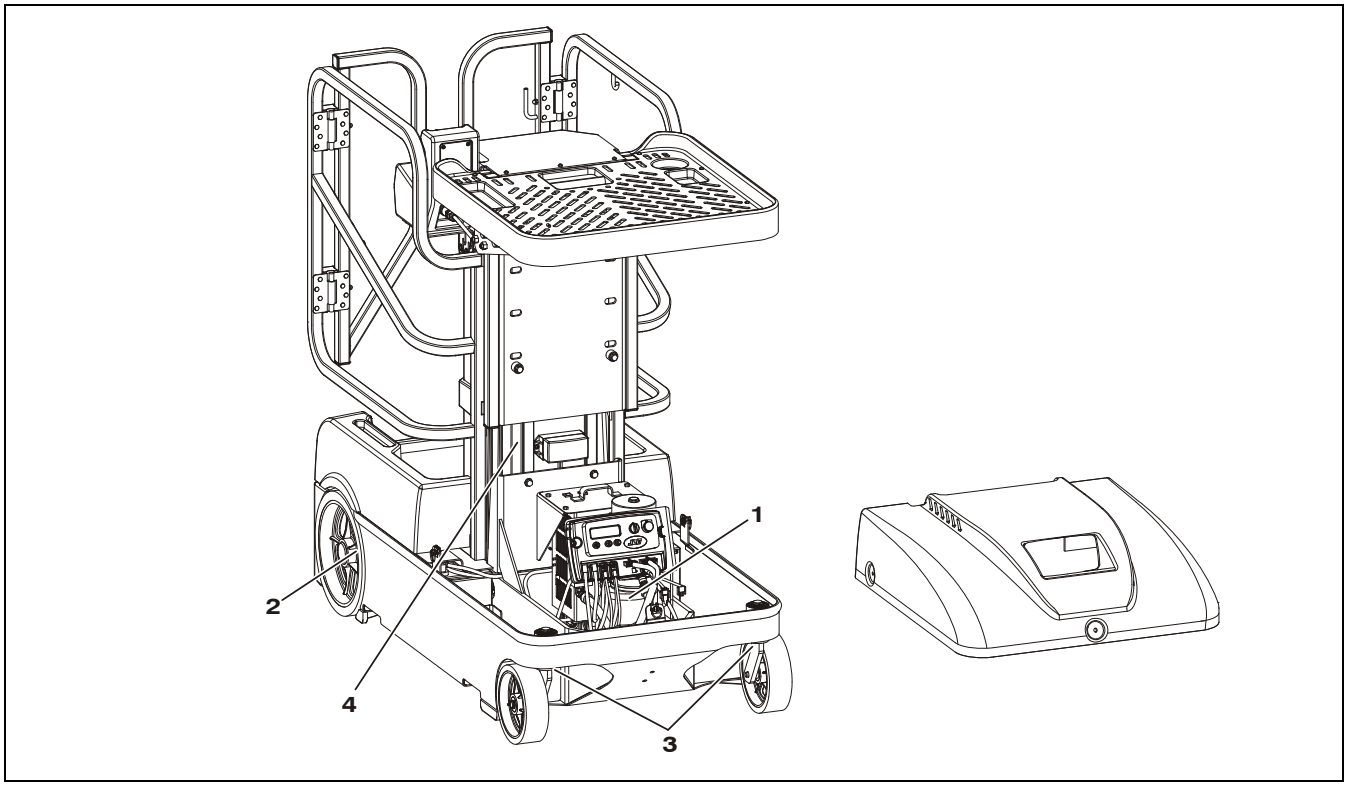

Table 1-6. Lubrication Intervals for Various Components

ITEM	COMPONENT	NO/TYPE (a) LUBE POINTS	LUBE/METHOD	INTERVAL (b)				COMMENTS
				3 MONTHS	6 MONTHS	1 YEAR	2 YEARS	
1	Hydraulic Oil	Fill To Full Line on Dipstick - 5 Qt. Reservoir	HO - Check Hyd. Oil Level HO - Change Hyd. Oil				✔	Check fluid level every day. (c) Change hydraulic oil every 2 years.
2	Drive Wheel Bearings	—	—					Permanently Sealed.
3	Drive Wheel Gear Box	2 - Gear Boxes	Gear Oil					Change only when serviced requires 6 oz. (175 cc's) to fill.
4	Caster Axles	—	—					Permanently Sealed.
5	Swivel Raceways	—	MPG					Upper: Permanently Sealed. Lower: Repack if Serviced.
6	Mast Chains	2 - Per Section	CL - Brush or Spray		✔			Inspect, lubricate if dry or rusting.

Key to Lubricants: **MPG** - Multipurpose Grease
HO - Hydraulic Oil - See Section 1.5, "Lubrication" in Service Manual.
GEAR OIL - Good Quality Worm Gear Oil - SAE 90 - AGMA#5 - EP Compounded
CL - Chain Lube. Use a good quality chain lubricant

Notes: ***(a)****Be certain to lubricate like items on each side of the machine.*
(b)*Recommended lubricating intervals are based on normal use. If machine is subjected to severe operating conditions, such as a high number of cycles, location, corrosive/dirty environment, etc., user must adjust lubricating requirements accordingly.*
(c)*Prior to checking hydraulic oil level, operate machine through one complete cycle of lift function (full up and down). Failure to do so will result in incorrect oil level reading on the hydraulic reservoir.*

VALUES FOR ZINC PLATED BOLTS ONLY														UNPLATED CAP SCREWS	
SIZE	THD	BOLT DIA. (IN.)	THREAD STRESS AREA (SQ. IN.)	SAE GRADE 5 BOLTS & GRADE 2 NUTS				SAE GRADE 8 BOLTS & GRADE 8 NUTS				UNBRAKO 1960 SERIES SOCKET HEAD CAP SCREW WITH LOC-WEL PATCH			
				CLAMP LOAD (LB.)	TORQUE			CLAMP LOAD (LB.)	TORQUE			CLAMP LOAD (LB.)	TORQUE (as received)		
					(DRY OR LOC. 263)	(LUB.)	(LOCTITE 262)	(LOCTITE 242 OR 271)	(DRY OR LOC. 263)	(LUB.)	(LOCTITE 262)	(LOCTITE 242 OR 271)			
					LB. IN.	LB. IN.	LB. IN.	LB. IN.	LB. IN.	LB. IN.	LB. IN.	LB. IN.		LB. FT.	
4	40	0.1120	0.00604	380	8	6	—	—	540	12	9	—	—	—	—
	48		0.00661	420	9	7	—	—	600	13	10	—	—	—	—
6	32	0.1380	0.00909	580	16	12	—	—	820	23	17	—	—	—	—
	40		0.01015	610	18	13	—	—	920	25	19	—	—	—	—
8	32	0.1640	0.01400	900	30	22	—	—	1260	41	31	—	—	—	—
	36		0.01474	940	31	23	—	—	1320	43	32	—	—	—	—
10	24	0.1900	0.01750	1120	43	32	—	—	1580	60	45	—	—	—	—
	32		0.02000	1285	49	36	—	—	1800	68	51	—	—	—	—
1/4	20	0.2500	0.0318	2020	96	75	—	105	2860	144	108	—	160	3180	13
	28		0.0364	2320	120	86	—	135	3280	168	120	—	185	3640	14
					LB. FT.	LB. FT.	LB. FT.	LB. FT.		LB. FT.	LB. FT.	LB. FT.	LB. FT.		
5/16	18	0.3125	0.0524	3340	17	13	16	19	4720	25	18	22	30	5240	25
	24		0.0580	3700	19	14	17	21	5220	25	20	25	30	5800	27
3/8	16	0.3750	0.0775	4940	30	23	28	35	7000	45	35	40	50	7750	45
	24		0.0878	5600	35	25	32	40	7900	50	35	45	55	8780	50
7/16	14	0.4375	0.1063	6800	50	35	45	55	9550	70	55	63	80	10630	70
	20		0.1187	7550	55	40	50	60	10700	80	60	70	90	11870	75
1/2	13	0.5000	0.1419	9050	75	55	68	85	12750	110	80	96	120	14190	110
	20		0.1599	10700	90	65	80	100	14400	120	90	108	135	15990	115
9/16	12	0.5625	0.1820	11600	110	80	98	120	16400	150	110	139	165	18200	155
	18		0.2030	12950	120	90	109	135	18250	170	130	154	190	20300	165
5/8	11	0.6250	0.2260	14400	150	110	135	165	20350	220	170	180	240	22600	210
	18		0.2560	16300	170	130	153	190	23000	240	180	204	265	25600	220
3/4	10	0.7500	0.3340	21300	260	200	240	285	30100	380	280	301	420	33400	365
	16		0.3730	23800	300	220	268	330	33600	420	320	336	465	37300	400
7/8	9	0.8750	0.4620	29400	430	320	386	475	41600	600	460	485	660	46200	585
	14		0.5090	32400	470	350	425	520	45800	660	500	534	725	50900	635
1	8	1.000	0.6060	38600	640	480	579	675	51500	900	680	687	990	60600	865
	12		0.6630	42200	700	530	633	735	59700	1000	740	796	1100	66300	915
1-1/8	7	1.1250	0.7630	42300	800	600	714	840	68700	1280	960	1030	1400	76300	1240
	12		0.8560	47500	880	660	802	925	77000	1440	1080	1155	1575	85600	1380
1-1/4	7	1.2500	0.9690	53800	1120	840	1009	1175	87200	1820	1360	1453	2000	96900	1750
	12		1.0730	59600	1240	920	1118	1300	96600	2000	1500	1610	2200	107300	1880
1-1/2	6	1.500	1.1550	64100	1460	1100	1322	1525	104000	2380	1780	1907	2625	115500	2320
	12		1.3150	73000	1680	1260	1506	1750	118100	2720	2040	2165	3000	131500	2440
1-1/2	6	1.500	1.4050	78000	1940	1460	1755	2025	126500	3160	2360	2530	3475	140500	3040
	12		1.5800	87700	2200	1640	1974	2300	142200	3560	2660	2844	3925	158000	3270

Note: These torque values do not apply to cadium plated fasteners.

Figure 1-4. Torque Chart. (ANSI Spec.)

VALUES FOR ZINC PLATED BOLTS ONLY														UNPLATED CAP SCREWS	
SIZE	THD	BOLT DIA. (CM)	THREAD STRESS AREA (SQ. CM)	SAE GRADE 5 BOLTS & GRADE 2 NUTS					SAE GRADE 8 BOLTS & GRADE 8 NUTS					UNBRAKO 1960 SERIES SOCKET HEAD CAP SCREW WITH LOC-WEL PATCH	
				CLAMP LOAD (KG)	TORQUE				CLAMP LOAD (KG)	TORQUE				CLAMP LOAD (KG)	TORQUE (as received)
					(DRY OR LOC. 263)	(LUB.)	(LOCTITE 262)	(LOCTITE 242 OR 271)		(DRY OR LOC. 263)	(LUB.)	(LOCTITE 262)	(LOCTITE 242 OR 271)		
					NM	NM	NM	NM		NM	NM	NM	NM		NM
4	40	0.2845	0.0153	172	1	1	—	—	245	2	1	—	—	—	—
	48		0.0168	191	1	1	—	—	272	2	1	—	—	—	—
6	32	0.3505	0.0232	263	2	2	—	—	372	3	2	—	—	—	—
	40		0.0258	277	2	2	—	—	417	3	2	—	—	—	—
8	32	0.4166	0.0356	408	4	3	—	—	572	5	4	—	—	—	—
	36		0.0374	426	4	3	—	—	599	5	4	—	—	—	—
10	24	0.4826	0.0445	508	5	4	—	—	717	7	5	—	—	—	—
	32		0.0508	583	6	4	—	—	817	8	6	—	—	—	—
1/4	20	0.6350	0.0808	916	11	9	—	12	1297	16	12	—	18	1442	18
	28		0.0925	1052	14	10	—	16	1488	19	14	—	21	1651	19
5/16	18	0.7938	0.1331	1515	23	18	22	26	2141	34	25	30	41	2377	34
	24		0.1473	1678	26	19	23	29	2821	34	27	34	41	2631	37
3/8	16	0.9525	0.1969	2241	41	31	38	48	3175	61	48	54	68	3493	61
	24		0.2230	2540	48	34	43	54	3583	68	48	61	75	3983	68
7/16	14	1.1112	0.2700	3085	68	48	61	75	4332	95	75	85	109	4822	95
	20		0.3015	3425	75	68	68	81	4854	109	81	95	122	5384	102
1/2	13	1.2700	0.3604	4105	102	75	92	115	5783	149	109	130	163	6437	149
	20		0.4061	4854	122	88	108	136	6532	163	122	146	183	7253	156
9/16	12	1.4288	0.4623	5262	149	109	133	163	7539	204	149	188	224	8256	210
	18		0.5156	5874	163	122	148	183	8278	231	176	209	258	9208	224
5/8	11	1.5875	0.5740	6532	204	149	183	224	9231	298	231	244	326	10251	285
	18		0.6502	7394	231	176	207	258	10433	326	244	277	359	11612	298
3/4	10	1.9050	0.8484	9662	353	271	325	387	13653	515	380	408	570	15150	495
	16		0.9474	10796	407	298	363	448	15241	570	434	456	631	16919	542
7/8	9	2.2225	1.1735	13336	583	434	523	644	18870	814	624	658	895	20956	793
	14		1.2929	14697	637	475	576	705	20775	895	678	724	983	23088	861
1	8	2.5400	1.5392	17509	868	651	785	915	23360	1220	922	931	1342	27488	1173
	12		1.6840	19142	949	719	858	997	27080	1356	1003	1079	1492	30074	1241
1-1/8	7	2.8575	1.9380	19187	1085	814	968	1139	31162	1736	1302	1396	1898	34610	1681
	12		2.1742	21546	1193	895	1087	1254	34927	1953	1464	1566	2136	38828	1871
1-1/4	7	3.1750	2.4613	24404	1519	1139	1368	1593	38554	2468	1844	1970	2712	43954	2373
	12		2.7254	27035	1681	1247	1516	1762	43818	2712	2034	2183	2983	48671	2549
1-1/2	6	3.4925	2.9337	29076	1980	1492	1792	2068	47174	3227	2413	2586	3559	52391	3145
	12		3.3401	33113	2278	1708	2042	2373	53570	3688	2766	2935	4068	59648	3308
1-1/2	6	3.8100	3.5687	35381	2630	1980	2379	2746	57380	4284	3200	3430	4712	63731	4122
	12		4.0132	39781	2983	2224	2676	3118	142200	4827	3607	3856	5322	71669	4433

Note: These torque values do not apply to cadium plated fasteners.

Figure 1-5. Torque Chart. (ANSI to METRIC Conversion)

			VALUES FOR ZINC PLATED / YELLOW CHROMATE FASTENERS ONLY									
			CLASS 8.8 METRIC BOLTS & CLASS 8 METRIC NUTS					CLASS 10.9 METRIC BOLTS & CLASS 10 METRIC NUTS				
SIZE	PITCH	TENSILE STRESS AREA	CLAMP LOAD	TORQUE				CLAMP LOAD	TORQUE			
				DRY OR LOCTITE 263	LUB	LOCTITE 262	LOCTITE 242 OR 271		DRY OR LOCTITE 263	LUB	LOCTITE 262	LOCTITE 242 OR 271
		sq. mm	KN	N, m	N, m	N, m	N, m	KN	N, m	N, m	N, m	N, m
3	.5	5.03	2.19	1.3	1.0	1.2	1.4	3.13	1.9	1.4	1.5	2.1
3.5	.6	6.78	2.95	2.1	1.6	1.9	2.3	4.22	3.0	2.2	2.4	3.3
4	.7	8.78	3.82	3.1	2.3	2.8	3.4	5.47	4.4	3.3	3.5	4.8
5	.8	14.2	6.18	6.2	4.6	5.6	6.8	8.85	8.9	6.6	7.1	9.7
6	1	20.1	8.74	11	7.9	9.4	12	12.5	15	11	12	17
7	1	28.9	12.6	18	13	16	19	18	25	19	20	28
8	1.25	36.6	15.9	25	19	23	28	22.8	37	27	29	40
10	1.5	58.0	25.2	50	38	45	55	36.1	72	54	58	79
12	1.75	84.3	36.7	88	66	79	97	52.5	126	95	101	139
14	2	115	50.0	140	105	126	154	71.6	200	150	160	220
16	2	157	68.3	219	164	197	241	97.8	313	235	250	344
18	2.5	192	83.5	301	226	271	331	119.5	430	323	344	473
20	2.5	245	106.5	426	320	383	469	152.5	610	458	488	671
22	2.5	303	132.0	581	436	523	639	189.0	832	624	665	915
24	3	353	153.5	737	553	663	811	220.0	1060	792	845	1170
27	3	459	199.5	1080	810	970	1130	286.0	1540	1160	1240	1690
30	3.5	561	244.0	1460	1100	1320	1530	349.5	2100	1570	1680	2310
33	3.5	694	302.0	1990	1490	1790	2090	432.5	2600	2140	2280	2860
36	4	817	355.0	2560	1920	2300	2690	509.0	3660	2750	2930	4020
42	4.5	1120	487.0	4090	3070	3680	4290	698.0	5860	4400	4690	6440

Note: These torque values do not apply to cadmium plated fasteners.

METRIC CLASS 8.8

METRIC CLASS 10.9

Figure 1-6. Torque Chart (Metric Class Fasteners)

SECTION 2. GENERAL SERVICE INFORMATION

2.1 MACHINE PREPARATION, INSPECTION, AND MAINTENANCE

General

This section provides the necessary information needed by those personnel that are responsible to place the machine in operation readiness and maintain its safe operating condition. For maximum service life and safe operation, ensure that all the necessary inspections and maintenance have been completed before placing the machine into service.

Preparation, Inspection, and Maintenance

It is important to establish and conform to a comprehensive inspection and preventive maintenance program. The following table outlines the periodic machine inspections and maintenance recommended by JLG Industries, Inc. Consult your national, regional, or local regulations for further requirements for aerial work platforms. The frequency of inspections and maintenance must be increased as environment, severity and frequency of usage requires.

Pre-Start Inspection

It is the User's or Operator's primary responsibility to perform a Pre-Start Inspection of the machine prior to use daily or at each change of operator. Reference the Operator's and Safety Manual for completion procedures for the Pre-Start Inspection. The Operator and Safety Manual must be read in its entirety and understood prior to performing the Pre-Start Inspection.

Pre-Delivery Inspection and Frequent Inspection

The Pre-Delivery Inspection and Frequent Inspection shall be performed by a qualified JLG equipment mechanic. JLG Industries, Inc. recognizes a qualified JLG equipment mechanic as a person who, by possession of a recognized degree, certificate, extensive knowledge, training, or experience, has successfully demonstrated the ability and proficiency to service, repair, and maintain the subject JLG product model.

The Pre-Delivery Inspection and Frequent Inspection procedures are performed in the same manner, but at different times. The Pre-Delivery Inspection shall be performed prior to each sale, lease, or rental delivery. The Frequent Inspection shall be accomplished for each machine in service for 3 months; out of service for a period of more than 3 months; or when purchased used. The frequency of this inspection must be increased as environment, severity and frequency of usage requires.

Reference the JLG Pre-Delivery and Frequent Inspection Form and the Inspection and Preventative Maintenance Schedule for items requiring inspection during the performance of these inspections. Reference the appropriate areas of this manual for servicing and maintenance procedures.

Annual Machine Inspection

The Annual Machine Inspection must be performed by a qualified JLG equipment mechanic on an annual basis, no later than thirteen (13) months from the date of the prior Annual Machine Inspection. JLG Industries, Inc. recognizes a qualified JLG equipment mechanic as a person who has successfully completed the JLG Service Training School for the subject JLG product model. Reference the machine Service and Maintenance Manual and appropriate JLG inspection form for performance of this inspection.

Reference the JLG Annual Machine Inspection Form and the Inspection and Preventative Maintenance Schedule for items requiring inspection during the performance of this inspection. Reference the appropriate areas of this manual for servicing and maintenance procedures.

For the purpose of receiving safety-related bulletins, it is important that JLG Industries, Inc. has updated ownership information for each machine. When performing each Annual Machine Inspection, notify JLG Industries, Inc. of the current machine ownership.

Preventative Maintenance

In conjunction with the specified inspections, maintenance shall be performed by a qualified JLG equipment mechanic. JLG Industries, Inc. recognizes a qualified JLG equipment mechanic as a person who, by possession of a recognized degree, certificate, extensive knowledge, training, or experience, has successfully demonstrated the ability and proficiency to service, repair, and maintain the subject JLG product model.

Reference Table 2-2, SSV-10 - Preventive Maintenance & Inspection Schedule., and the appropriate areas of this manual for servicing and maintenance procedures. The frequency of service and maintenance must be increased as environment, severity and frequency of usage requires.

Table 2-1. Maintenance and Inspection Requirements.

Type	Frequency	Primary Responsibility	Service Qualification	Reference
Pre-Start Inspection	Prior to use each day; or At each Operator change.	User or Operator	User or Operator	Operator and Safety Manual
Pre-Delivery Inspection	Prior to each sale, lease, or rental delivery.	Owner, Dealer, or User	Qualified JLG Mechanic	Service and Maintenance Manual and applicable JLG inspection form.
Frequent Inspection	In service for 3 months; or Out of service for a period of more than 3 months; or Purchased used.	Owner, Dealer, or User	Qualified JLG Mechanic	Service and Maintenance Manual and applicable JLG inspection form.
Annual Machine Inspection	Annually, no later than 13 months from the date of the prior inspection.	Owner, Dealer, or User	Qualified JLG Mechanic	Service and Maintenance Manual and applicable JLG inspection form.
Preventative Maintenance	At intervals as specified in the Service and Maintenance Manual.	Owner, Dealer, or User	Qualified JLG Mechanic	Service and Maintenance Manual

2.2 PREVENTIVE MAINTENANCE AND INSPECTION SCHEDULE

(See Table 2-2.)

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

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.

Table 2-2. SSV-10 - Preventive Maintenance & Inspection Schedule.

AREA ON MACHINE	INTERVAL				
	PRE-START (a) INSPECTION	3 MONTH PREVENTATIVE MAINTENANCE	6 MONTH PREVENTATIVE MAINTENANCE	PRE-DELIVERY (b) OR FREQUENT (c) INSPECTION	ANNUAL (d) (YEARLY) INSPECTION
MAST ASSEMBLY	7				
Mast Sections				2, 5	2, 5
Chain Systems			14	3, 14	14, 25
Sequence Cable Systems				3	1, 2, 3
Covers and Shields					1
Sheave Systems				1, 2	1, 2
Bearings					1, 2
Slide Pads					1, 2
PLATFORM ASSEMBLY	7				
Platform and Material Tray				1	1
Guard Rails				1, 2, 4	1, 2, 4
Gate				1, 5	1, 5
Floor				1, 2	1, 2
Lanyard Anchorage Point				1, 4	1, 4
CHASSIS ASSEMBLY	7				
Hood and Covers Installation				1, 7	1, 7
Static Strap				1	1
Caster Wheels	1, 2			1, 2	1, 2
Drive Wheels/Axle Assembly				2	2
Gear Box Assembly *	—	—	—	—	—
Drive Motor Brushes **	—	—	—	—	—
FUNCTIONS/CONTROLS	7				
Platform Controls				5, 6, 7	5, 6, 7
Ground Controls				5, 6	5, 6, 14
Function Control Locks, Guards, or Detents				5	5
Function Enable System	5				
Emergency Stop Switches (Ground & Platform)					5
Function Limit or Cutout Switch Systems				5	
Brake Release					5
Manual Descent or Auxiliary Power				5	5
POWER SYSTEM					
Batteries	19			9	18
Battery Charger					5
HYDRAULIC/ELECTRIC SYSTEM	9				
Hydraulic Pump				1, 2, 9	1, 2, 5, 9
Hydraulic Cylinder				2, 7, 9	2, 9
Cylinder Attachment Pins and Pin Retainers				1, 2	1, 2
Hydraulic Hoses, Lines, and Fittings				1, 9	1, 9
Hydraulic Reservoir, Cap, and Breather				5, 7	5, 7
Hydraulic Filter	9				25
Hydraulic Fluid ***	11			11	11
Electrical Connections				20	20
Instruments, Gauges, Switches, Lights, Horn	5				

Table 2-2. SSV-10 - Preventive Maintenance & Inspection Schedule. (Continued)

AREA ON MACHINE	INTERVAL				
	PRE-START (a) INSPECTION	3 MONTH PREVENTATIVE MAINTENANCE	6 MONTH PREVENTATIVE MAINTENANCE	PRE-DELIVERY (b) OR FREQUENT (c) INSPECTION	ANNUAL (d) (YEARLY) INSPECTION
GENERAL					
Operation & Safety Manual in Storage Box	21			21	21
ANSI & EMI Handbooks in Storage Box	21			21	21
Capacity Decals Installed, Secure, Legible	21			21	21
All Decals/Placards Installed, Secure, Legible	21			21	21
"Walk-Around" Inspection Performed	22				
Annual Machine Inspection Due					21
No Unauthorized Modifications or Additions				21	21
All Relevant Safety Publications Incorporated				21	21, 22
General Structural Condition and Welds				2, 4	2, 4
All Fasteners, Pins, Shields, and Covers					1, 2
Grease and Lubricate to Specifications				22	22
Function Test of All Systems	22			22	
Paint and Appearance				7	7
Stamp Inspection Date on Frame					22
Notify JLG of Machine Ownership					22

* Change only when serviced, requires 6 oz. (175cc's) to fill.
** Replace every 200 - 400 hours (Traction Time) - Depending on Application.
*** Drain and refill with fresh hydraulic fluid every two years.

Maintenance and Inspection Table Codes:

1. Check for proper and secure installation.
2. Visual inspection for damage, cracks, distortion, or excessive wear.
3. Check for proper adjustment.
4. Check for cracked or broken welds.
5. Operates properly.
6. Returns to neutral or "off" position when released.
7. Clean and free of debris.
8. Interlocks function properly.
9. Check for signs of leakage.
10. Decals installed and legible.
11. Check for proper fluid level.
12. Check for chafing and proper routing.
13. Check for proper tolerances.
14. Properly lubricated.
15. Torqued to proper specification.
16. No gouges, excessive wear, or cords showing.
17. Properly inflated and seated around rim.
18. Proper and authorized components.
19. Fully charged.
20. No loose connections, corrosion, or abrasions.
21. Verify.
22. Perform.
23. Sealed properly.
24. Overrides Platform controls.
25. Inspected per Service and Maintenance Manual.

Footnotes:

(a) Prior to use each day; or at each Operator change

(b) Prior to each sale, lease, or delivery

(c) In service for 3 months; or Out of service for 3 months or more; or Purchased used

(d) Annually, no later than 13 months from the date of the prior inspection

2.3 SERVICING AND MAINTENANCE GUIDELINES

General

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

Safety and Workmanship

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

NEVER WORK UNDER AN ELEVATED PLATFORM UNTIL PLATFORM HAS BEEN SAFELY RESTRAINED FROM ANY MOVEMENT BY BLOCKING OR OVERHEAD SLING.

Cleanliness

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

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

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

Components Removal and Installation

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

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

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

Component Disassembly and Reassembly

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

Pressure-Fit Parts

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

Bearings

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

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

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

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

Gaskets

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

Bolt Usage and Torque Application

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

Unless specific torque requirements are given within the text, standard torque values should be used on heat-treated bolts, studs, and steel nuts, in accordance with

recommended shop practices or the Torque Chart Figures in Section 1 of this Service Manual.

Hydraulic Lines and Electrical Wiring

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

Hydraulic System

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

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

Lubrication and Servicing

Components and assemblies requiring lubrication and servicing are shown in the Lubrication Chart, *(See Figure 1-2. in Section 1)*. Service applicable components with the amount, type, and grade of lubricant recommended in this manual, at the specified intervals. When recommended lubricants are not available, consult your local supplier for an equivalent that meets or exceeds the specifications listed.

Batteries

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

Mast Chain Inspection Procedure

Inspect mast chains for the following conditions:

Wear: Always inspect that segment of chain that operates over a sheave. As the chain flexes over the 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 2-3 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.

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.

Table 2-3. Chain Stretch Tolerance

Chain Size	Pin to Pin Measurement	Allowable Stretch
.50" pitch	12" or 24 pitches	.24 in./12 in. span
.625 pitch	15" or 24 pitches	.30 in./15 in. span

Fatigue Cracks: Fatigue is a phenomenon that affects most metals, and is the most common cause of chain plate failures. Fatigue cracks are found through 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 of 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 are incurred as a result of severe abuse as design specs are well within the rated lifting capacity of these chains.

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

a. Bent pins or plates.
b. Rusty joints.
c. Peened plate edges.

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

Protruding or Turned Pins: Chains operating with inadequate lube generate tremendous friction between the pin and plates (pin and bushing on leaf chain). In extreme cases, this frictional torque can actually turn the pins in the outside press-fit 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.

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 misalignment. Anchors with worn or broken fingers should be replaced. They should also be adjusted to eliminate twisting the chain for an even load distribution.

Inspect the sheaves, sheave bearings, sheave grooves and pins for extreme wear, replace as necessary. A worn sheave can mean several problems, as follows:

a. Chains too tight.
b. Sheave bearings/pin bad.
c. Bent/misaligned chains.

2.4 LUBRICATION INFORMATION

Hydraulic System

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

The design and manufacturing tolerances of the component working parts are very close, therefore, even the smallest amount of dirt or foreign matter entering a system can cause wear or damage to the components and generally results in faulty operation. Every precaution must be taken to keep hydraulic oil clean, including reserve oil in storage.

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

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

NOTE: *Metal particles may appear in the oil of new machines due to the wear-in of meshing components.*

Hydraulic Oil

For best performance, JLG recommends the use of ISO-Vg grade 32, 46 oil with a viscosity range between 15-250 SUS at 100 degrees F *(32-54 cST at 40 degrees C)*. Refer to Section 1-5 of this Service Manual for recommended hydraulic oils.

Changing Hydraulic Oil

Use of any of the recommended hydraulic oils eliminates the need for changing the oil on a regular basis. If it is necessary to change the oil, use only those oils meeting or exceeding the specifications appearing in this manual. If unable to obtain the same type of oil supplied with the machine, consult local supplier for assistance in selecting the proper equivalent. Avoid mixing petroleum and synthetic base oils. JLG Industries recommends changing the hydraulic oil annually.

Use every precaution to keep the hydraulic oil clean. If the oil must be poured from the original container into another, be sure to clean all possible contaminants from the service container.

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

Lubrication Specifications

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

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SECTION 3. BASE COMPONENTS

3.1 BASE ASSEMBLY COMPONENTS

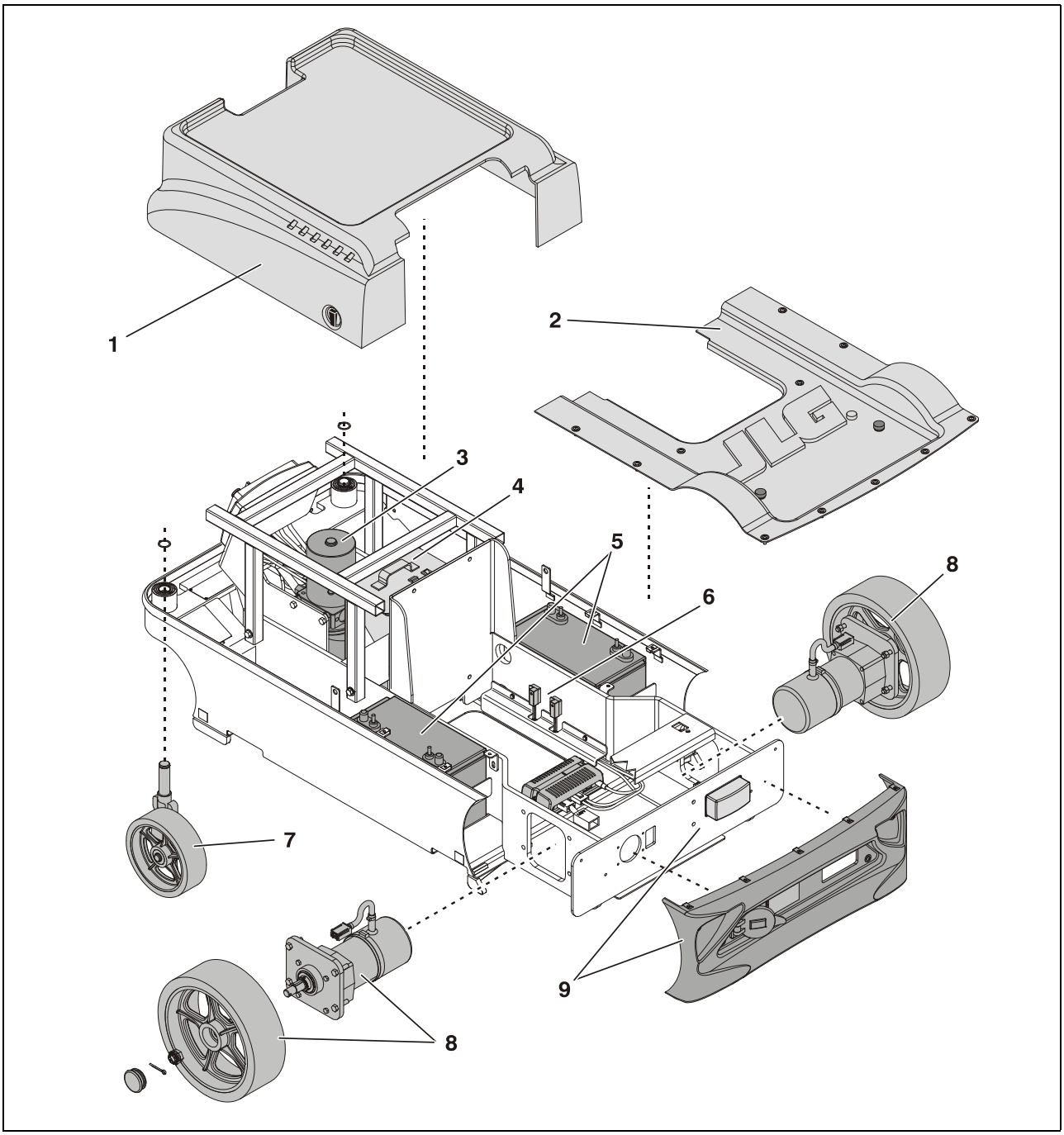
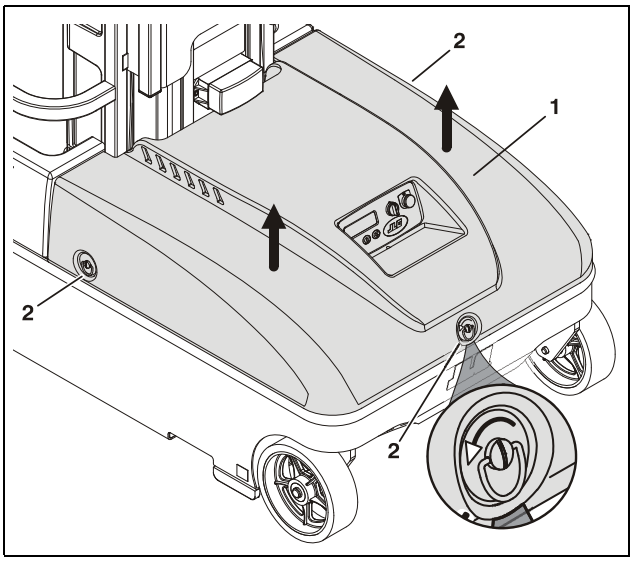


Figure 3-1. Base Components.

1. Front Cover
2. Drive Motor Cover
3. Hydraulic Pump Motor/Reservoir
4. Battery Charger
5. Batteries
6. Limit Switches (Mast Activated)
7. Front Caster Wheels
8. Drive Motor Assemblies
9. Rear Bumper Cover

3.2 BASE FRAME COVERS

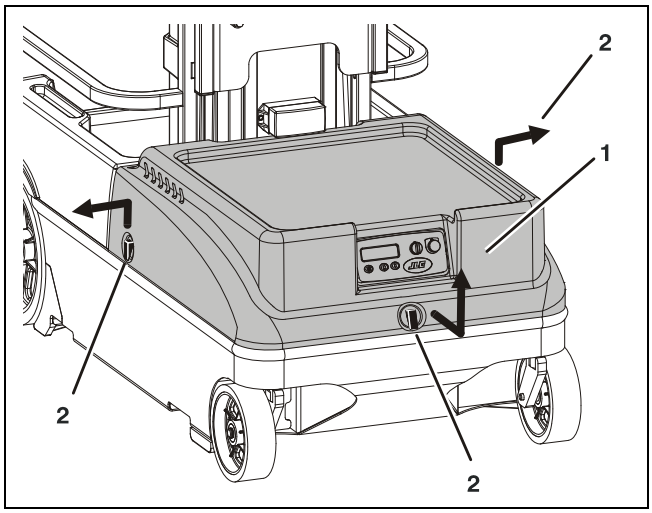
Front Cover - Installation (Original)



Front Cover Installation

1. Front Cover **2.** Cover Screws (3-places)

Front Cover - Installation (Carry Deck Version)

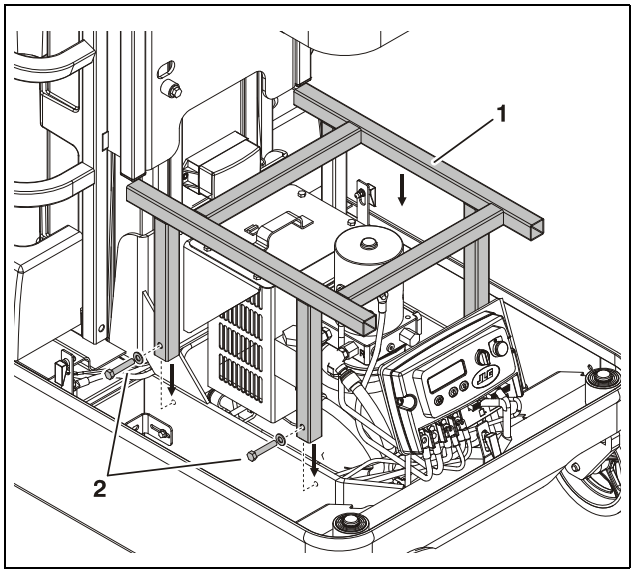


Front Cover (Carry Deck) Installation

1. Front Cover(Carry Deck) (a) **2.** Cover Latches (3-places) (b)

NOTE: *(a) The Carry Deck has a maximum capacity of 250 lb. (115k).*
(b) Lift each latch until straight out to release from the latch mount under the cover. Lift the rear of the hood slightly out of the frame gasket and pull out on each rear latch to clear the latch mount on the base frame. Lift deck and slide deck forward and lift to remove deck from machine.

Carry Deck Support Frame - Installation

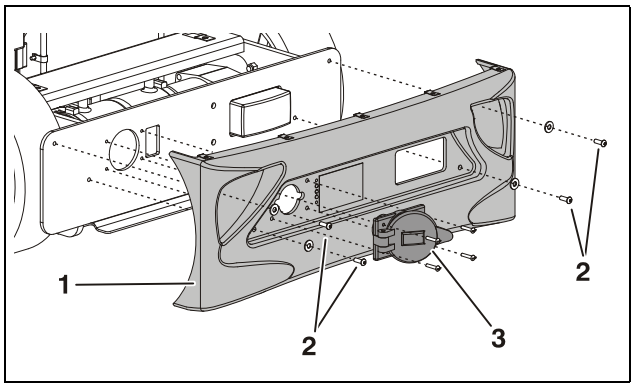


Carry Deck Support Frame Installation

1. Carry Deck Support **2.** Support Screws (4-places) (Apply Loctite #242)

Rear Bumper Cover - Installation

Five (5) of the Drive Motor cover screws must be removed to remove the rear bumper cover, see the Drive Motor Cover - Installation illustration. To gain access to those screws, elevate the platform.



Rear Bumper Cover Installation

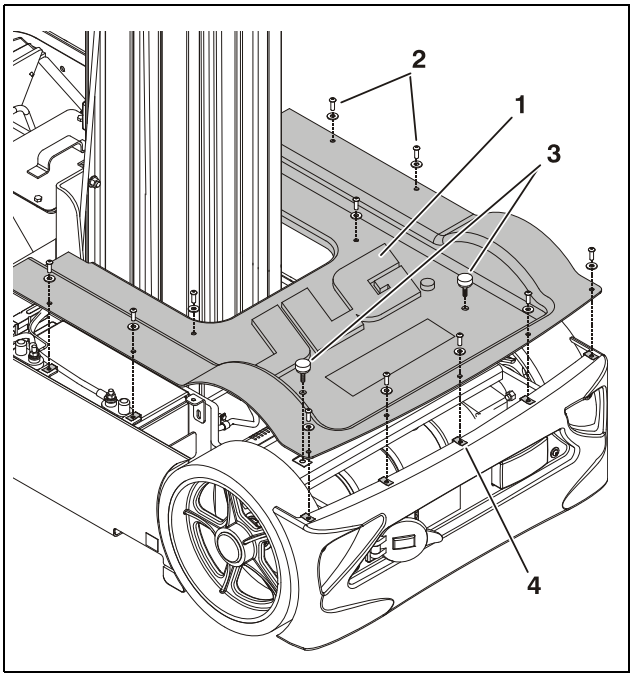
1. Bumper Cover **2.** Screws/Washers **3.** AC Input - Receptacle Assembly Cover

⚠ WARNING

NEVER WORK UNDER AN ELEVATED PLATFORM UNTIL THE PLATFORM HAS BEEN SAFELY RESTRAINED FROM ANY MOVEMENT BY BLOCKING OR OVERHEAD SLING.

Drive Motor Cover - Installation

To gain access to the drive motor cover and screws, elevate the platform.



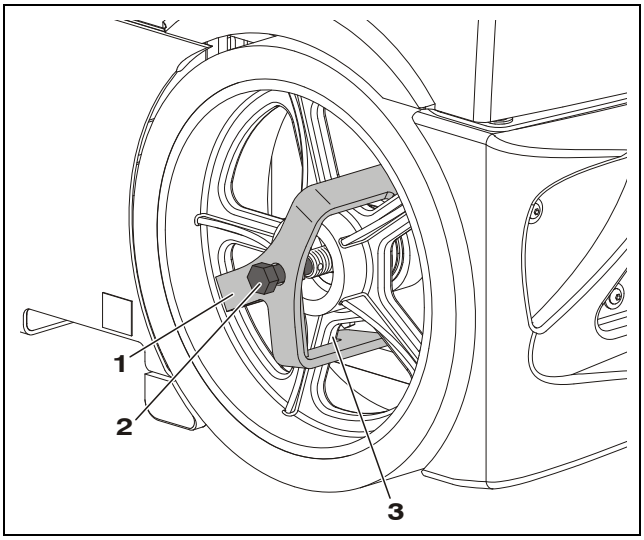
Drive Motor Cover Installation

1. Cover
2. Screws/Washers (a)
3. Platform Stop (a) (b)
4. U-Style Tapped Nuts

NOTE: *(a) Apply Loctite #242 to threads before tightening.*
(a) Height of the platform stops is set by installing two (2) 5/16" dia. wide plain steel flatwashers under the head of each stop, tighten securely.

3.3 DRIVE AND CASTER WHEELS

(Rear) Drive Motor Wheel - Removal

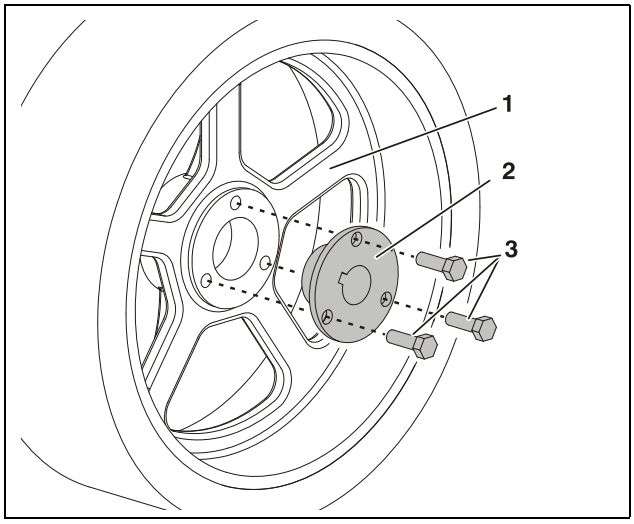


Drive Wheel Removal Tool

1. Wheel Puller Tool (a)
2. Puller - Hex Head Screw (b)
3. Interface with back of wheel spokes.

NOTE: *First remove the Hub Cover, Cotter Pin, Shield and Nut.*
(a) JLG Tool Part Number - 2915027
(b) Tighten in against the end of the drive motor shaft until the wheel comes loose.

Drive Motor Wheel Hub - Installation

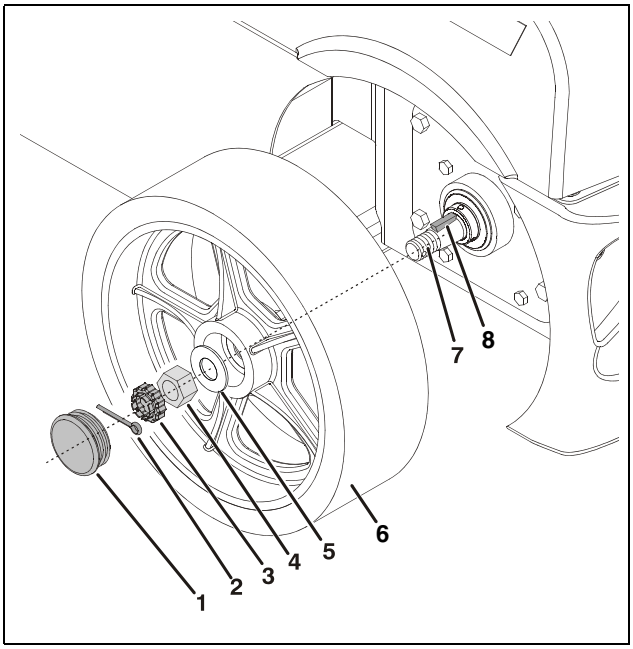


Drive Wheel Hub Installation

1. Rear Drive Wheel
2. Keyed Hub Insert
3. Hub Screws (a)

NOTE: *(a) Apply loctite #271 to threads, torque to 19 ft. lb.*

(Rear) Drive Motor Wheel - Installation

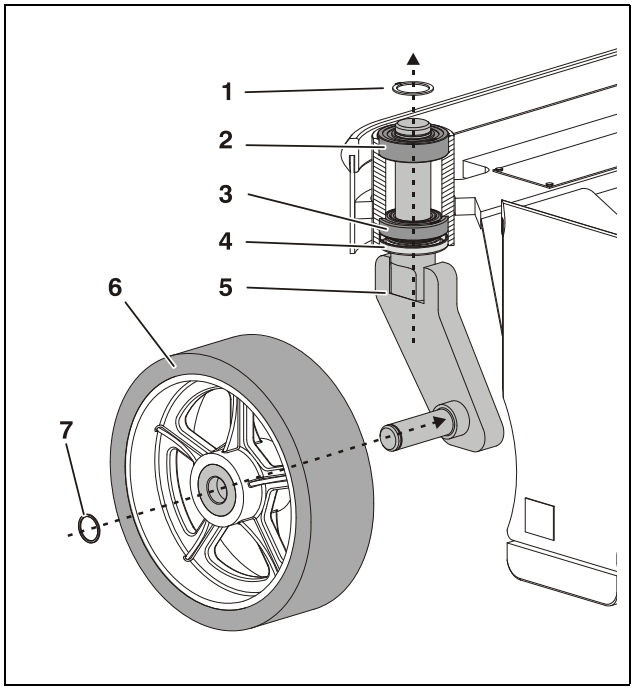


Drive Wheel Installation

1. Wheel Hub Cover
2. Cotter Pin
3. Nut Lock Shield
4. Wheel Nut (b)
5. Washer
6. Wheel/Hub (a)
7. Drive Motor Shaft (a)
8. Shaft Key (c)

NOTE: *(a) Coat the drive motor shaft and the inside of the wheel hub with Loctite Moly Paste Lubricant #51049 (JLG P/N- 3020039) before assembly.*
(b) On final assembly apply Loctite #242 to threads before tightening to 100 ft. lb.
(c) Lightly tap key into keyway on shaft, check that flat on key is parallel with shaft before installing wheel.

(Front) Caster Wheel - Installation

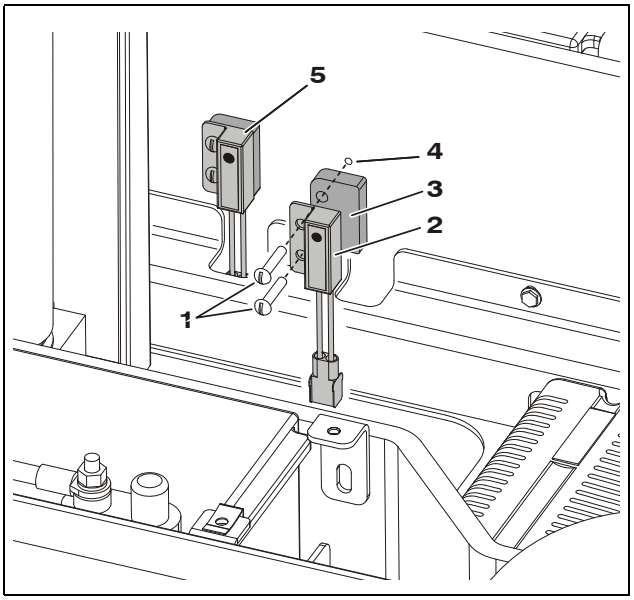


Front Caster Wheel Installation

1. Snap Ring
2. Upper Bearing (a)
3. Lower Bearing (a)
4. Spindle Shaft Seal
5. Spindle/Axle Assy.
6. Caster Wheel (b)
7. Snap Ring (c)

NOTE: *Base shown cutaway for illustrative purposes only.*
(a) If replacing bearing, pack bearing completely full of grease before assembling, use (JLG P/N-3020029 - Mobil SHC 460 Synthetic or equivalent), tap in evenly until seated.
(b) Coat the axle shaft with Loctite Moly Paste lubricant before assembling wheel. Axle bearings on wheel are maintenance free.
(c) After installing the wheel and just before installing the Snap Ring, wipe the end of the axle clean and coat the end of the axle with Clear Varnish.

3.4 DRIVE/ELEVATION CUT-OUT SWITCH INSTALLATION



Drive/Elevation Switch Cut-Out Switch Installation

1. Mounting Screws (a)
2. Proximity Switch (b)
3. Switch Mounting Block
4. Mounting Holes
5. Proximity Switch (b)

NOTE: *(a) Apply Loctite #242 to mounting screw threads on final assembly.*
(b) The SSV-10 is designed with two (2) drive/elevation cut-out proximity switches in the event that if one fails the other will continue to operate. Both are plugged into the wiring harness to the P2 connector on the Ground Control Station. If either switch would fail the Ground Control Module will signal a fault condition.

3.5 PUMP-MOTOR ASSEMBLY - SERVICE PROCEDURE

General

The following is a complete tear-down/re-assembly of the machines' pump/motor assembly. No internal parts to the hydraulic pump are serviced by JLG except for a pump installation seal kit. Also the only parts serviceable internal to the pump electric motor is the motor brush kit.

NOTE: *During reassembly of the pump/motor assembly, apply a liberal coat of JLG recommended hydraulic fluid to all seals and o-rings.*
Also keep all internal metal parts clean and coated with hydraulic fluid to prevent surface corrosion.
JLG recommends replacing all seals and o-rings when disassembling and reassembling the pump/motor unit.

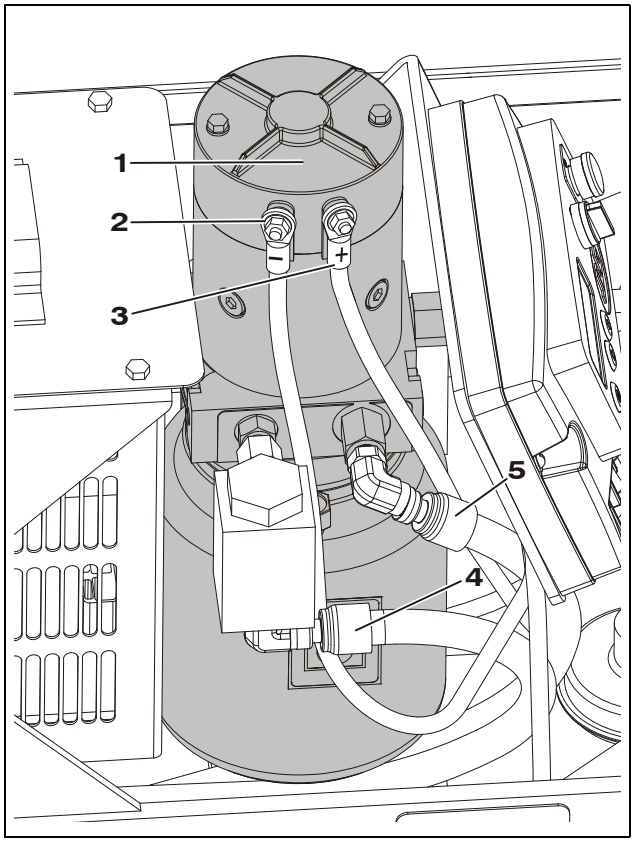
IMPORTANT

DISCONNECT THE LEFT SIDE BATTERY (+) POSITIVE BATTERY TERMINAL BEFORE REMOVING THE PUMP/MOTOR FROM THE MACHINE.

Pump-Motor Assembly - Remove/Install

⚠ WARNING

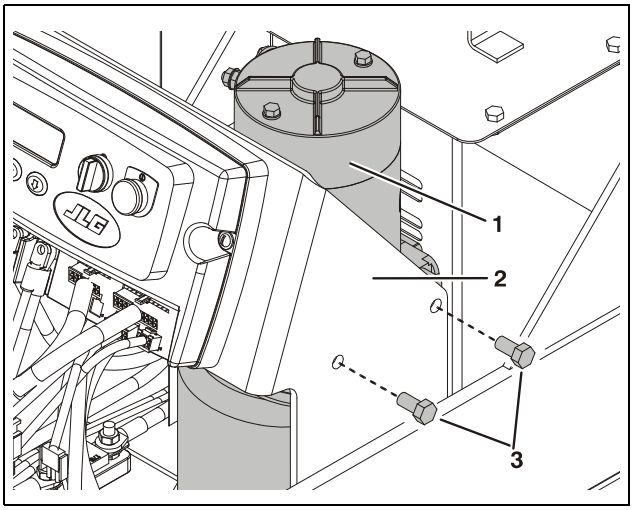
BE CERTAIN THE MAST IS FULLY LOWERED BEFORE REMOVING ANY HYDRAULIC LINES FROM THE PUMP UNIT. WEAR PROTECTIVE GEAR WHEN WORKING AROUND PRESSURIZED HYDRAULIC LINES. REMOVE CONNECTIONS CAREFULLY AND CAP ALL LINES AND PORTS WHEN DISCONNECTED.



Hydraulic Pump Assembly Components

1. Hydraulic Pump/Motor/Reservoir Assembly
2. (–) Power Cable from Ground Control Station (a)
3. (+) Power Cable from Ground Control Station (a)
4. Hydraulic Extend Pressure Line to Lift Cylinder (b)
5. Hydraulic Return Line from Lift Cylinder (b)

NOTE: *(a) Shown with protective cover removed.*
(b) Completely lower platform before loosening any hydraulic lines to remove any pressure remaining in the lines. Take proper caution and wear protective gear anytime you are opening a hydraulic line.
Once power cables and hydraulic lines are removed from this side of pump assembly, remove the mounting screws from the other side of the pump, see the following illustration.

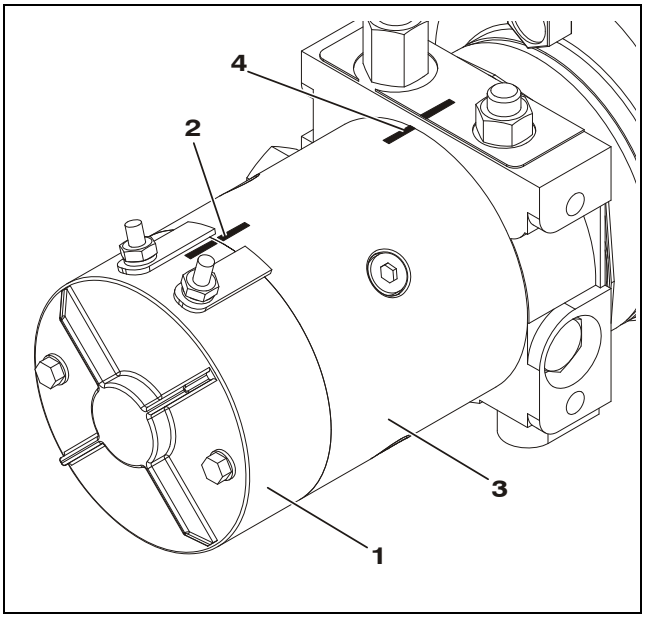


Hydraulic Pump Mount and Mounting Screws

1. Hydraulic Pump/Motor/Reservoir Assembly
2. Pump/Ground Control Station Mounting Bracket
3. Pump Mounting Screws (a)

NOTE: *(a) Apply Loctite #242 to screw threads before final assembly.*

Motor - Remove/Install - Reference Marks

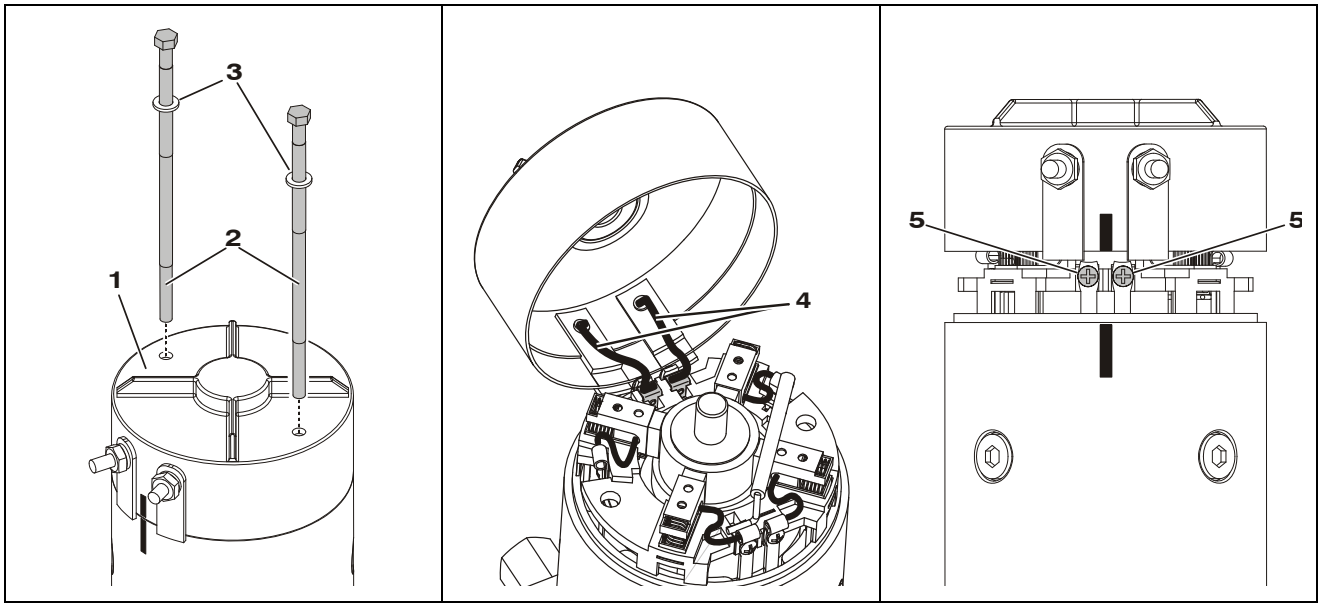


Pump Motor - Removal/Installation - Reference Marks

- For reference when reassembling, mark motor cover, housing and valve body position before disassembling.

1. Motor Top Cover
2. Cover/Housing Reference Mark
3. Motor Housing
4. Housing/Motor Valve Body Reference Mark
5. Motor Valve Body

Motor/Brush Cover - Remove/Install



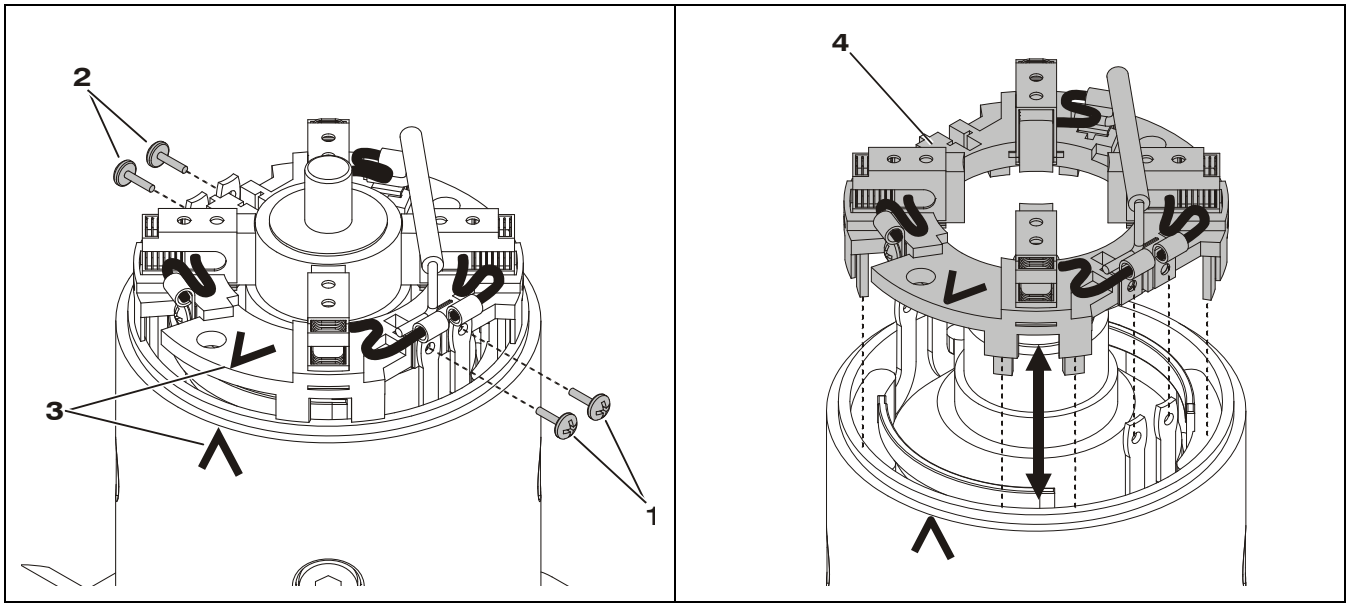
Motor/Brush Cover - Removal/Installation

1. Motor/Brush Cover (a)
2. Cover Screws (b)
3. Washers
4. Power Leads to Lead Clips (Soldered)
5. Power Lead Clip Attach Screws

IMPORTANT NOTE:
REMOVE THE MOTOR COVER CAREFULLY, THE (SHORT) POWER LEADS INSIDE THE COVER FROM THE (+/–) POSTS ARE SOLDERED TO ATTACH CLIPS WHICH ARE FASTENED TO THE BRUSH CARRIER ASSEMBLY WITH SCREWS (ITEM-5). RAISE THE COVER STRAIGHT UP - REMOVE THE SCREWS - THEN HINGE THE COVER UP (SEE CENTER ILLUSTRATION) AND PRY THE CLIPS OFF OF THE BRUSH CARRIER ASSEMBLY TO COMPLETELY REMOVE THE MOTOR COVER.

NOTE: *(a) Once cover screws are removed, you may need to tap lightly around the edge of the top cover to separate it from the motor housing. Read the note above before attempting to remove the cover.*
(b) These steel screws are threaded into the aluminum valve body, do not overtighten.

Brush Carrier Assembly - Remove/Install

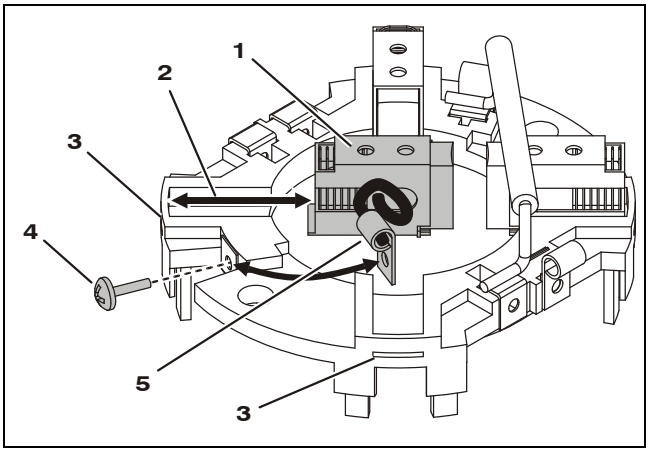


Brush Carrier Assembly - Remove/Install

1. Stator/Brush Carrier Screws (Pump Rear)
2. Stator/Brush Carrier Screws (Pump Front) (a)
3. Mark Brush Carrier Position on Motor Housing
4. Brush Carrier Assembly

NOTE: *(a) Removed previously with motor cover disassembly (shown for reference only).*

Brush Assembly - Remove/Install

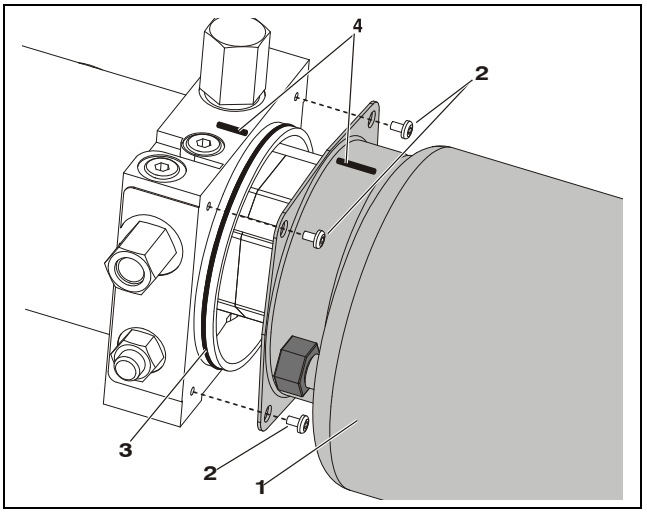


Brush Assembly - Remove/Install

1. Brush Assembly (a)
2. Brush Carrier Socket
3. Brush Tab Slot
4. Brush Terminal Screw
5. Brush Attach Terminal

NOTE: *(a) Slide brush assembly into socket until tab is in slot at rear of socket.*

Tank Remove/Install



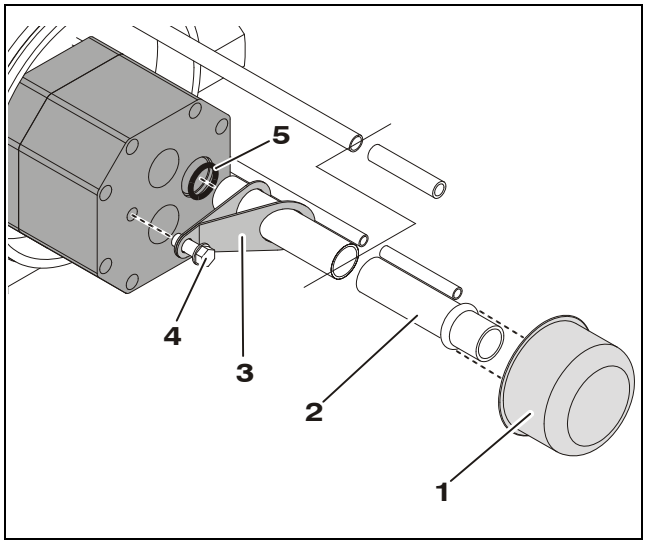
Tank - Remove/Install

• For reassembly reference, place a mark on tank and valve body.

1. Tank Assembly
2. Tank Screws (Qty. 4)
3. O-Ring Seal (a)
4. Reference Mark

Note: (a) Lubricate o-ring with clean hydraulic fluid before sliding tank over during installation.

Filter Screen Remove/Install



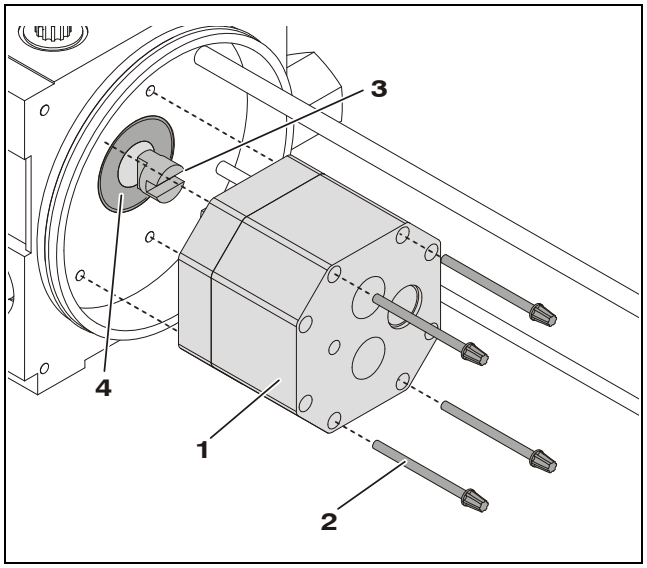
Filter Screen - Remove/Install

- Requires removal of tank assembly.

1. Filter Screen
2. Pump Pick-Up Tube
3. Tube Retainer Clip
4. Tube Attach Screw
5. O-Ring

Note: Tubes shown shortened for illustrative purposes only.

Pump Remove/Install

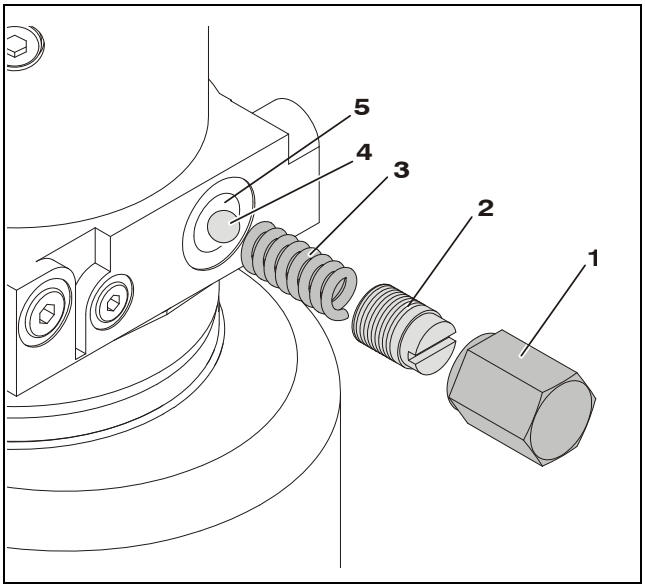


Pump - Remove/Install

- Requires removal of tank assembly and pump pick-up tube.

1. Pump Assembly
2. Pump Assembly Screws
3. Motor to Pump Coupler
4. Pump Shaft Bearing

Pressure Adjust Valve Remove/Install

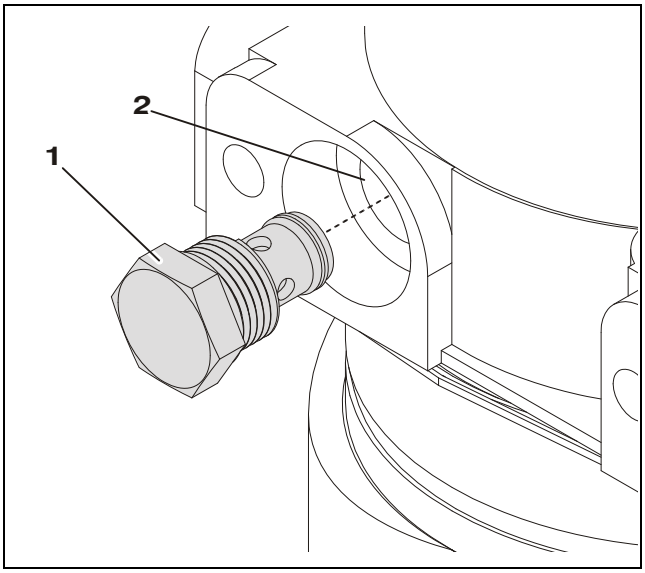


Pressure Adjust Valve - Remove/Install

1. Adjust Valve Cap
2. Adjustment Screw
3. Valve Spring
4. Valve Ball
5. Adjust Valve Port

Note: Adjust pressure per specification shown in Section-1 of this Service Manual.

Pressure Check Valve - Remove/Install



Pressure Check Valve Remove/Install

1. Check Valve Assembly
2. Check Valve Port

3.6 DRIVE MOTOR ASSEMBLY - SERVICING

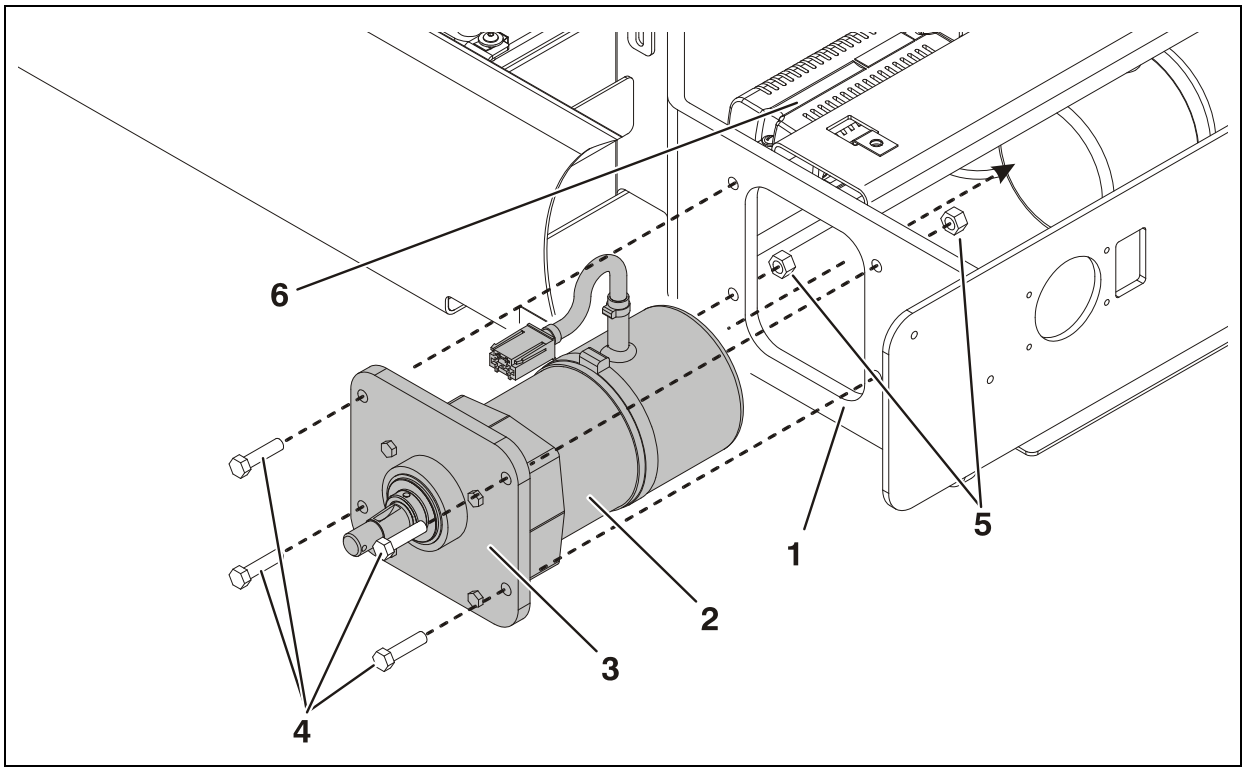
The component parts of the left and right drive motor assemblies are identical. The left drive motor is run in the reverse direction of the right motor.

Drive Motor Assembly - Removal

The SSV-10 electric drive motor assemblies are mounted indepentent of each other in the base frame at the rear of the machine.

The drive motor assembly consists of the electric drive motor with a 32:1 ratio parallel drive gear box mounted on one end, and a friction disk brake - covered with a rubber boot, mounted on the other end. This assembly is mounted to a motor mounting plate/bearing carrier which is bolted to the machines base frame.

1. Elevate the platform and remove the drive motor cover and set aside, see Section 3.2 on page 3-2.
2. Disconnect the positive battery terminals from the left side battery.
3. Raise the rear drive wheels of the machine off the ground, use a fork truck or floor jack. Place a block or safety stand under machine.
4. Remove the drive motor wheel(s), see Section 3.3 on page 3-3.
5. Disconnect the drive motor power harness connector(s) from the traction module mounted just in front of the drive motor location in the base frame.
6. Remove the four (4) hex head cap screws and lock nuts from the drive assembly mounting frame.
7. Carefully slide the drive motor assembly out of the base frame assembly for disassembly.

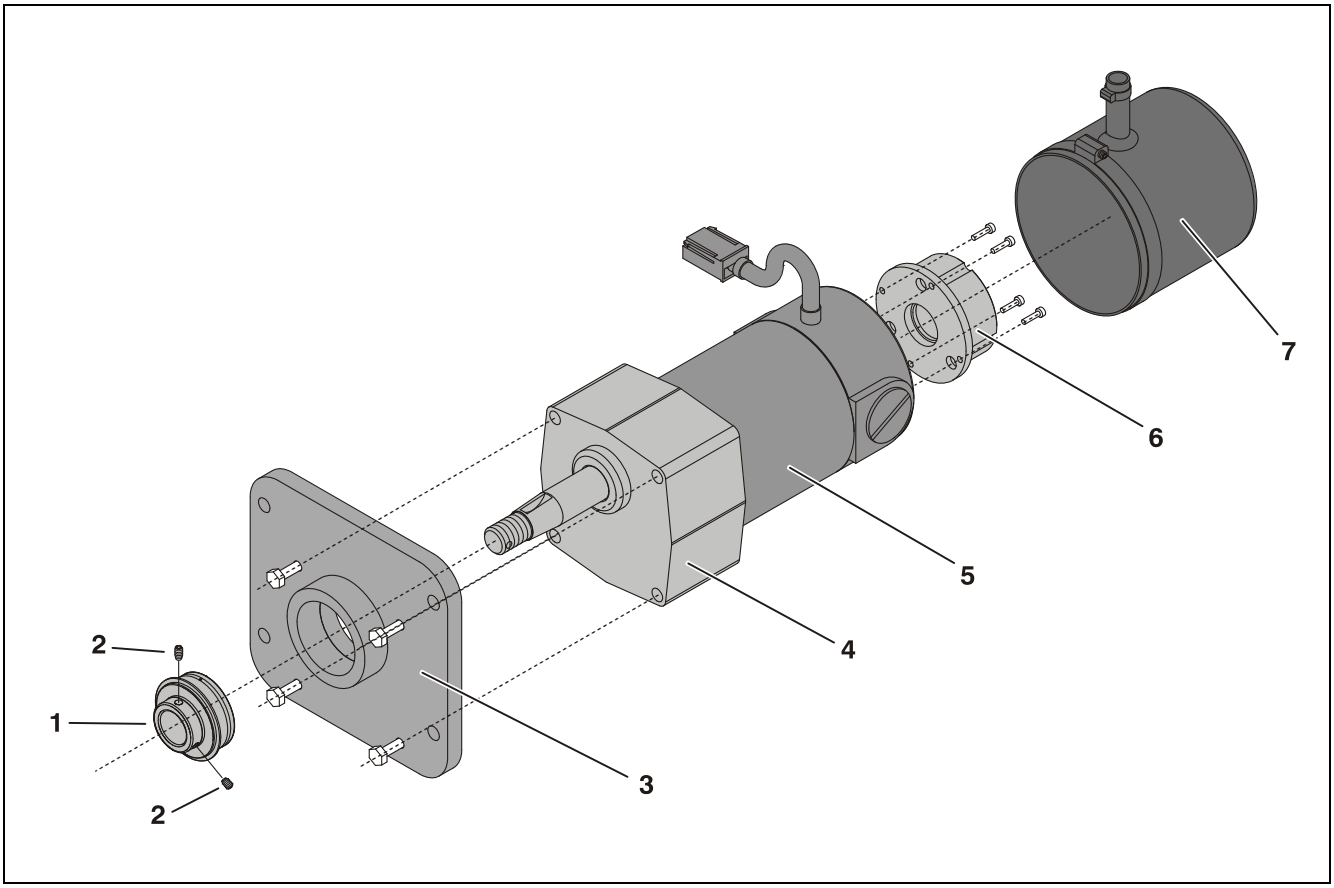


Drive Motor Assembly - Installation

1. Frame Mounting Surface
2. Drive Motor Assembly
3. Motor Mounting Plate/Bearing Carrier
4. Drive Motor Mounting Bolts
5. Lock Nuts (1 on each mounting bolt)
6. Traction Control Module Location

NOTE: *Installation same for left and right drive motor.*
Base shown with rear bumper cover assembly removed for illustrative purposes only.

Drive Motor Assembly - Components

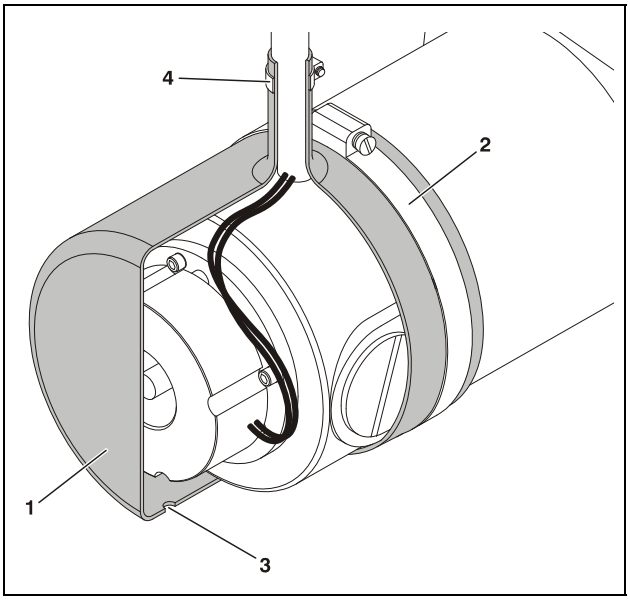


Drive Motor Assembly - Components

1. Drive Shaft Bearing (a)
2. Bearing Set Screws (b)
3. Motor Mount/Bearing Frame (c)
4. Drive Gear Box - 32:1 Ratio
5. Electric Drive Motor (d)
6. Drive Motor Brake
7. Motor/Brake Boot (e)

NOTE: *(a) Once motor is mounted to motor mount/bearing frame, slide drive shaft bearing into frame till it is seated.*
(b) Tighten bearing set screws once bearing is seated in motor mount/bearing carrier.
(c) Apply Loctite #242 to threads of motor mount screws at final assembly.
(d) Electric Motor harness contains both the drive motor and the brake leads. The motor leads are negative (–) lead is BLACK and positive (+) lead is WHITE.
(e) Mount boot with electrical lead sleeve at top and condensation drain hole in boot on bottom.

Drive Motor - Boot Installation



Drive Motor Boot - Installation

1. Boot - *(Shown Cutaway)*
2. Boot Clamp
3. Drain Hole (a)
4. Power Cable Sleeve/Clamp

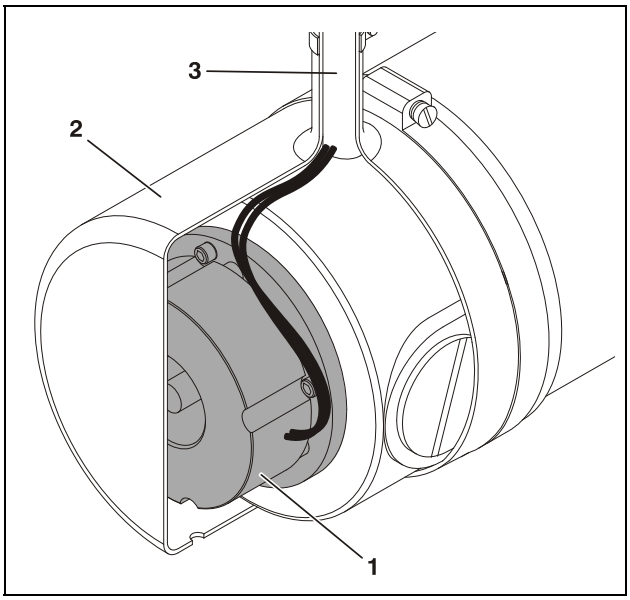
NOTE: *When removing, loosen clamps, slide boot clamp forward on motor, pull bottom of boot up over brake and slide up harness sleeve.*

(a) If replacing the boot assembly with a new one, check the bottom of the boot for a drain hole. If none exists, cut a drain hole approximately 1/8 inch (3mm) size on the ***BOTTOM*** *of the new boot. This will allow any accumulated condensation to drain out and not remain trapped there.*

Drive Motor - Brake Location

A brake assembly is mounted to the end of the drive motor housing. The brakes are ENGAGED *(brakes on)* when the machine is parked and are RELEASED electrically *(brakes off)* when the joystick is enabled and pushed in any direction. The brakes can also be RELEASED electrically using the manual brake release button on the ground control station.

NOTE: *The brakes are intended only as a parking brake to keep the machine from moving while at rest. The brakes are not used to stop the machine during driving operations, this braking is controlled by the drive motors themselves. Under normal driving conditions, once released the brakes are not engaged again until the machine comes to a complete stop.*

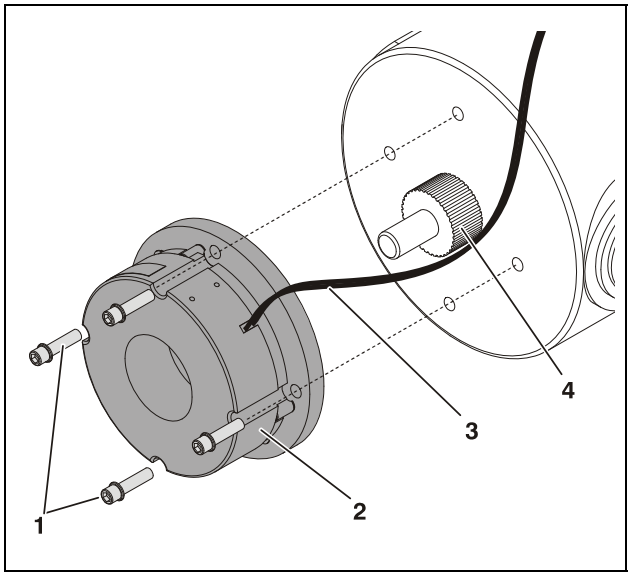


Drive Motor Brake Location

1. Drive Motor Brake
2. Boot - (Shown Cutaway)
3. Motor/Brake Power Cable

Brake Assembly Removal From Motor

1. Elevate the platform to gain access to the drive motor covers.
2. Remove the drive motor cover. (See Drive Motor Cover - Installation on Page 3-3).
3. Remove the drive wheel. (See (Rear) Drive Motor Wheel - Installation on Page 3-4).
4. Disconnect the drive motor/brake power connector from it's wiring harness connector.
5. Remove the drive motor. (See Drive Motor Assembly - Removal on Page 3-11).
6. Loosen the boot clamp, and slide the protective rubber boot off the end of the drive motor housing exposing the brake assembly.
7. Remove the four (4) hex cap screws securing the brake assembly to the end of the drive motor housing and remove the brake assembly from the end of the drive motor.



Brake Removal

1. Round Hex Screws
2. Brake Assembly
3. Brake Power Leads
4. Motor Shaft to Brake Disc Spline Gear

Brake Operation

When the magnetic coil is not energized *(brake on)*, the armature plate is pushed away from the magnetic coil surface by heavy springs internally mounted in the magnetic coil housing. This pressure forces the armature plate against the friction brake disk holding it tight between the armature plate and the mounting plate. The internally splined friction brake pad is mated to an externally splined gear on the drive motor armature shaft. The brake is not released until the magnetic coil is energized pulling the armature plate away from the friction brake disk.

A correctly adjusted brake will ideally have a measurement of approximately .006" *(but will operate normally at .004" to .010")* between the armature plate and magnetic coil housing surface when the brakes are ENGAGED *(brakes on)*.

Never allow any type of lubricant (oil, grease, hydraulic fluid, etc.) to come in contact with the brake friction disk or it's contacting surfaces. Also if the brake becomes clogged with debris or dirt the brake may not release properly.

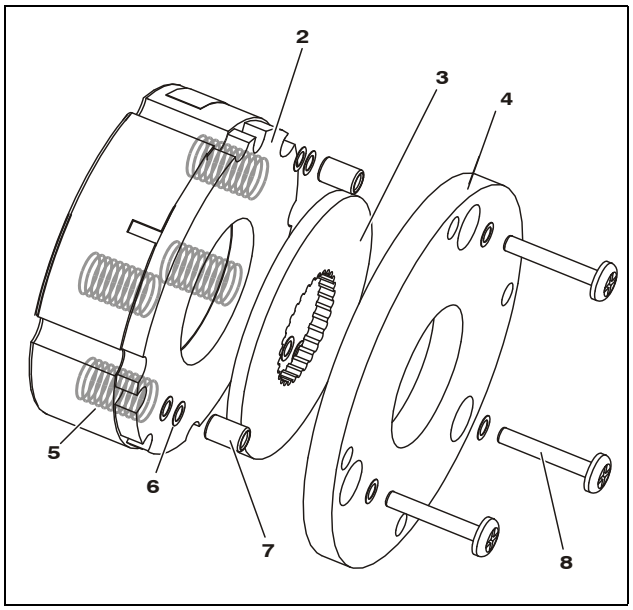


Figure 3-2. Brake Assembly Components

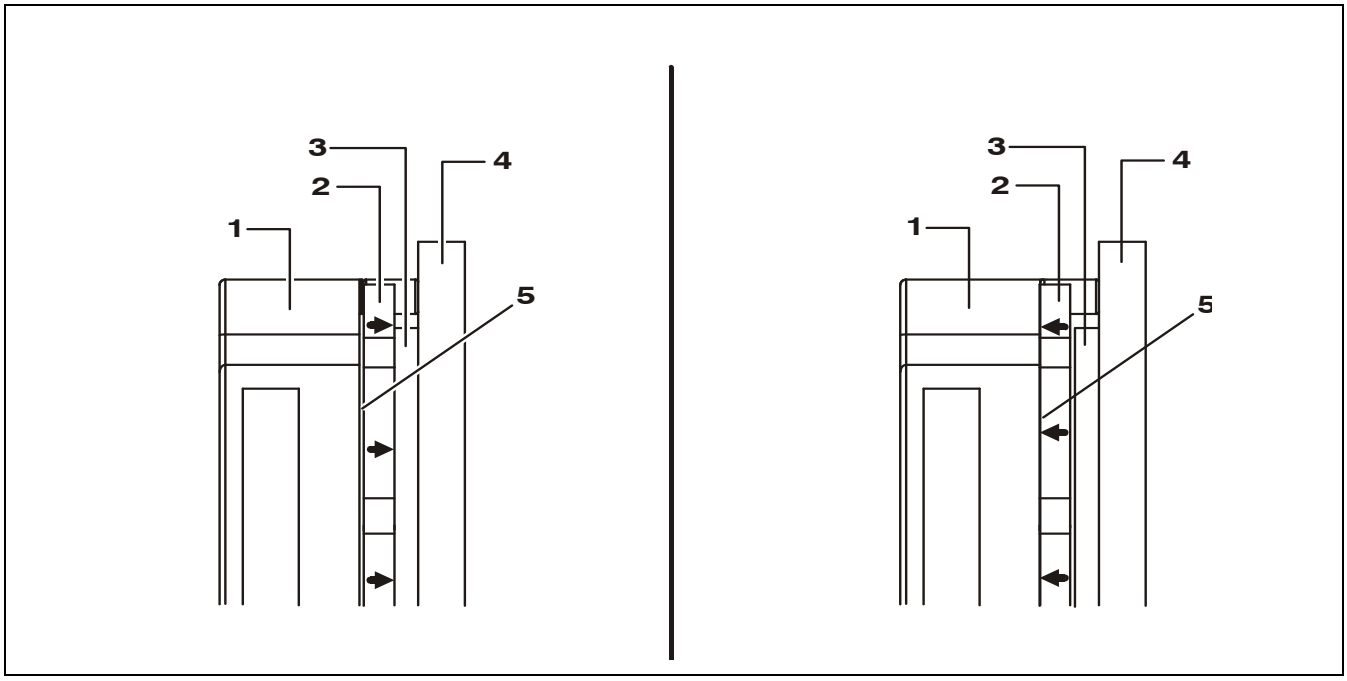
1. Magnetic Coil Housing
2. Armature Plate
3. Friction Brake Disk
4. Mounting Plate
5. Plate Springs
6. Shim Washers
7. Spacer
8. Mounting Plate Screws

Checking/Adjusting Armature Plate Gap Setting

1. First inspect that all parts of the brake assembly are tight and secure. Tighten as necessary.
2. Inspect the brake for any debris which may be lodged in the air gap between the armature plate and magnetic coil when the brakes are ENGAGED *(brakes on)*; on either side of the friction disk when the brake is RELEASED *(brakes off)*. Clean and remove debris as necessary.
3. With the brakes ENGAGED measure the air gap between the armature plate and the magnetic coil housing. The correct setting should be .006", however the brakes will operate properly if the measurement is a minimum of .004" and a maximum of .010". *(See "Gap Setting" Illustration this Section)*
4. If the air gap falls outside the maximum allowable setting of .010" the friction disk has worn. To correct this replace the disk with a new one.
5. If the air gap is below the minimum allowable setting of .004", recheck the areas between the magnetic coil housing, armature plate, friction disk and mounting plate for debris. Clean as necessary.

Brake Assembly Installation

1. Secure the brake assembly to the drive motor housing using four (4) hex cap screws with washers. Torque evenly to 44 in. lbs.
2. Reinstall the protective rubber boot over the drive motor housing, secure the boot with the boot clamp.
3. Reconnect the drive motor/brake power wiring connector to wiring harness connector.
4. Install the drive motor cover.



Gap Setting - Brake Engaged
(magnet not energized-springs engage plate against disk)

1. Magnetic Coil **2.** Armature Plate **3.** Brake Disk(Engaged) **4.** Mounting Plate **5.** .006" Gap

Gap Setting - Brake Disengaged
(magnet energized-plate compresses springs, disk rotates freely)

1. Magnetic Coil **2.** Armature Plate **3.** Brake Disk (Free) **4.** Mounting Plate **5.** Plate Engaged - Springs Compressed

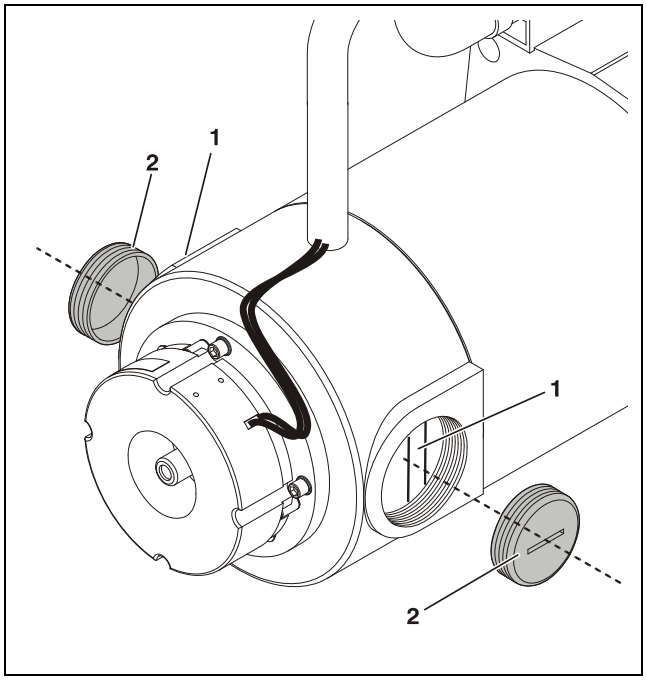
Drive Motor Brush Replacement

Each drive motor contains two (2) brushes, the brushes are located under the two (2) large round slotted brush caps on the front end of each drive motor.

NOTE: *When determining hourmeter hours on the Ground Control Module for brush replacement, remember the hourmeter display can be RESET back to 00000.0 at any time. A more accurate reading can be obtained by entering the Ground Control Module programming mode and checking the Timer readings there. Also if the machine's Ground Control Module has been replaced the current hourmeter hours will also be inaccurate unless a written record has been kept.*

The drive motor brushes must be replaced, depending on application, every 200 - 400 hours (Traction Time) as indicated on the Ground Control Module in programming mode. See Section 4, Ground Control Module Programming about accessing the machine timer hours.

NOTE: *If machine hourmeter hours cannot be determined accurately as noted above, a visual inspection and measurement of the brushes must be made. The brushes must be replaced before they are less than .405 inch (11mm) in length.*



Drive Motor Brush Location

1. Brush Location **2.** Brush Caps *(shown removed)*

⚠ WARNING

DISCONNECT THE POWER LEADS FROM THE POWER SOURCE BEFORE INSPECTING OR REPLACING BRUSHES.

Brush Removal

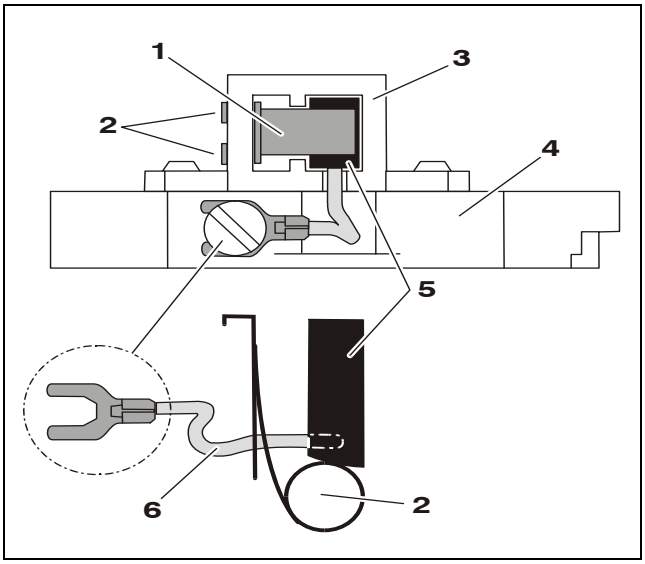
Removal of the brushes also requires the removal of the drive motor(s) from the machine, See Drive Motor Assembly - Removal on Page 3-11.

After removing the drive motor from the machine, remove the brush assemblies using the following steps:

1. Remove the clamp and protective rubber boot from the drive motor.
2. Unscrew the large round brush caps from each side of the drive motor, use as large a screw driver as possible.
3. The brushes are retained by constant-force, roll-type springs. To remove the springs, press inward on the end of the spring retaining bracket using the tip of a pair of long nose pliers or other appropriate tool. The brushes should pop out, if not, they can be removed by pulling outward on the spring brackets with a pair of long nose pliers after the inside ends are unhooked.
4. Now pull the brush out of the brush box by it's wire *(pig-tail)*.

NOTE: *If only inspecting the brushes, it is not necessary to remove the pig-tail terminal from it's connection to the brush box.*

5. Loosen the screw securing the pig-tail terminal end to the brush box and slide the terminal end out from under the screw completely removing the brush from the drive motor.



Brush Component Installation

1. Roll Spring
2. Roll Spring Hooks
3. Brush Box
4. Brush Box Insulator
5. Brush
6. Pigtail Wire

Brush Reassembly

⚠ CAUTION

MAKE CERTAIN THAT THE GROUND WIRE IS SECURELY RECONNECTED TO THE GROUND TERMINAL IF REMOVED. LEADS, INTERNAL TO THE SHIELD, MUST BE ROUTED AWAY FROM THE ARMATURE, (E.G.: BE CLOSE TO THE INSIDE WALL OF THE ALUMINUM SHIELD) TO PREVENT A SAFETY HAZARD AND/OR DAMAGE TO THE MOTOR.

1. Install the brush *(pig-tail)* terminal end under the screw on the brush box in the same manner as the old brush that was removed and tighten the screw.
2. Slide the body of the brush into the brush box, be certain that the wire *(pig-tail)* is aligned with the slot in the base of the brush box so that it can "feed" into the brush box slot as the brush wears down.

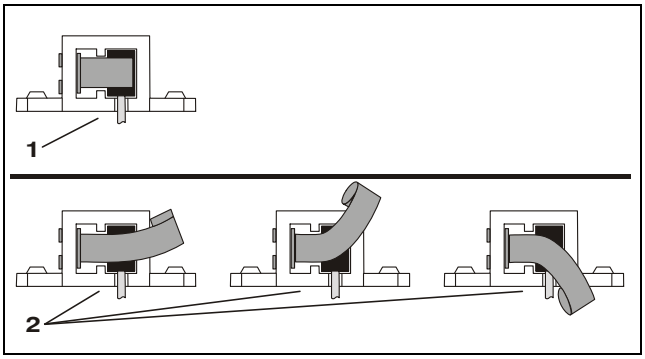
NOTE: *The pig-tail wire should be formed to rest against the nonmetallic insulator. It must be spaced from any metallic surfaces other than the brush box by a minimum of .125 in. (3mm).*

3. Now install the brush retaining spring bracket. Grasp the tip of the spring bracket such that the roll-type spring will be on the "brush side" of the brush box, and resting on top of the brush when the brush spring is completely installed.
4. Push the spring bracket slowly into it's slot while letting it's two attaching hooks slide on the wall of the brush box.
5. Stop, but do not release the spring bracket when it's hooks slip around the edge of the brush box.
6. While still grasping the spring bracket with the pliers, slowly bring the spring back out of the brush box until the hooks latch around the edge of the brush box.
7. Now release the spring bracket and check that it is lying flat against the brush box wall. If it is "cocked" it is improperly seated and will have to be reinstalled.

IMPORTANT

THE SPRING BRACKET MUST BE ALSO LIE COMPLETELY INSIDE THE BRUSH BOX AND NOT OUT OVER THE EDGE. THE ROLL END OF THE SPRING MUST BE CENTERED ON THE TOP OF THE BRUSH. (SEE ILLUSTRATION FOLLOWING)

8. Also apply slight pressure by pulling up on the spring bracket to be certain it is hooked securely around the brush box wall at the bottom of the brush box.
9. Screw the brush caps back into the end shield using the largest possible screwdriver.



Correct/Incorrect Brush Installation

1. Correct **2.** Incorrect

10. Reinstall the drive motor(s) to the machine and reconnect the power source.

IMPORTANT

NEW BRUSHES MAY BE SEATED BY RUNNING THE DRIVE MOTOR AT NO LOAD. PROPER SEATING IS REQUIRED FOR LOWEST BRUSH NOISE LEVEL.

3.7 BATTERIES AND BATTERY CHARGER - SERVICE PROCEDURES

Battery Condition Testing

NOTE: *Batteries in storage should be kept at 12.5V or higher.*

Before testing for battery condition, the open circuit voltage should be taken from each battery. If the voltage of the batteries differs by 0.3 volts or more, the lower voltage battery should be replaced.

Battery Testing Can Be Performed In Two Ways:

1. The batteries can be tested using a battery tester capable of testing 12V 100Ah AGM VRLA *(Valve Regulated Lead Acid)* batteries, using the instructions of the battery tester manufacturer.
2. If an appropriate battery tester is unavailable, the batteries can be tested by fully charging them with the charger that is installed in the machine. Then check the battery voltage of each battery - 4 hours - after charging is complete. Batteries less than 12.72 volts should be replaced.

NOTE: *If a faulty charger is suspected, the batteries can be charged using a charger that supplies 2.45 volts/cell. Charging should be terminated when the charge current drops below 1 amp.*

Battery Replacement

Replacement battery(s) must be of equivalent voltage and amperage output as the OEM battery(s) in order for the machine to operate to as manufactured specifications. Battery replacement part weight must also be equivalent to OEM, (65 lb.) (30Kg) per battery, in order to maintain machine stability as manufactured.

⚠ WARNING

DO NOT REPLACE ITEMS CRITICAL TO STABILITY, SUCH AS BATTERIES, WITH ITEMS OF DIFFERENT WEIGHT OR SPECIFICATION. DO NOT MODIFY UNIT IN ANY WAY TO AFFECT STABILITY.

Battery - Installation

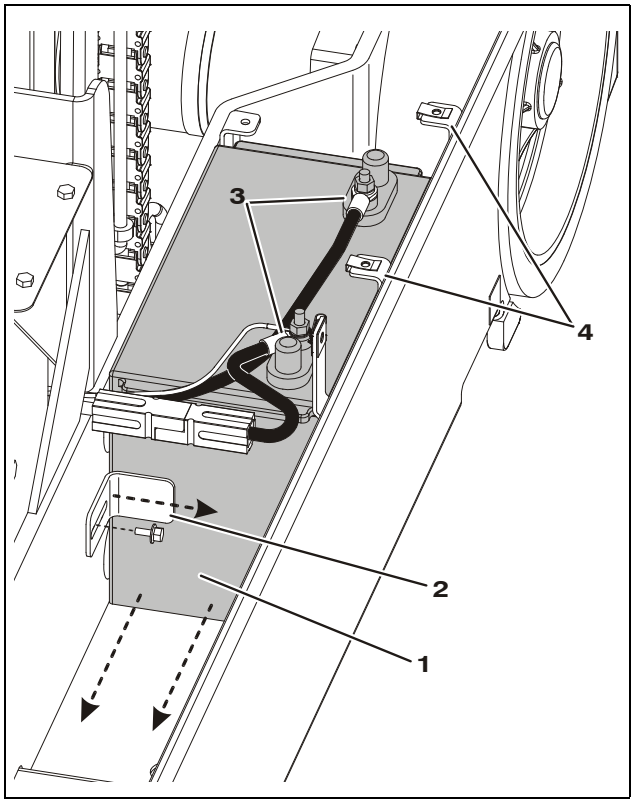
To gain access to the batteries, requires removal of the front cover and rear drive motor cover See Section 3.2 on page 3-2.

Procedure for removal is same for both batteries.

On installation, batteries set in machine with the posts to the outside. Left side battery (+) POS post at front (shown below), Right side battery (–) NEG post towards machine front.

⚠ WARNING

NEVER WORK UNDER AN ELEVATED PLATFORM UNTIL THE PLATFORM HAS BEEN SAFELY RESTRAINED FROM ANY MOVEMENT BY BLOCKING OR OVERHEAD SLING.

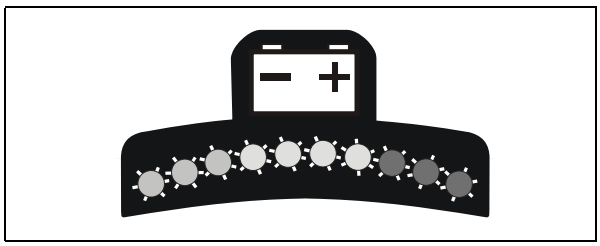


Battery Installation (Left Side Battery Shown)

1. Battery (a) (b)
2. Hold-Down Bracket and Screw
3. Battery Posts
4. Drive Motor Cover Screw Brackets

NOTE: *(a) Once hold-down bracket (item 2) is removed, remove the cables from the battery posts, slide battery forward to clear brackets (item 4). Then lift battery out of base frame.*
(b) The carry deck support frame will need to be removed, on machines equipped with the carry deck.

Battery Charge LED Indicator on Platform Control Console



On normal power-up and operation this series of ten (10) LEDs visually indicates the amount of charge remaining in the batteries.

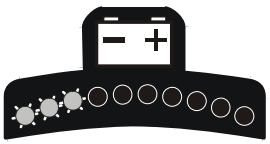
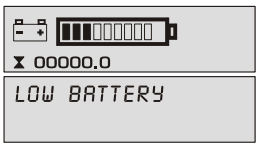
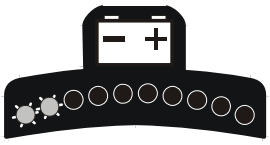
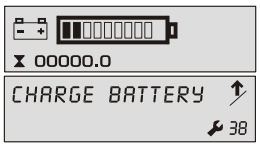
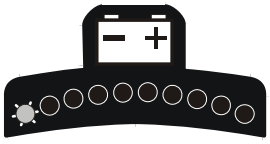
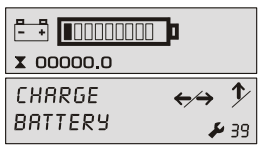
The number of LEDs lit will change depending on the level of charge in the batteries.

- (+) All Three (3) GREEN LEDs lit up indicate maximum battery charge.
- Four (4) YELLOW LEDs indicate a two thirds to one third battery charge remaining.
- (–) Three (3) RED LED's lit indicate minimum battery charge remaining. The machine will continue to operate at this charge level but will begin to indicate battery low voltage warning indicators.

Battery Low Voltage Warning Indicators

The Platform Control Console and Ground Control Station indicate battery low voltage at three (3) Warning Levels. *(See Table 3-1. following).*

Table 3-1. Battery Low Voltage Warning Indicators.

WARNING LEVEL	INDICATOR LOCATION		RESULT	ACTION REQUIRED TO CLEAR FAULT
	PLATFORM CONTROL LED	GROUND CONTROL LCD		
LEVEL-1			• 3 LEDs/BARS Flashing with an audible beep. • Machine will Operate - No Control Functions Locked Out.	Charge batteries to a level of four (4) LEDs/BARS or more before operating.
LEVEL-2			• 2 LEDs/BARS Flashing with an audible beep. • Platform Lift-UP Function is Locked Out.	Charge batteries for a minimum of four (4) continuous hours or more, or (8) LEDs/ BARS lit before operating. (a)
LEVEL-3			• 1 LED/BAR Flashing with an audible beep. • Drive and Platform Lift-UP Functions Locked Out.	Charge batteries for a minimum of four (4) continuous hours or more, or (8) LEDs/ BARS lit before operating. (a)

NOTE: *(a) To maximize battery life, it is recommended that the factory supplied batteries be charged continuously for a minimum of 4 hours or until 8 bars are lit on the ground station LCD Display before operating the machine. When drained to Warning Level 2, batteries must be charged until 8 bars are lit on the ground station LCD display to clear the fault code.*

Battery Charger General Information

IMPORTANT

DO NOT ATTEMPT TO DISASSEMBLE THE BATTERY CHARGER IF MACHINE IS STILL UNDER WARRANTY. OPENING THE BATTERY CHARGER WHILE THE MACHINE IS UNDER WARRANTY WILL VOID THE CHARGER WARRANTY. IF UNDER WARRANTY REQUEST A REPLACEMENT CHARGER FROM THE FACTORY.

ALSO BEFORE REPLACING ANY COMPONENT, USE THE CHARGER MANUFACTURERS TROUBLESHOOTING GUIDE SHIPPED WITH THE MACHINE TO CHECK THE INTERNAL AC AND DC CIRCUITS AND DETERMINE WHICH COMPONENT HAS FAILED. A WIRING DIAGRAM FOR THIS MODEL DUAL VOLTAGE-SCR CHARGER IS INCLUDED AT THE END OF THIS SECTION OF THE MANUAL, SEE FIGURE 3-3.

The battery charger allows for replacement of the following internal components. Consult your Illustrated Parts Manual for part numbers of these components which are available from the JLG Parts Department:

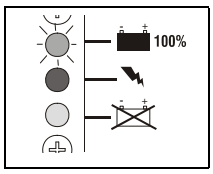
- Transformer
- Printed Circuit Board
- Shunt Assembly
- Interlock Relay
- SCR Rectifier
- AC Circuit Breaker
- DC Circuit Breaker
- AC Voltage Selector Switch
- Wet/VRLA Charging Profile Selector Switch

Replacement and troubleshooting of these components requires removal of the battery charger from it's mounting position on the machine.

Battery Charging Status Indicators

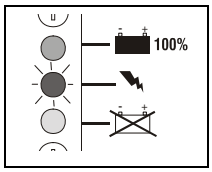
The battery charging status LED indicators are located next to the charger AC input receptacle on the rear bumper of the machine. This LED indicator set is plugged directly into a connector on the back of the battery charger and indicates current charging status.

When first plugged in, the charger runs through a self-diagnostic test, lighting the LEDs in sequence, then charging will begin. The following descriptions indicate charging status after diagnostic test is complete.



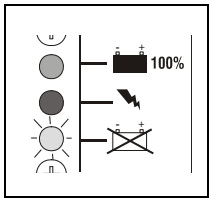
CHARGE COMPLETE

GREEN (TOP) LED ON
100% Complete



CHARGING

AMBER (MIDDLE) LED ON
Charge Incomplete



CHARGING PROBLEM

RED (BOTTOM) LED ON
Consult Troubleshooting Section of the Service Manual or the Charger SCR Manual in Manual Storage Box.

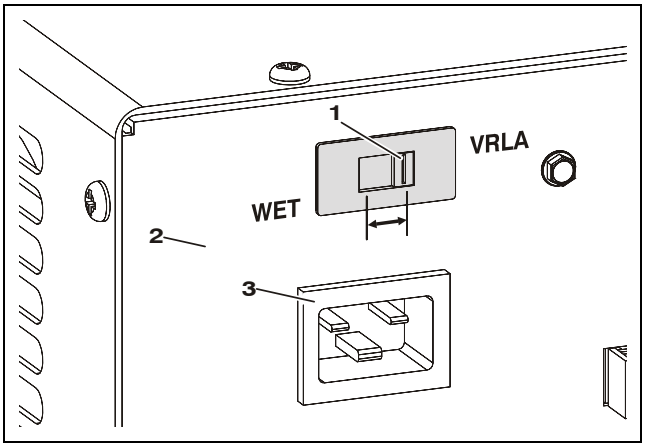
Wet/VRLA Battery - Charging Profile Switch

The battery charger is equipped with a manually selectable charge profile switch, located on the rear panel. This switch must be set properly to select the charging profile required for either **WET** gassing lead acid batteries or **VRLA** - Valve Regulated Lead Acid, gelled/agm type lead acid batteries.

The machine is equipped from the factory with VRLA - valve regulated lead acid batteries, and the switch is set from the factory to **VRLA**. If the factory batteries are replaced with wet gassing batteries, set this switch to **WET**.

IMPORTANT

AN IMPROPER PROFILE SETTING MAY DAMAGE THE BATTERIES AND SHORTEN THE BATTERY'S LIFE.

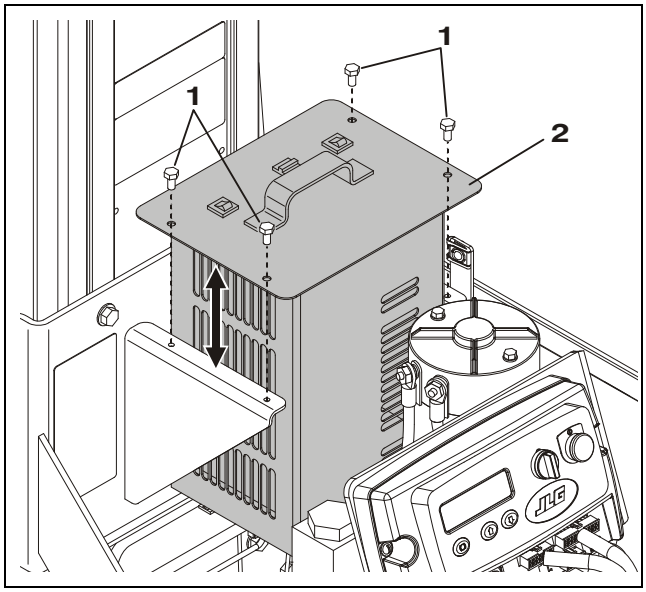


WET/VRLA Battery Selector Switch Location

1. WET/VRLA Battery Selector Switch
2. Battery Charger Rear Panel
3. AC Voltage Input Receptacle

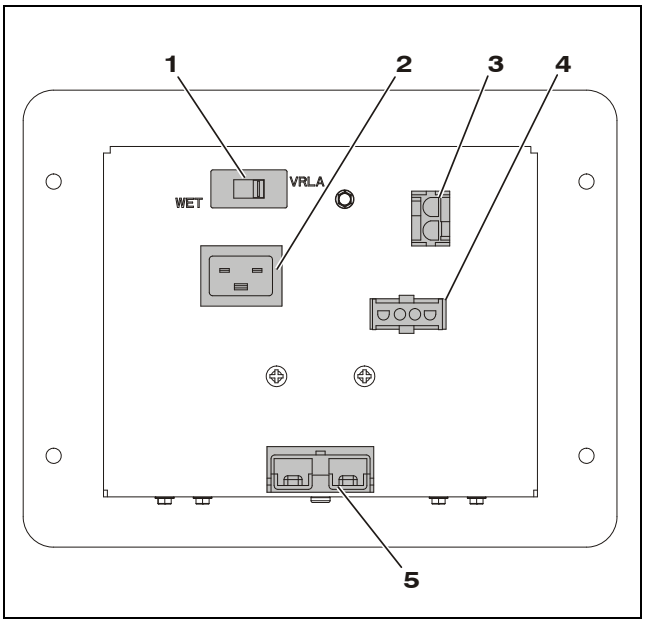
Battery Charger Installation

1. Remove the front cover from the machine. (See Page 3-2)
2. Disconnect the positive (+) battery cable at the left side battery.
3. Remove the four (4) capscrews and washers on the front of the charger securing it to the base frame charger mount.
4. Lift charger up and lay on it's side to disconnect the wiring connectors from the back of the charger assembly. Move the charger to a suitable work surface.



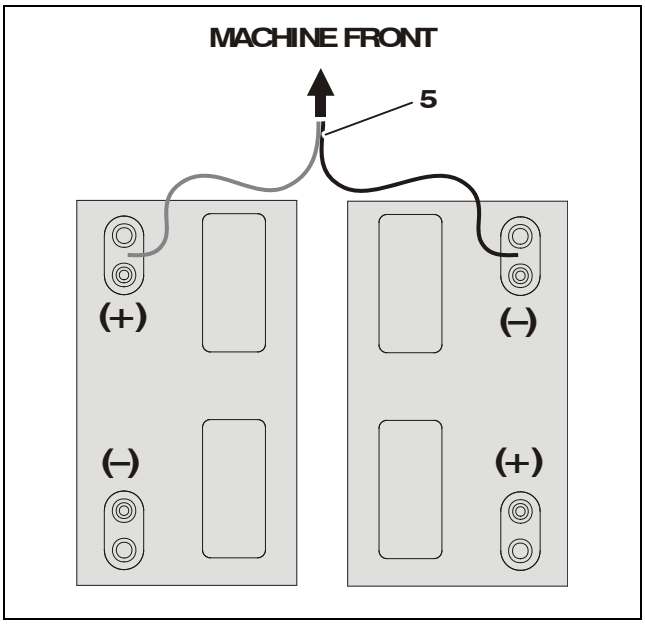
Battery Charger - Remove/Install

1. Battery Charger Assembly
2. Charger Capscrews/Washers (4)

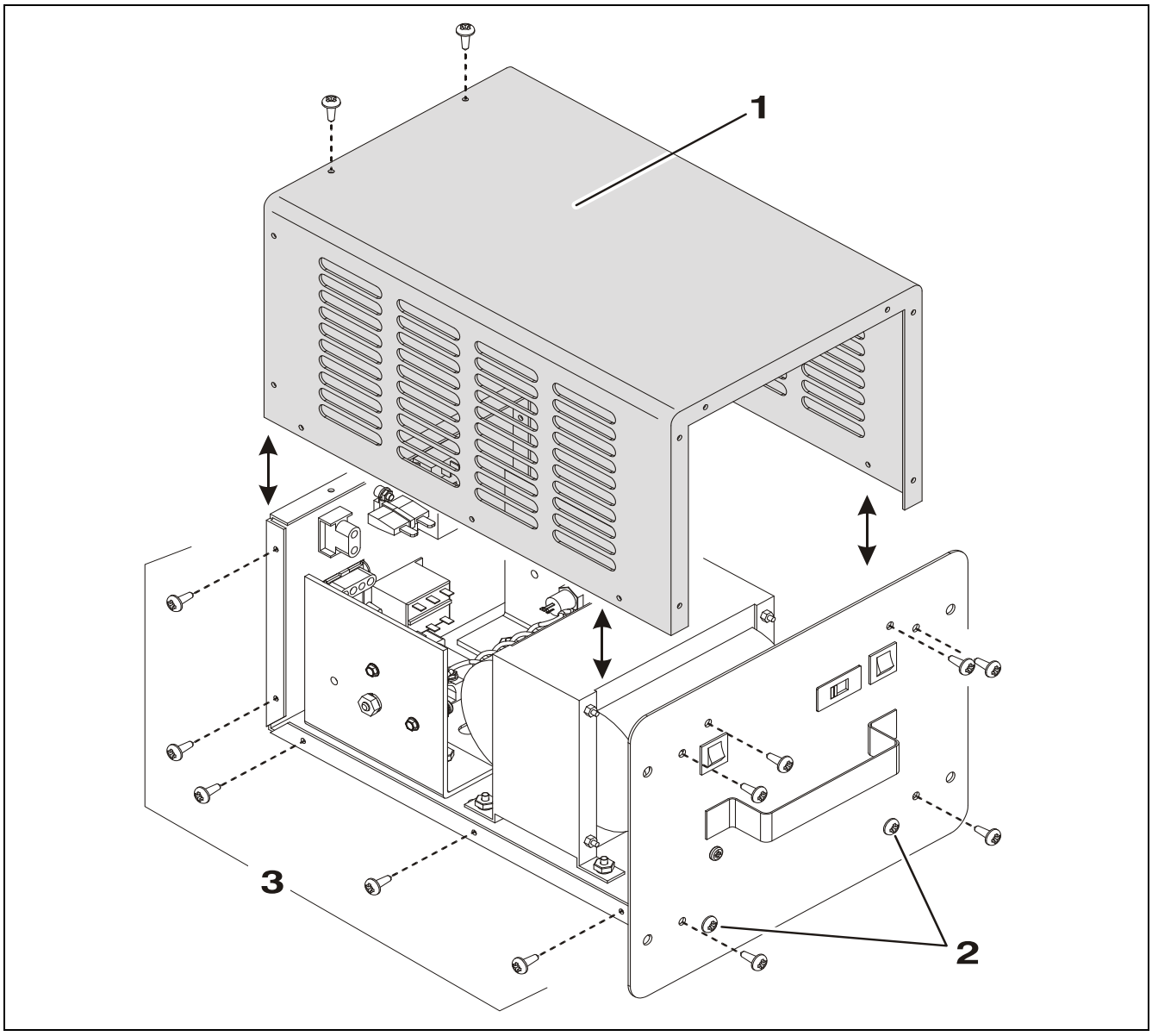


Battery Charger - Rear Panel Connections

1. Wet/VRLA Selector Switch
2. To AC 120/220Volt Input Socket (On Rear Bumper)
3. Drive Cut-Out Wires to P2 Connector on Ground Control Station
4. To Charging Status LED Indicators (On Rear Bumper)
5. DC Voltage Output to Battery +/– Posts (See Below)



Battery Charger Cover Installation



Battery Charger Cover - Remove/Install

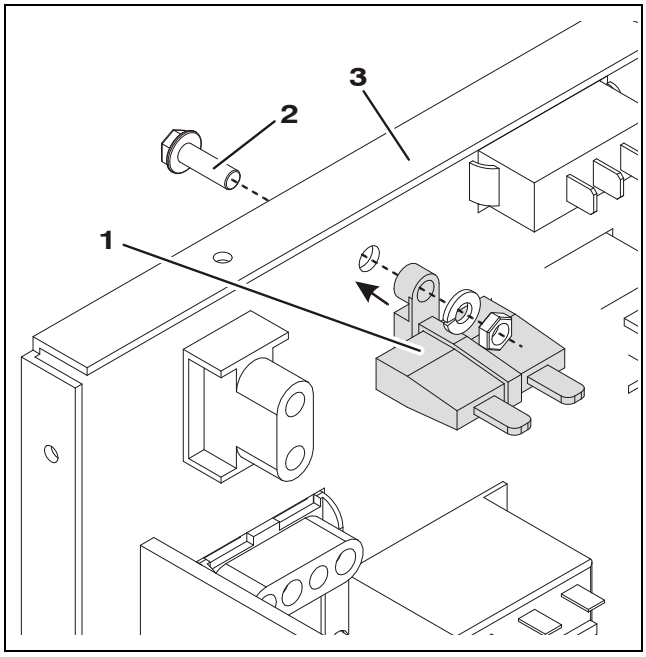
1. Charger Cover **2.** Bottom Tray Screws (Removal Optional) **3.** Screws - Same on Both Sides

General Component Installation Notes

When removing components make note of the wiring connections before disconnecting the wiring between the components within the charger assembly. Only disconnect enough wiring to remove a component.

The battery charger manual supplied with the machine contains a wiring diagram for the charger as well as Figure 3-3. at the end of this section of the manual.

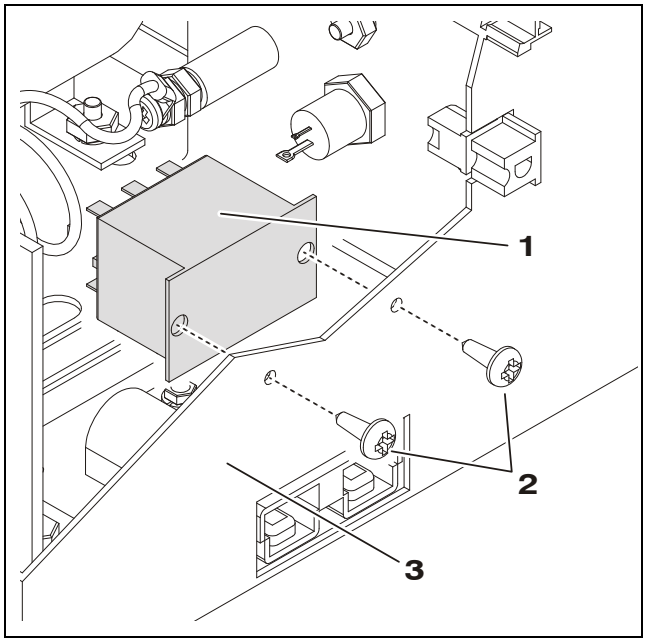
AC Line Fuse Installation



AC Line Fuse - Remove/Install

1. AC Line Fuse
2. Cap Screw/Lock Washer/Nut
3. Back of Charger

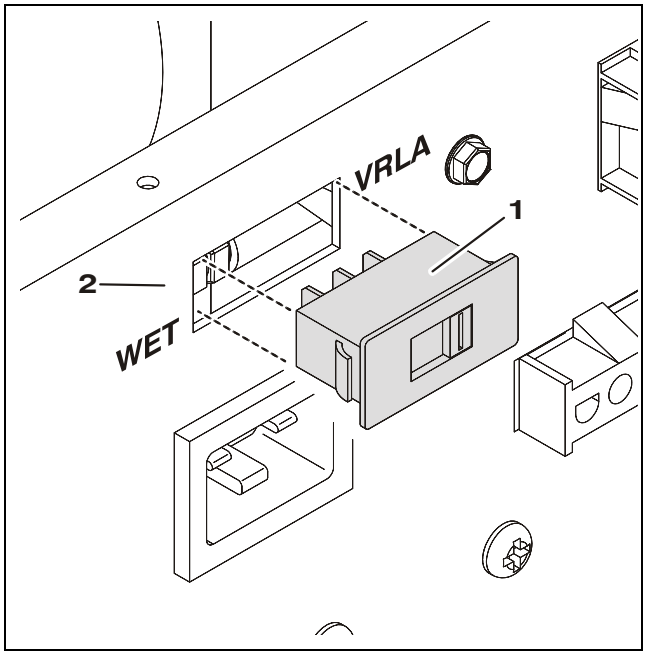
Interlock Relay Installation



Interlock Relay - Remove/Install

1. Interlock Relay
2. Attach Screws (2)
3. Back of Charger

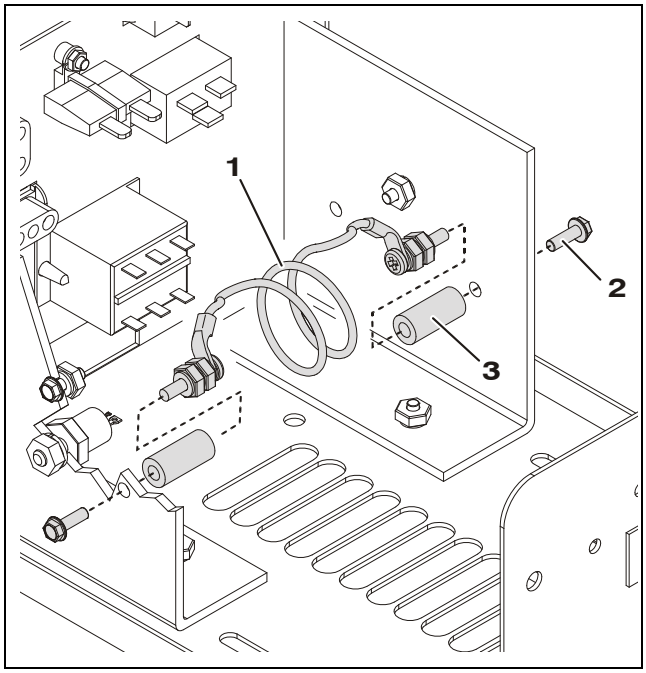
Wet/VRLA Switch Installation



Wet/VRLA Switch - Remove/Install

1. Wet/VRLA Switch
2. Back of Charger

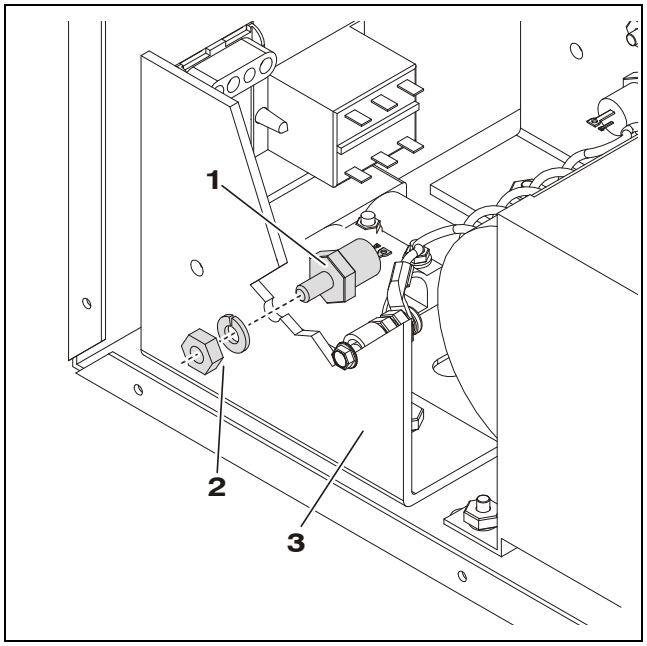
Shunt Assembly Installation



Shunt Assembly - Remove/Install

1. Shunt Assembly
2. Cap Screws (2)
3. Spacers (2)

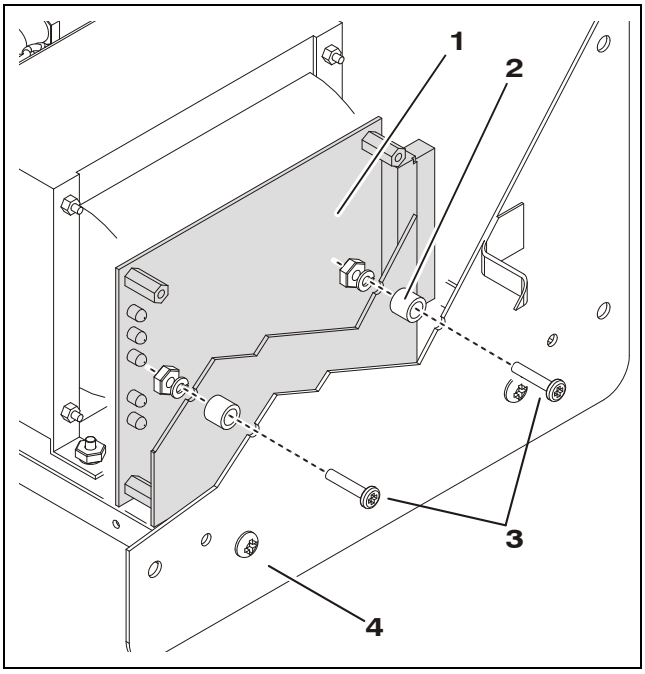
SCR Rectifier Installation (Either Side)



SCR Rectifier - Remove/Install
(Same Mounting on Both Sides)

1. SCR Rectifier
2. Nut/Lock Washer
3. Aluminum Mount Plate

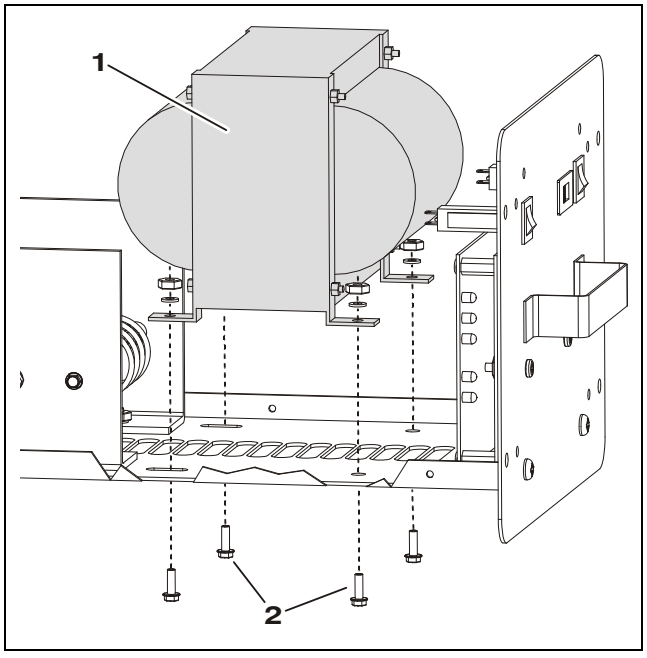
Printed Circuit Board Installation



Circuit Board - Remove/Install

1. Circuit Board
2. Spacer (2)
3. Board Screws/Nuts/Washers (2)
4. Charger Face Plate

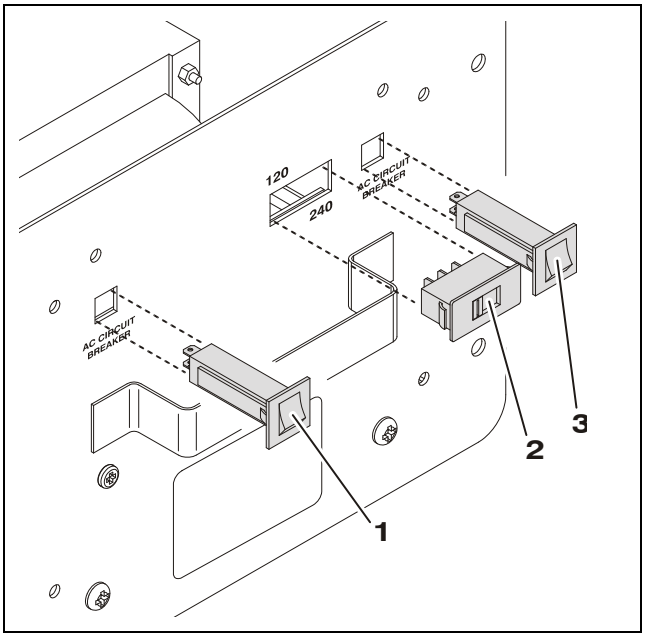
Transformer Installation



Transformer Remove/Install

1. Transformer
2. Capscrews, Nuts/Washers (4)

DC Breaker/Voltage Select Switch Installation



DC Circuit Breaker/Voltage Select Switch - Remove/Install

1. DC Circuit Breaker
2. 120/240 Voltage Selector Switch
3. DC Circuit Breaker

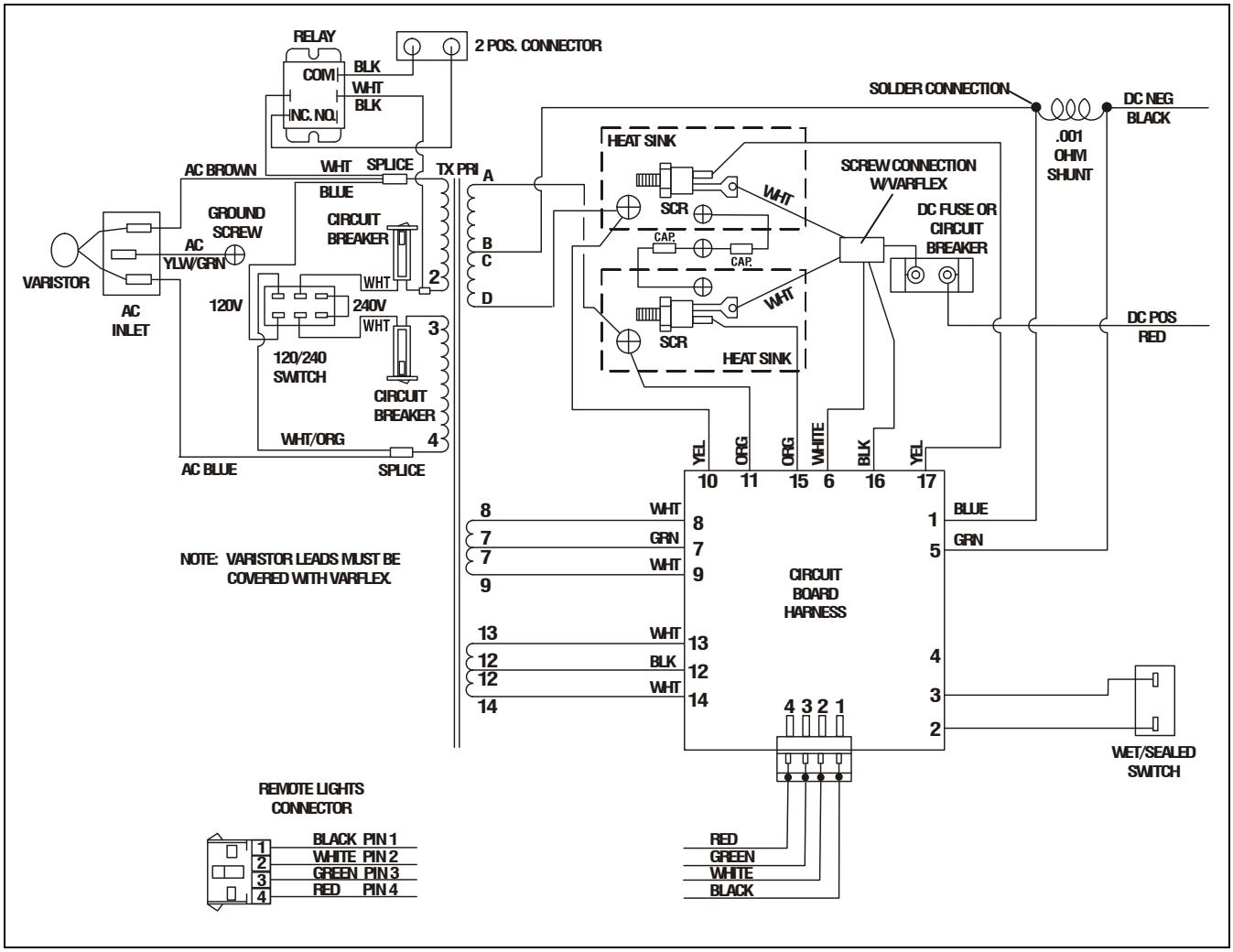


Figure 3-3. SCR Dual Voltage - Battery Charger Wiring Diagram.

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SECTION 4. CONTROL COMPONENTS

4.1 CONTROL COMPONENTS OVERVIEW

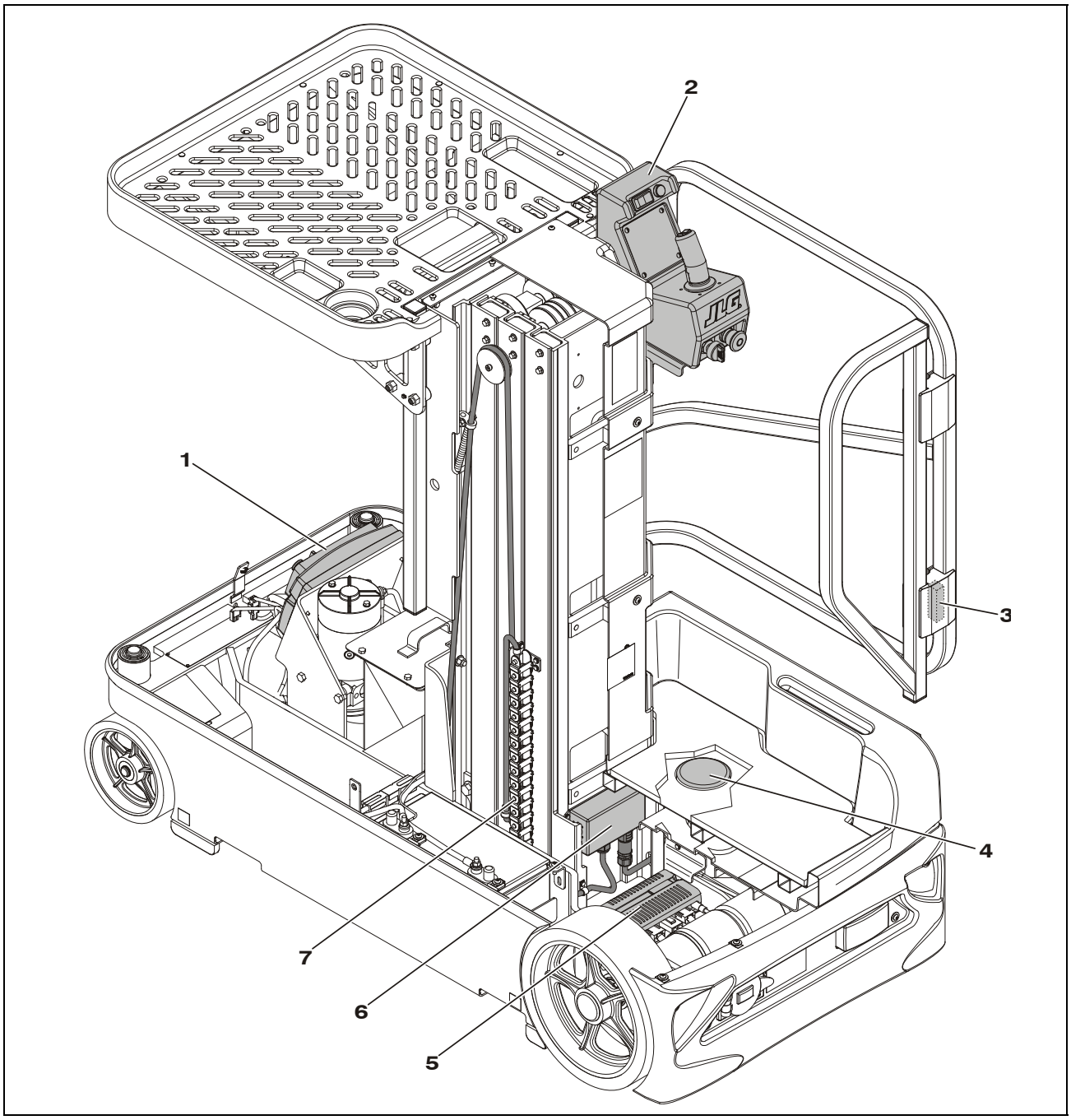


Figure 4-1. Control Components Location

1. Ground Control Station
2. Platform Control Console
3. Platform Gate Interlock Switches*
4. Platform Footswitch Interlock
5. Traction Control Module
6. Platform Junction Box
7. Platform Junction Box to Ground Control Harness

* Mounted inside lower gate hinge left and right side.

4.2 CONTROL COMPONENTS - INSTALLATION

IMPORTANT

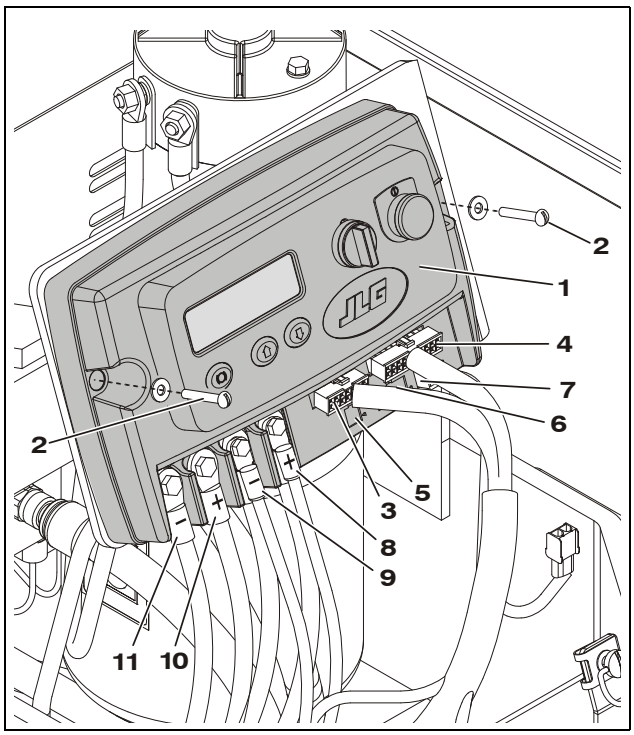
BEFORE REMOVING ANY COMPONENT FROM THE ELECTRICAL SYSTEM, DISCONNECT THE POSITIVE TERMINAL FROM THE LEFT SIDE BATTERY.

Ground Control Module

The face of the Ground Control Module is visible from the front of the machine and is located under the front cover. It is mounted to a bracket on the base frame in front of the hydraulic pump.

All electrical components on the machine operate directly or indirectly through the Ground Control Module. The module is currently programmed at the factory with the machines operating profile. If replacing a Ground Control Module the new module may require some programming to enable any optional equipment.

For servicing and programming information for the Ground Control Modudle, See Section 4.3, Ground Control Module - Service Procedure and Section 4.4, Ground Control Module - Programming.



Ground Control Module - Installation

1. Ground Control Station Module
2. Mounting Screws/Washers (a)
3. P1 Connector (b)
4. P2 Connector (b)
5. P3 Connector (b)
6. P4 Connector (b)
7. P5 Connector (b)
8. From Inline Fuse (Battery +) and To Traction Control Module (+)
9. From Battery (–) and To Traction Control Module (–)
10. To (+) Post on Hydraulic Pump
11. To (–) Post on Hydraulic Post

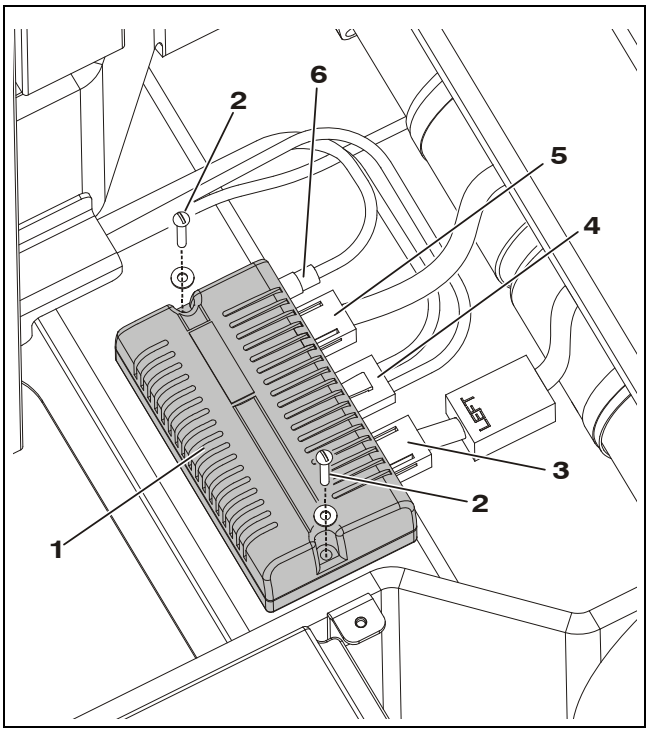
Note: *(a) Apply Loctite #242 to screw threads on final assembly. (b) To help seal unit from dust and moisture, apply electrical contact grease CG60 (JLG Part# 3020038) to all electrical connectors before assembly.*

Traction Control Module

The Traction Control Module is mounted to the base frame beneath the platform, under the drive motor cover.

This module controls the voltage to the drive motors as regulated by the Ground Control Module from signals received from the Joystick Controller located on the Platform Control Module.

There are no internal parts serviced on this module.



Traction Control Module - Installation

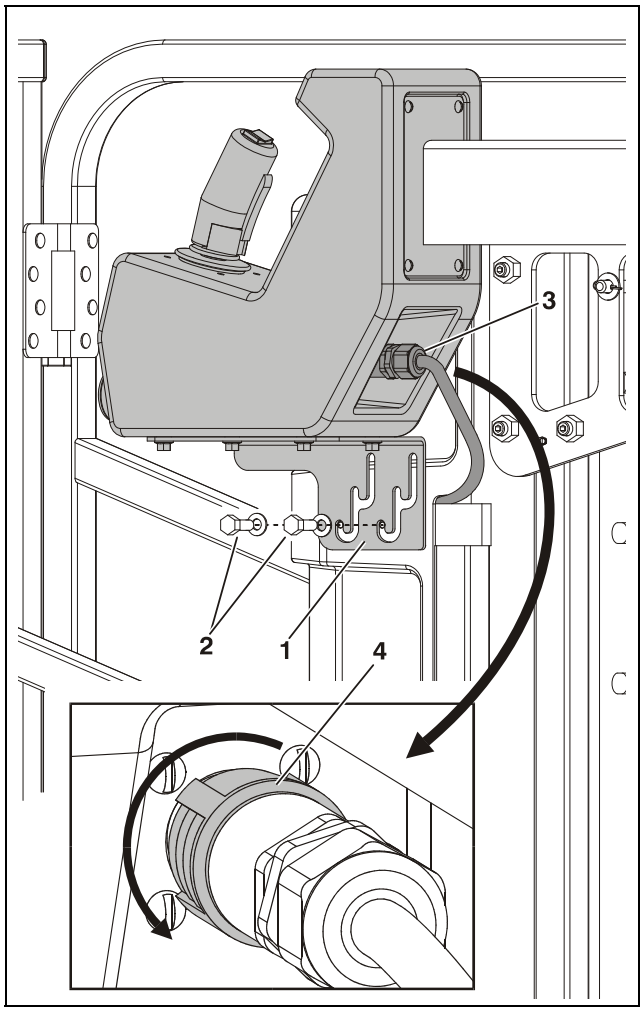
1. Traction Control Module
2. Module Mounting Screws/Washers (a)
3. Left Drive Motor Power Cable w/Reverser Harness
4. +/– Power From Ground Control Station
5. Right Drive Motor Power Cable
6. Communication Cable from Ground Control Station

Note: *(a) Apply Loctite #242 to mounting screw threads on final assembly.*

Platform Control Console Installation

The platform control console is located in the platform and mounted on the right side of the mast assembly.

For removal see below, for servicing information see Section 4.5, Platform Control Console - Service Procedures.



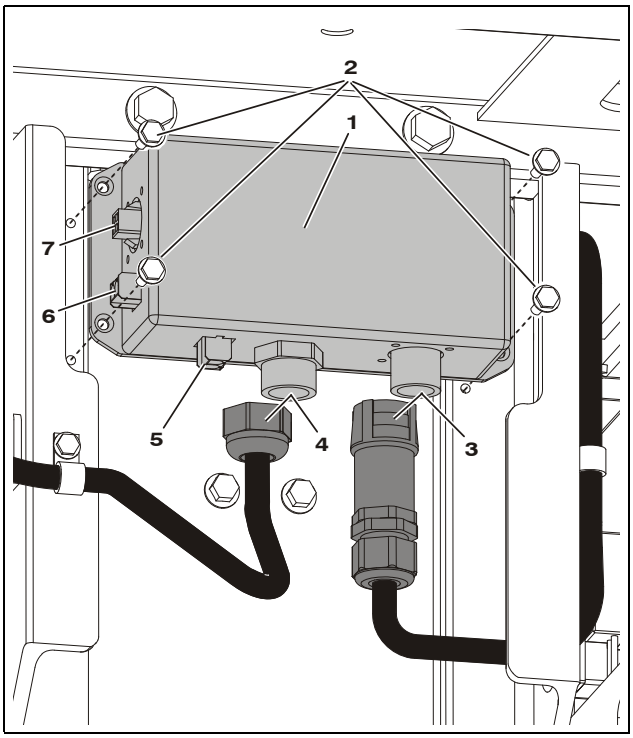
Platform Control Console - Installation

1. Console (3-Level) Mounting Bracket
2. Mounting Bracket Screws and Washers
3. Platform Console to Junction Box Harness (a)
4. Harness Connector - Removal Nut

Note: *(a) The other end of this harness is plugged into the platform junction box mounted to the mast under the platform. From the console the harness is run under the mast cover, is tie strapped to the top platform attach support, and run inside the mast down and out the bottom rectangular hole. Then runs down along the outside of the mast and through a large hole in the mast to the platform junction box.*

Platform Junction Box - Install/Remove

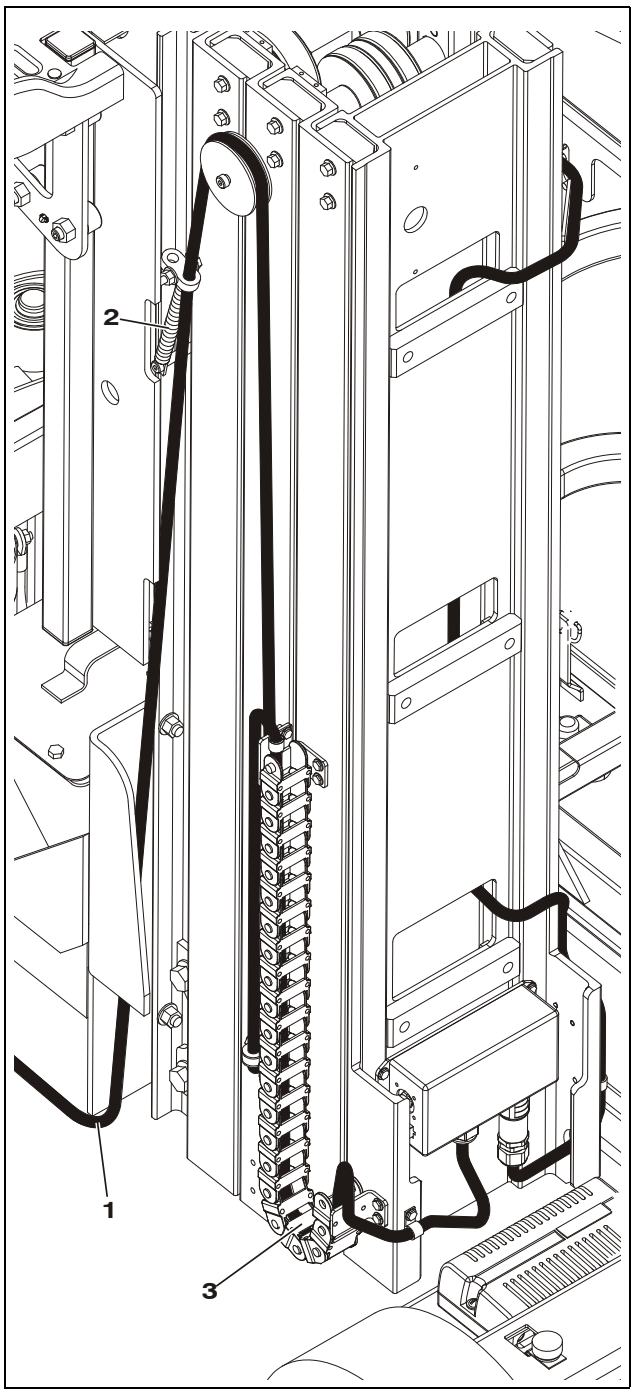
All the platform mounted switches and controls connect to the platform junction box before running to the Ground Control Module *(P2, P3, and P4 Connectors)*, the Ground Control Module Harness is attached to the side of the mast assembly.



Platform Junction Box - Installation

1. Platform Junction Box
2. Junction Box Attach Screws
3. Platform Console Harness Connector
4. Ground Control Module Harness Connector
5. Platform Aux. # 2 Connector (Spare)
6. Platform Aux. #1 (Footswitch/Platform Gate Interlock Connector)
7. Programmable Security Lock (PSL) Connector

Junction Box to Ground Control Harness - Remove/Install



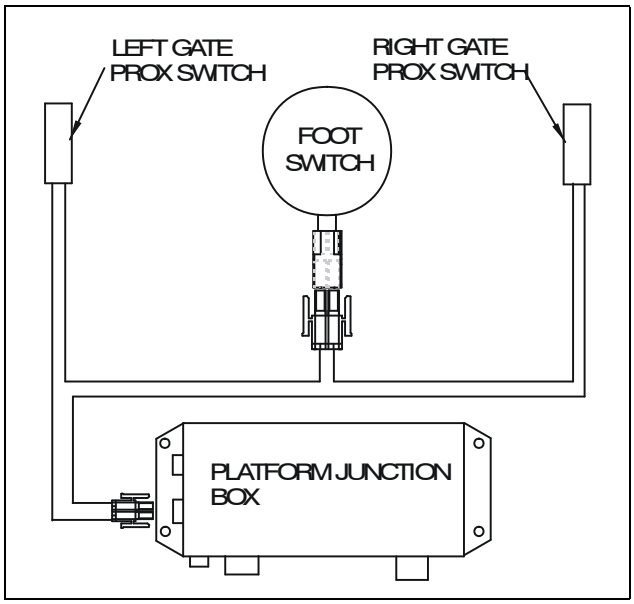
Junction Box to Ground Control Module Harness - Installation

1. Platform Junction Box to Ground Control Harness
2. Spring Tensioner Clamp
3. Harness Power Trak Assembly

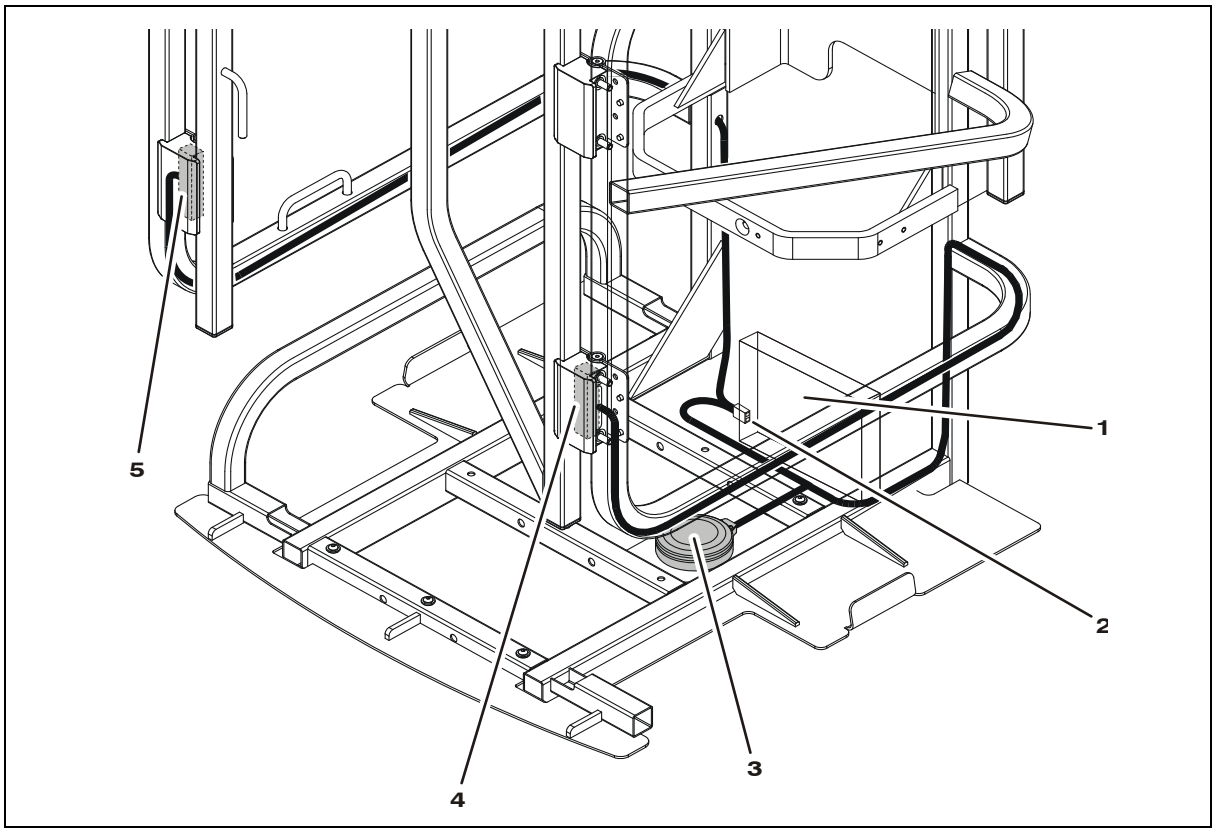
Note: *See Figure 5-7., Section 5 - Mast Components for more detailed installation.*

Platform Interlock Switch Circuit

The platform interlock circuit consists of the platform footswitch and the platform gate switches wired in series. This circuit will inhibit the machines lift and drive functions and display a fault code on the Ground Control Station if the circuit is not closed during machine operation. The circuit utilizes the Auxiliary #1 plug on the Platform Junction Box *(located under the platform)*. From there the circuit is wired to the Ground Control Module (P2)-connector through the Platform Junction Box to Ground Control Module wiring harness. For Ground Control Module (P2) pin assignments see the machine wiring schematic in Section 6, Troubleshooting.



Platform Interlock Switch Circuit



Platform Interlock Switch Components

1. Platform Junction Box
2. Platform Aux. #1 Connector - (Footswitch/Platform Gate Interlock Connector)
3. Platform Footswitch
4. Right Gate Interlock Switch Location
5. Left Gate Interlock Switch Location

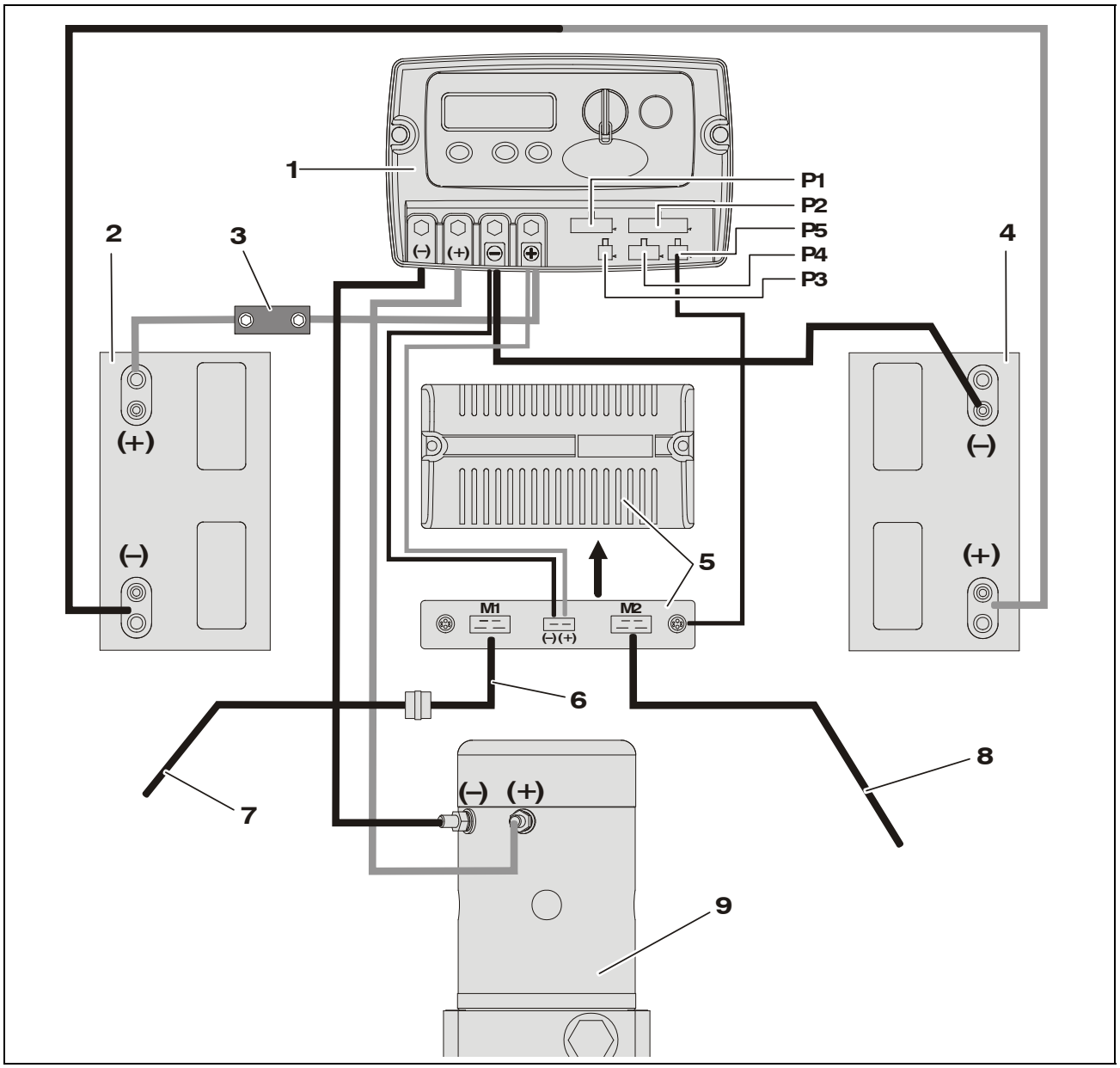


Figure 4-2. Component Electrical Connections.

1. Ground Control Module (a)
2. Left Side Battery (b) (c)
3. 175 Amp Fuse
4. Right Side Battery (b)
5. Traction Control Module (a)
6. Left Drive Motor Harness Reverser (a)
7. Power Cable To Left Drive Motor/Brake (a)
8. Power Cable To Right Drive Motor/Brake (a)
9. Hydraulic Pump/Motor/Tank Assembly (b)

Ground Control Module Plugs:
P1 - Horn, Alarm, Beacons, Lift Down Valve Harness (a)
P2 - Elevation/Speed, Charger Limit Switch Harness (a)
P3 - Programmable Security Lock Harness (Option) (a)
P4 - Platform Joystick Harness (a)
P5 - Joystick Protocol Harness to Traction Control Module (a)

Notes: *(a) Apply di-electric grease JLG Part Number 3020038 to wiring harness terminals, to prevent moisture from entering module.*
(b) Seal NEG (–) and POS (+) posts with battery grease to prevent corrosion.
(c) An quick-disconnect is installed on the left battery (+) POSITIVE cable for easier power disconnect when servicing machine.

See Section 6 - Figure 6-3. - Troubleshooting for complete machine wiring schematic.

4.3 GROUND CONTROL MODULE - SERVICE PROCEDURE

IMPORTANT

DO NOT ATTEMPT TO DISASSEMBLE THE GROUND CONTROL MODULE IF MACHINE IS STILL UNDER WARRANTY. OPENING THE GROUND CONTROL MODULE WHILE THE MACHINE IS UNDER WARRANTY WILL VOID THE WARRANTY. IF UNDER WARRANTY REQUEST A REPLACEMENT MODULE FROM THE FACTORY.

The Ground Control Module allows for field replacement of two (2) components internal to the module.

- Emergency Stop Switch
- Power Selector Switch (Key)

IMPORTANT

ELECTROSTATIC DISCHARGE CAN DAMAGE COMPONENTS ON THE INTEGRATED CIRCUIT BOARD. PLACE THE GROUND CONTROL MODULE ON A NON-CONDUCTIVE SURFACE WHEN OPENING.

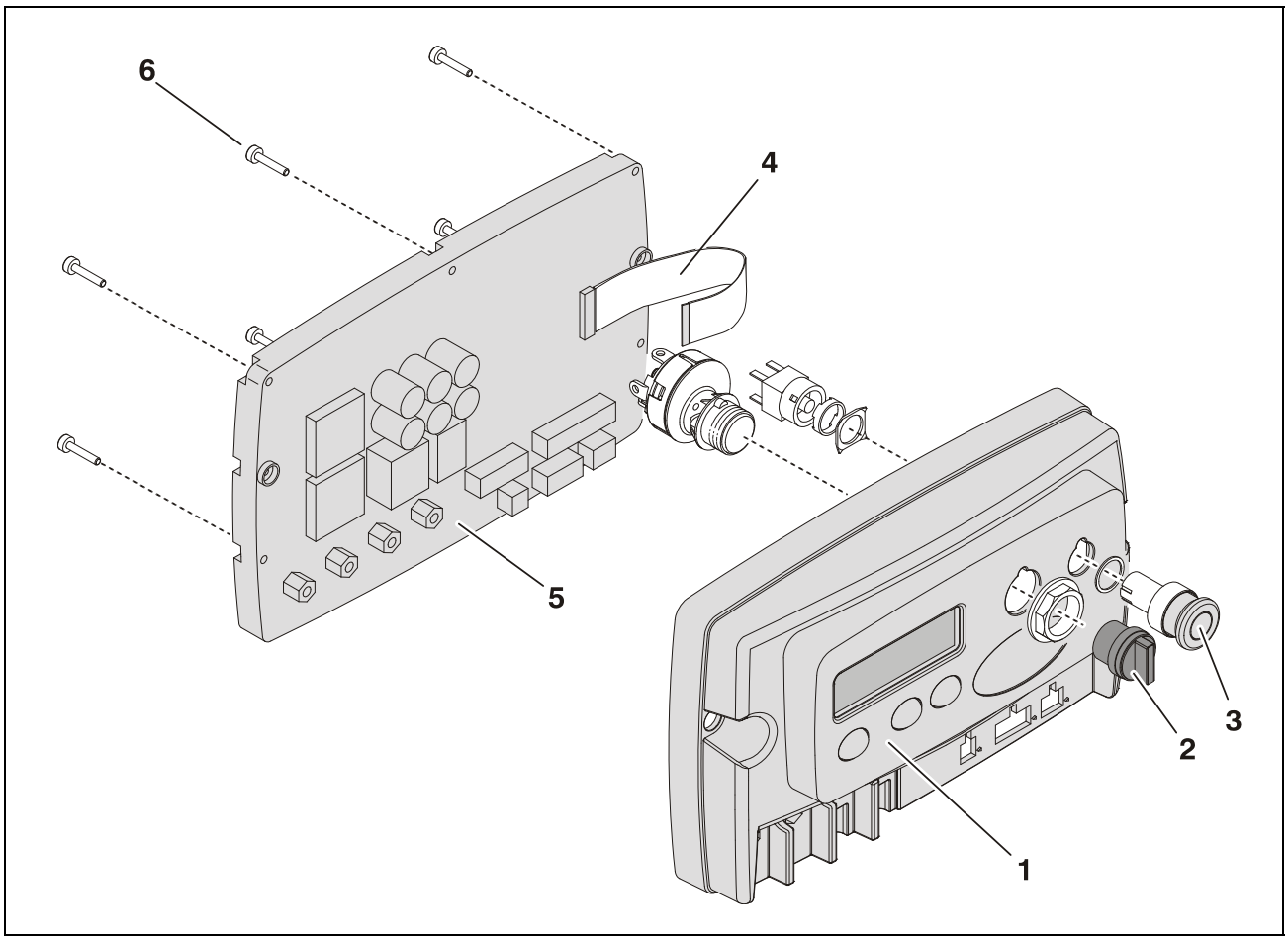


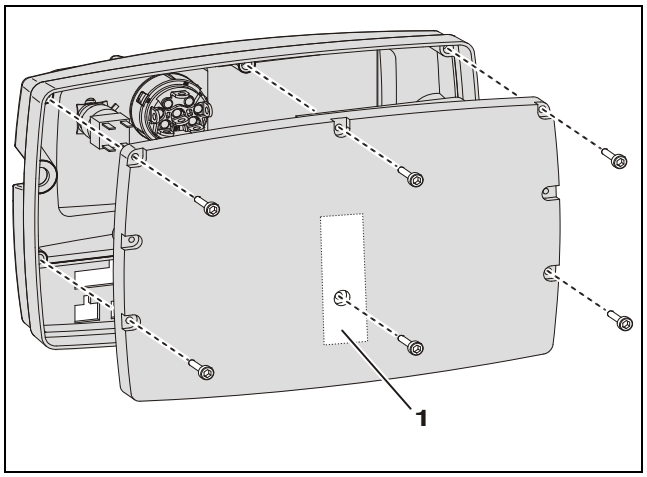
Figure 4-3. Ground Control Module Components.

1. Cover/LCD Assembly
2. Power Selector Switch Assembly
3. Emergency Stop Switch Assembly
4. Main Board to LCD - Ribbon Cable
5. Heat Sink Base/Main Board Assembly
6. Cover Attach Screws

Cover Removal/Installation

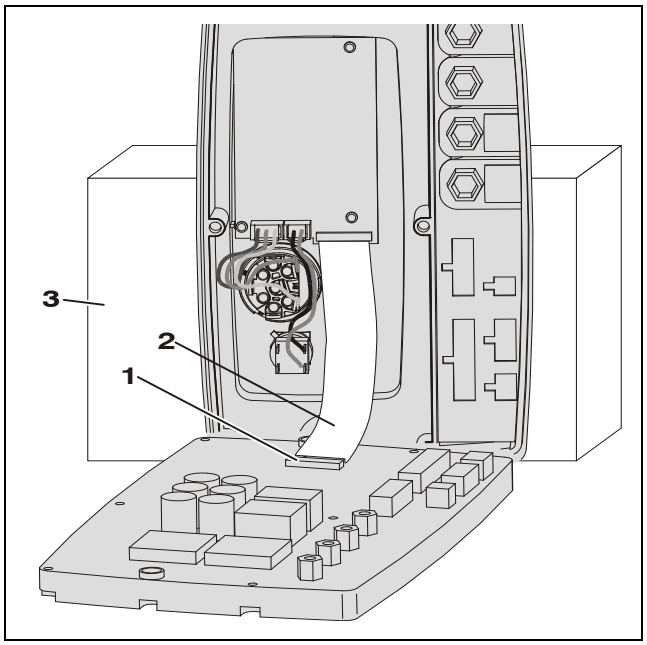
IMPORTANT

THE MAIN CIRCUIT BOARD AND THE SMALLER LCD CIRCUIT BOARD MOUNTED TO THE COVER ASSEMBLY, ARE CONNECTED BY A RIBBON CABLE. REMOVE THE COVER CAREFULLY ONCE THE COVER SCREWS ARE REMOVED FROM THE BACK OF THE MODULE.



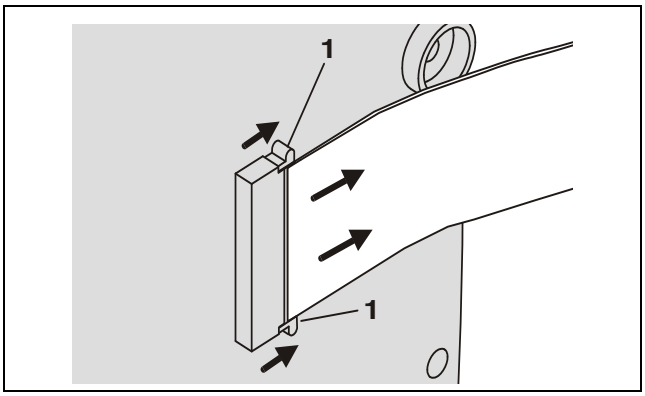
Cover Installation

1. Remove the (6) Hex Socket Screws from the Heat Sink/ Base. One screw is under the Warranty/Tamper Label.



Disconnect the Ribbon Cable

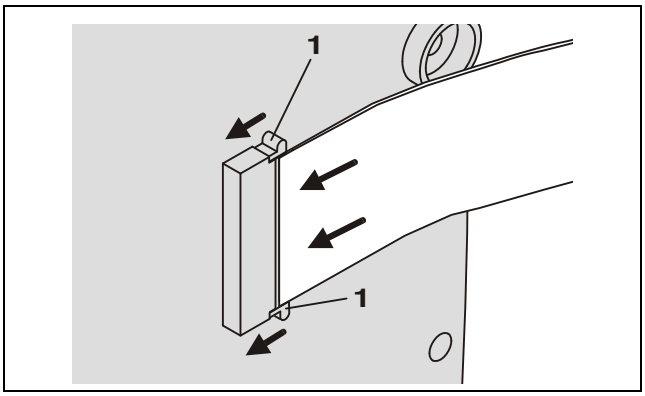
1. Ribbon Cable Connector
2. Ribbon Cable
3. Support for Cover



Release Ribbon Cable

1. Ribbon Cable Connector Tabs (Push tabs away from connector to release cable then slide cable out of connector)

Note: Connector works same at both ends of the ribbon cable.

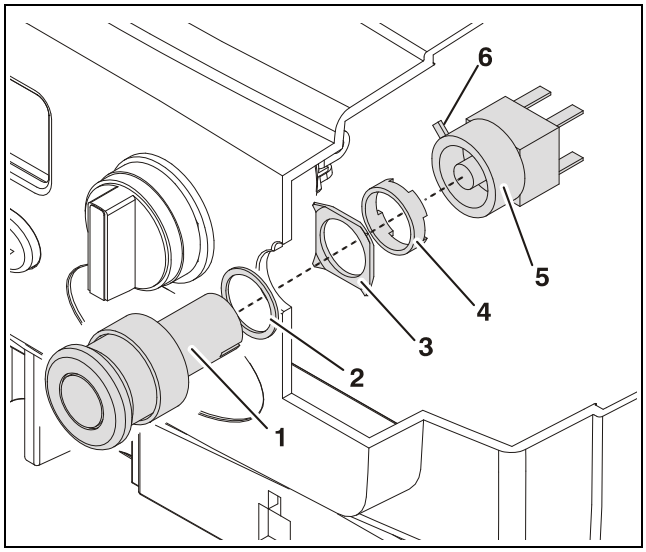


Reconnecting Ribbon Cable

1. Ribbon Cable Connector Release Tabs (Slide cable into connector then push tabs back into connector)

Note: Connector same at both ends of the ribbon cable.

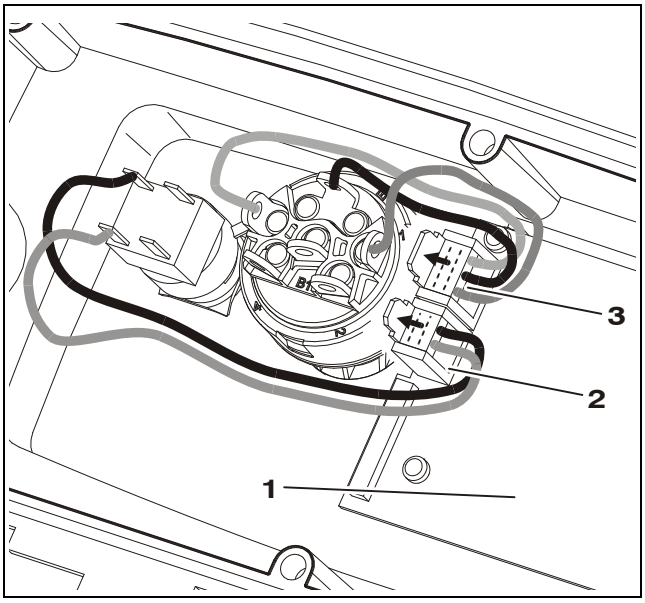
Power Selector/EStop Switch Installation



Emergency Stop Switch Installation

1. Emergency Stop Button
2. Button Seal
3. Square Lock Washer
4. Nut
5. Emergency Stop Switch
6. Switch Lock/Release Lever

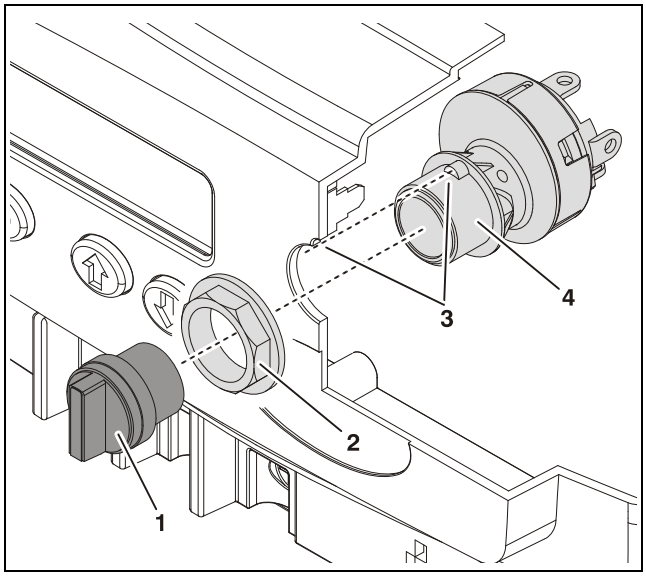
Note: Tighten nut enough to keep button from turning. Reattach wires to same terminals on new switch.



EStop/Power Selector Switch Connector Locations

1. LCD and Button Circuit Board
2. Emergency Stop Switch Connector
3. Main Power Selector Switch Connector

Note: To release switch connectors, push tab on top of connector.



Power Selector Switch Installation

1. Selector Knob
2. Nut
3. Power Selector Switch
4. Align and insert tab into cover

Note: Reattach wires to the same terminals on new switch.

4.4 GROUND CONTROL MODULE - PROGRAMMING

General

The Ground Control Module allows on-board programming of various component and control function personality settings.

Programming may be required under circumstances such as:

- Replacement of the Ground Control or Traction Control Module some components or optional equipment may not be enabled under the standard default settings of the replacement unit.
- Optional equipment has been added to the machine in the field and that function must be enabled before operation.
- Customizing the machine to fit a specific application, such as changing the LCD display language, programming operating speeds such as braking, turning or lifting speeds.

Programming Levels

There are three (3) **password protected** programming levels, from highest to lowest, the levels are:

- **Level-1:** JLG Engineering Settings
- **Level-2:** Service and Maintenance Settings -
  Level-2 Password: 91101
- **Level-3:** Operator Settings -
  Level-3 Password: 33271

IMPORTANT

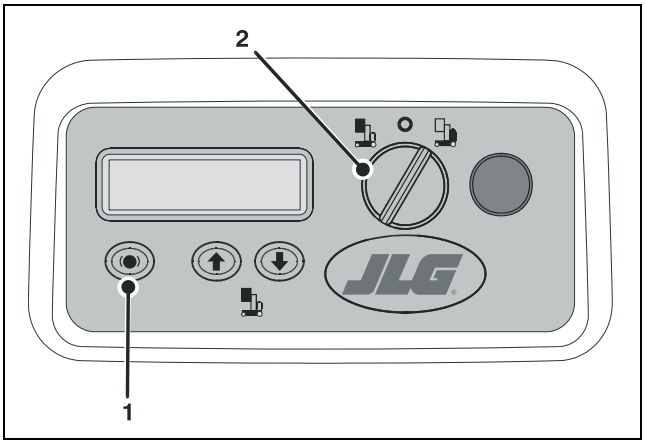
THE LEVEL 1: JLG ENGINEERING SETTINGS ARE NOT DISPLAYED IN THE PROGRAMMABLE SETTINGS UNDER PASSWORD LEVEL-2 OR LEVEL-3. LEVEL-1 SETTINGS MUST NOT BE MODIFIED UNLESS DIRECTED BY JLG ENGINEERING DEPARTMENT PERSONNEL.

Level-1: JLG Engineering Settings include voltage, amperage, and ohm output settings that are within the operating parameters of various machine components. This Level can adjust all programmable settings.

Level-2: Service and Maintenance Settings allow modification to machine personality settings such as lift speeds, drive speeds, as well as various switch polarity settings, also enable various optional equipment if installed. This level can also adjust Level-3 settings.

Level-3: Operator Settings allow the direct user to modify a few settings such as the language setting of text output to the Ground Control Module LCD screen, setting machine sleep time, and enabling the detection of the horn and beacon components.

Activating Programming Mode



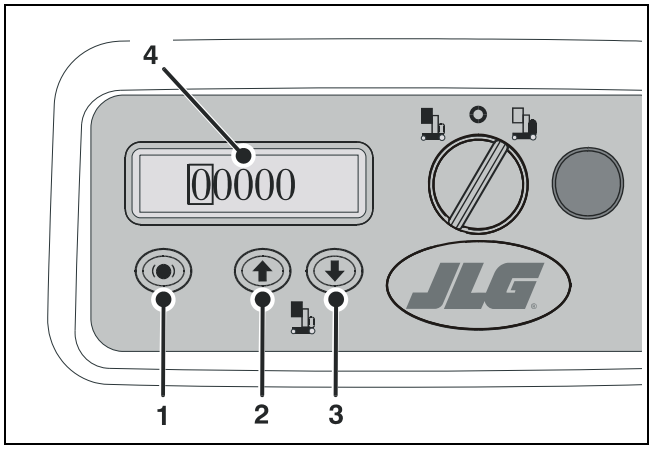
Activating Programming Mode

1. With machine power off, press and hold the Brake Release Button (1) on the Ground Control Module.
2. While holding the Brake Release Button in, power machine up by turning the Main Power Selector Switch (2), to either the Ground Control or Platform Control Mode.
3. Release the Brake Release Button (1) after machine is powered up. The LCD display should now display five zeros, one with a box around. Continue to next step Entering Password.

NOTE: *If machine did not power up, check that both the Ground Control Module - Emergency Stop Button, and the Platform Control Console - Emergency Stop Button, are in the RESET position.*

Also, if machine is equipped with the (PSL) Programmable Security Lock option, refer to the Operators Manual for additional machine power-up steps.

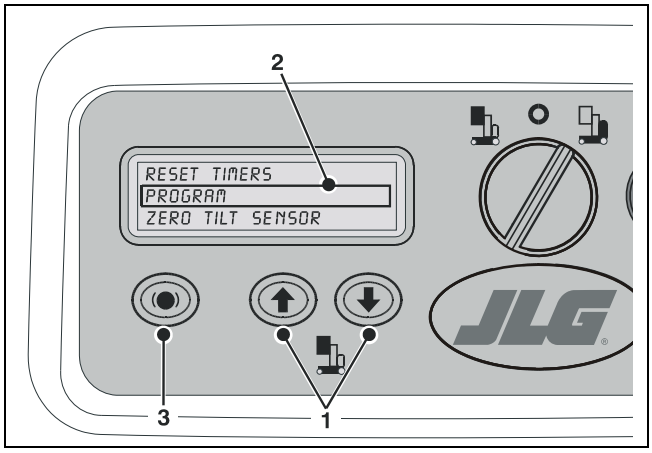
Entering Password



Entering Password

1. The Brake Release button (1) moves the box (around digit) from left to right to select which digit to change.
2. Platform UP button (2) increases the numerical digit.
3. Platform DOWN button (3) decreases the numerical digit.
4. Change all five digits (4) to match password level, then press the Brake Release button (1) again.

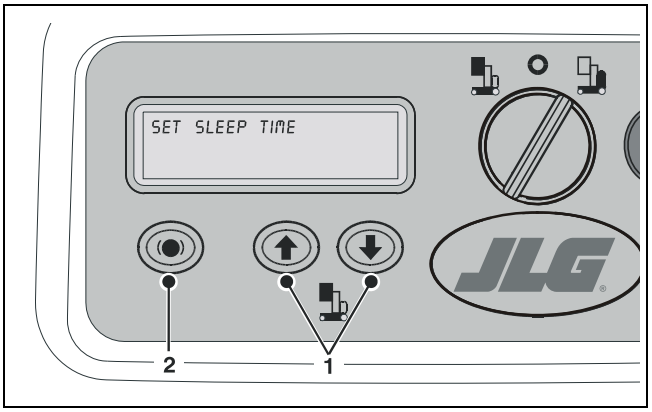
Programming Mode Selection



Programming Mode Selection

1. Use Platform UP/DOWN buttons (1) to move the selection box (2) up or down to select item to program.
2. Press the Brake Release button (3) to enter selected mode then move on to Selecting Programmable Item to Adjust.

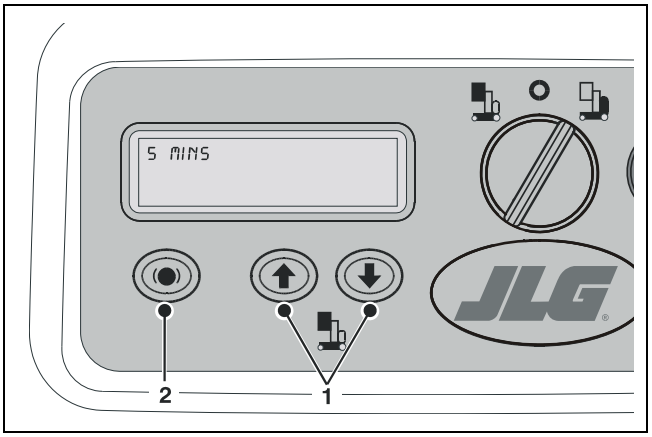
Selecting Programmable Item to Adjust



Selecting Programmable Item to Adjust

1. Use the Platform UP/DOWN buttons (1) to scroll through the list of programmable items available to your programming level.
2. Once a programmable item to be adjusted is selected, press the Brake Release button (2) to enter that settings' adjustment mode.

Adjusting Programmable Setting



Adjusting Programmable Setting

1. Adjust the programmable setting using the Platform UP/DOWN buttons (1), see Table 4-1 on Page 4-13 for range of settings for the item selected.
2. Once parameter is set for the programmable item, press the Brake Release button (2), this will enter the parameter and return you to the Programmable Settings Menu.

TO EXIT Programming Mode after entering programmable settings, power machine off with either the Main Power Selector Switch or Emergency Stop Button.

Service Programming Mode - (Level-2)

In the Service Programming Mode the following items are shown on the main menu (Also See Table 4-1 on Page 4-13):

- Reset Timers
- Program
- Tilt Sensor
- OSS Sensor

NOTE: *There are two production modules available at this time, one for North/South American and European languages, and one for Asian languages. All programmable items between these modules are identical with the exception of language selection.*

Reset Timers

This setting displays five (5) timers as described following:

- **Trip Time:** This timer shows total accumulated hours since last trip timer reset. This is the hour meter reading displayed on the Ground Control Module LCD Display during normal machine operation.
- **Traction Time:** Displays the amount of accumulated DRIVE hours on the machine's current drive components.
- **Lift UP Time:** Displays the amount of accumulated time the machine has operated the Lift UP function.
- **Lift DOWN Time:** Displays the amount of accumulated time machine has operated the Lift DOWN function.
- **Total Time:** Displays the total amount of time accumulated by the Traction, Lift UP and Lift DOWN Timers.

Of these five (5) timers, the Trip Timer is the only timer which can be RESET back to 00000.0.

Program

Allows service personnel to program the Level-2 and Level-3 items shown in Table 4-1 on Page 4-13.

Tilt Sensor

Allows service personnel to reset the Ground Control Module's internal digital Tilt Sensor to zero (0.0) degrees in both the X and Y axis.

⚠ DANGER

ZEROING THE TILT SENSOR REQUIRES THE MACHINE TO BE RESTING ON A SURFACE CHECKED WITH A DIGITAL LEVEL MEASURING WITHIN 0.0 DEGREES LEVEL IN BOTH THE X AND Y AXIS DIRECTIONS.

NOTE: *When entering this mode the LCD will display in real time the current X and Y degree readings of the tilt sensor. The reading being displayed is based on the previous zero setting and may not reflect level of the machines current resting surface.*

1. Position the machine on a level surface verified level in both the X and Y axis with a digital level.
2. Select "Zero Tilt Sensor" from the menu and press the Brake Release button.
3. The current tilt sensor readings are displayed. To zero both the X and Y direction sensor setting to the machines' present resting surface, press the Brake Release button.
4. Select "Back to Main Menu" and press the Brake Release Button.
5. Power machine off and begin operation.

Operator Programming Mode - (Level-3)

In the Operator Programming Mode the following items are shown on the main menu (Also See Table 4-1 on Page 4-13):

- Tilt Sensor
- Program

NOTE: *There are two production modules available at this time, one for North/South American and European languages, and one for Asian languages. All programmable items between these modules are identical with the exception of language selection.*

Tilt Sensor

Allows viewing current tilt sensor individual X and Y direction degree reading.

Program

Allows the Operator to program Level-3 items shown in Table 4-1 on Page 4-13.

Table 4-1. Ground Control Module - Field Programmable Settings and Factory Preset. (SSV-10)

Level-2: Service Level Settings — On LCD Display: YES = ✓ HIGH = ↑
Level-3: Operator Level Settings — NO = X LOW = ↓

LEVEL	PROGRAMMABLE ITEM	FACTORY PRESET	SETTING RANGE
2	Back to Main	–	Return to Programming Menu
3	Set Language ***NOTE:*** *There are two production modules available at this time, one for North/South American and European Languages, and one for Asian Languages.*	1	**1** - English **6** - Italian **2** - German **7** - Swedish **3** - Dutch **8** - Brazilian Portuguese **4** - French **9** - Finnish **5** - Spanish
		2	**1** - English **3** - Japanese **2** - Chinese
2	Set Maximum Lift Up Speed	100%	0 - 100%
2	Set Maximum Lift Down Speed	100%	0 - 100%
2	Zero the On-Board Tilt Sensor	NO	YES/NO
2, 3	Set Sleep Time	10 MINS	0 - 60 MINS
2	Set Polarity Of Left Pot Hole Input 1	0	0=DISABLED/1=LOW/2=HIGH
2	Set Polarity Of Right Pot Hole Input 2	0	0=DISABLED/1=LOW/2=HIGH
2	Set Polarity Of Up Limit/elevation Input	HIGH	HIGH/LOW
2	Set Polarity Of Charger Inhibit	HIGH	HIGH/LOW
2, 3	Set Polarity Of The Keypad Code	LOW	HIGH/LOW
2	Set Polarity Of Ancillary Input 1	HIGH	HIGH/LOW
2	Set Polarity Of Ancillary Input 2	LOW	HIGH/LOW
2, 3	Enable Detection Of Horn Open Circuit	NO	YES/NO
2, 3	Enable Detection Of Beacon Open Circuit	NO	YES/NO
2	Enable Obstruction Sensor System (OSS)	NO	YES/NO
2	Enable Detection Of Ancl. #1 Open Circuit	NO	YES/NO
2	Enable Detection Of Ancl #2 Open Circuit	NO	YES/NO
3	Forward Alarm Disable	NO	YES/NO
3	OSS Diagnostic	NO	YES/NO
2	Load Sensing (LSS)	OFF	OFF/CUTOUT PLAT./CUTOUT ALL
2	Aux. 1 - Inhibit - (Active when Ancilliary 1 is set to HIGH)	4	0=Inhibit Lift 1=Inhibit Drive when Platform is elevated 2=Inhibit Drive regardless of Plat. position 3=Inhibit Lift and Drive when Plat. elevated 4=Inhibit Lift and Drive regardless of Plat. position
2	Aux. 2 - Inhibit - (Active when Ancilliary 2 is set to HIGH)	0	0=Inhibit Lift 1=Inhibit Drive when Platform is elevated 2=Inhibit Drive regardless of Plat. position 3=Inhibit Lift and Drive when Plat. elevated 4=Inhibit Lift and Drive regardless of Plat. position
2	Aux . 1 - Tie Down	1	0=Disabled 1=trip if low at start-up 2=trip high at start-up
2	Aux. 2 - Tie Down	0	0=Disabled 1=trip if low at start-up 2=trip high at start-up
2	Mode Select Delay	5 SEC.	1 - 60 SECONDS

Table 4-1. Ground Control Module - Field Programmable Settings and Factory Preset. (SSV-10)

Level-2: Service Level Settings — On LCD Display: YES = ✓ HIGH = ↑

Level-3: Operator Level Settings — NO = X LOW = ↓

LEVEL	PROGRAMMABLE ITEM	FACTORY PRESET	SETTING RANGE
2	Acceleration (Platform Lowered)	40	1 - 100
2	Deceleration (Platform Lowered)	45	1 - 100
2	Turn Acceleration (Platform Lowered)	30	1 - 100
2	Turn Deceleration (Platform Lowered)	30	1 - 100
2	Maximum Forward Speed (Platform Lowered)	100	1 - 100
2	Minimum Forward Speed (Platform Lowered)	30	1 - 100
2	Maximum Reverse Speed (Platform Lowered)	100	1 - 100
2	Minimum Reverse Speed (Platform Lowered)	20	1 - 100
2	Maximum Turn Speed (Platform Lowered)	30	1 - 100
2	Minimum Turn Speed (Platform Lowered)	10	1 - 100
2	Minimum Forward Speed (Platform Elevated)	20	1 - 100
2	Minimum Reverse Speed (Platform Elevated)	20	1 - 100
2	Maximum Turn Speed (Platform Elevated)	10	1 - 100
2	Motor Compensation	130 mOhms	0 - 500 mOhms

4.5 PLATFORM CONTROL CONSOLE - SERVICE PROCEDURES

General

IMPORTANT

DO NOT ATTEMPT TO DISASSEMBLE THE PLATFORM CONTROL BOX IF MACHINE IS STILL UNDER WARRANTY. OPENING THE PLATFORM CONTROL BOX WHILE THE MACHINE IS UNDER WARRANTY WILL VOID THE WARRANTY. IF UNDER WARRANTY REQUEST A REPLACEMENT BOX FROM THE FACTORY.

The platform control console allows for replacement of nine (9) components.

- Emergency Stop Switch
- Key Switch
- Joystick Assembly
- Display/Controller Module
- Drive/Lift Mode Selector Switch
- Horn Button Switch
- Rear Cover
- Wiring Harness Connector Socket
- Mounting Bracket

Remove Platform Control Console

First remove the platform control console completely from the platform assembly, See Section 4.2, Control Components - Installation, Platform Control Console Installation.

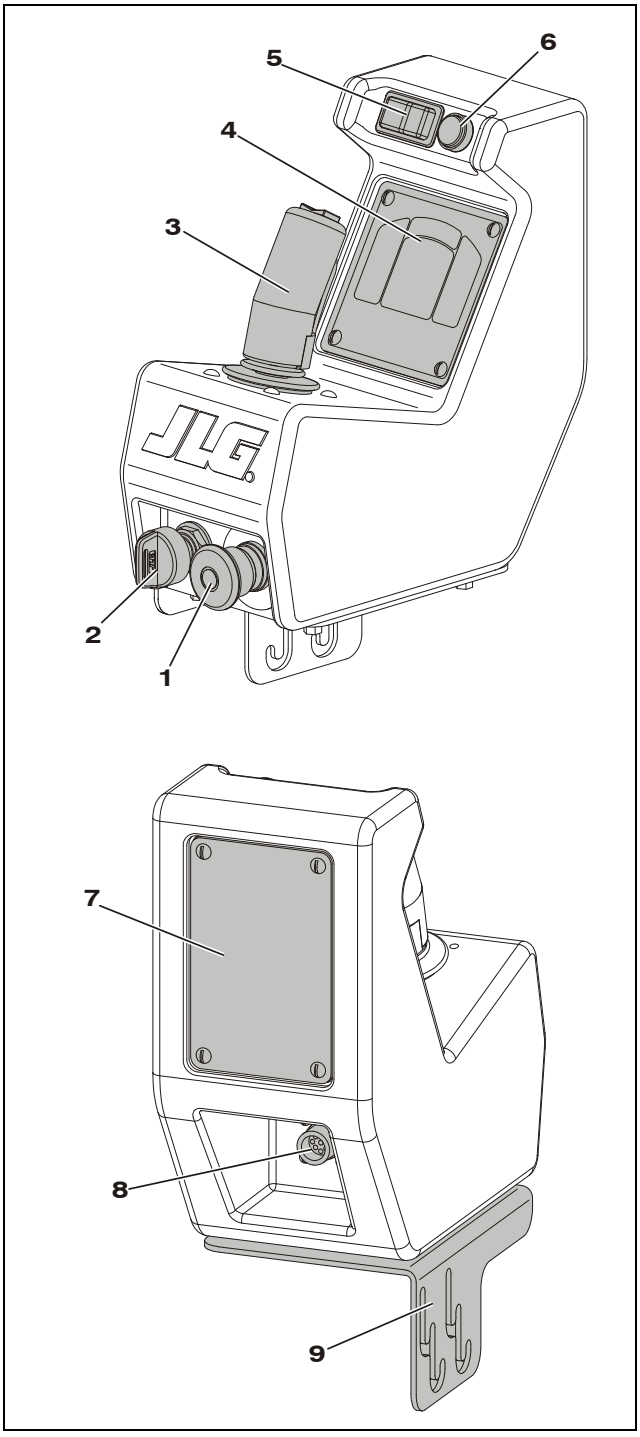
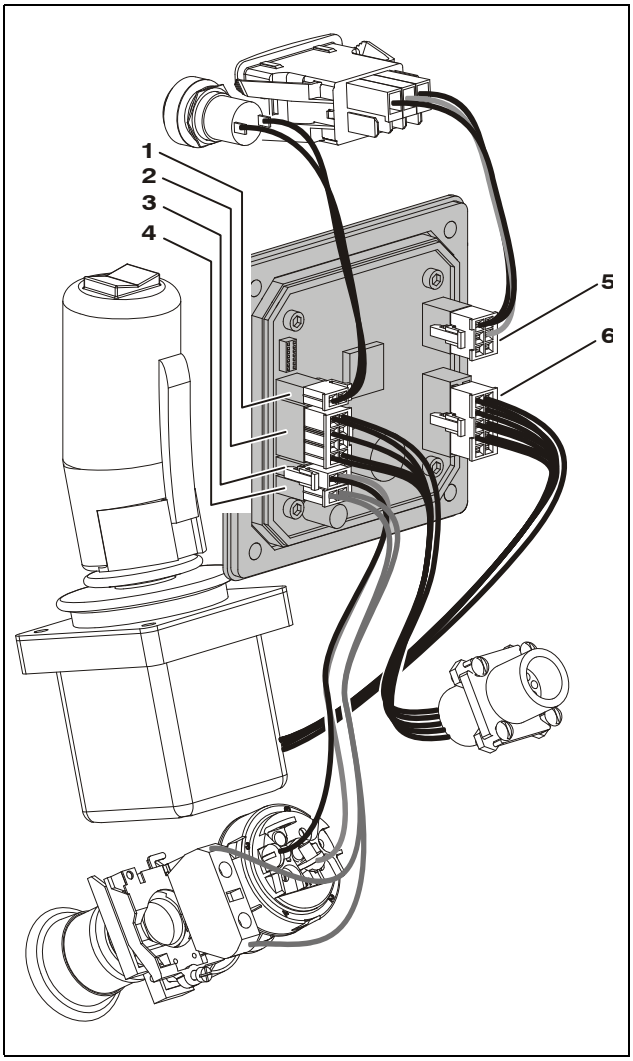


Figure 4-4. Platform Control Console Components.

1. E-Stop/Shut Down Switch
2. ON/OFF Key Switch
3. Joystick Assembly
4. Display/Controller Module
5. Drive/Lift Mode Selector Switch
6. Horn Button Switch
7. Rear Cover
8. Wiring Harness Connector
9. Adjustable Mounting Bracket

Display/Controller Module Electrical Connections

The internal switches and joystick controller of the platform console, plug directly into the Display/Controller Module. This module then relays the signals from these switches to the Ground Control Box through the communications cable running to the platform junction box mounted to the mast under the platform.

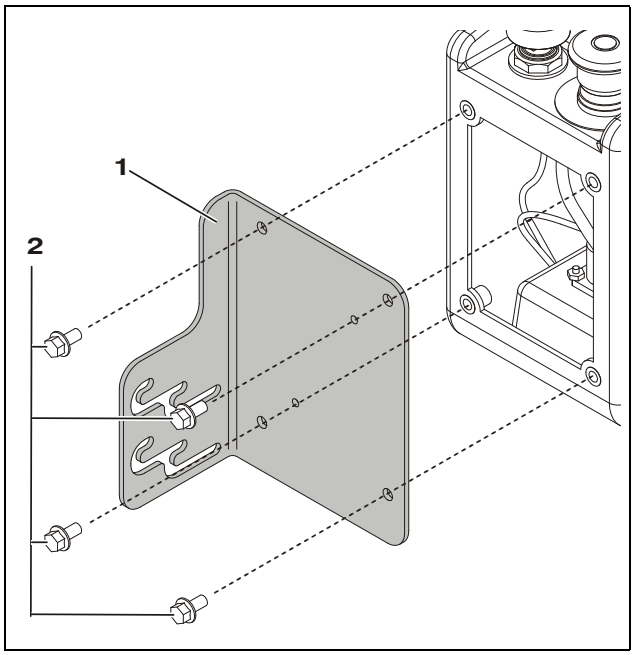


Platform Console - Circuit Board Connections

1. Horn Switch - (C5)
2. Communications Cable to Platform Junction Box - (C6)
3. ON/OFF Key Switch (C3)
4. E-Stop/ShutDown Switch - (C4)
5. Drive/Lift ModeSelect Switch - (C7)
6. Joystick - (C8)

Note: *The (C) numbers shown after the description above represent the corresponding identification of the plug on the module's circuit board.*

Mounting Bracket - Install/Remove

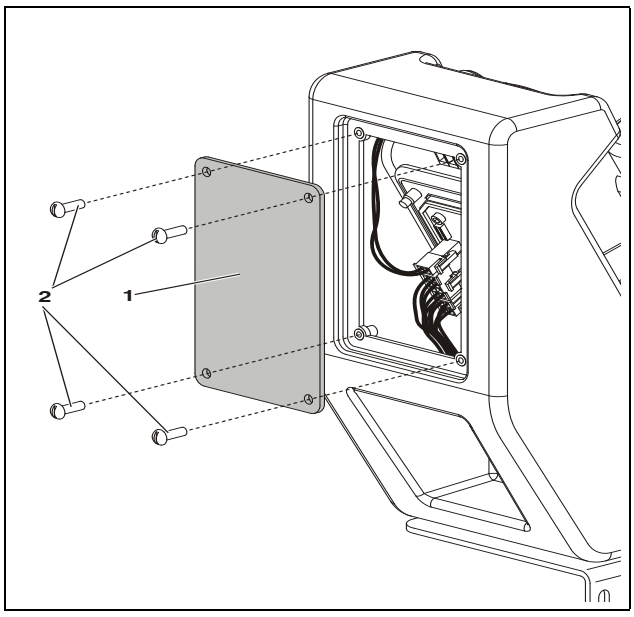


Platform Console - Mounting Bracket

1. Mounting Bracket
2. Bracket Screws (a)

Note: *(a) Apply Loctite #242 to screw threads on final assembly.*

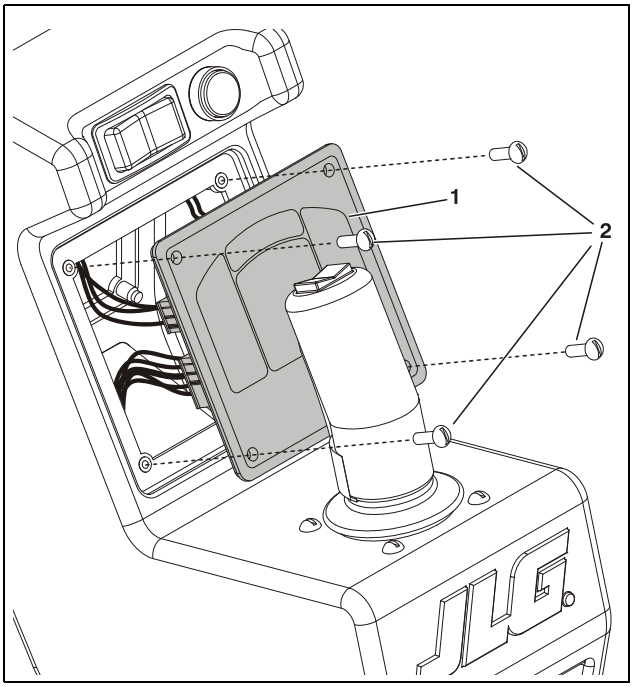
Rear Cover - Install/Remove



Platform Console - Rear Cover Installation

1. Rear Cover
2. Cover Mounting Screws

Display/Controller Module - Install/Remove

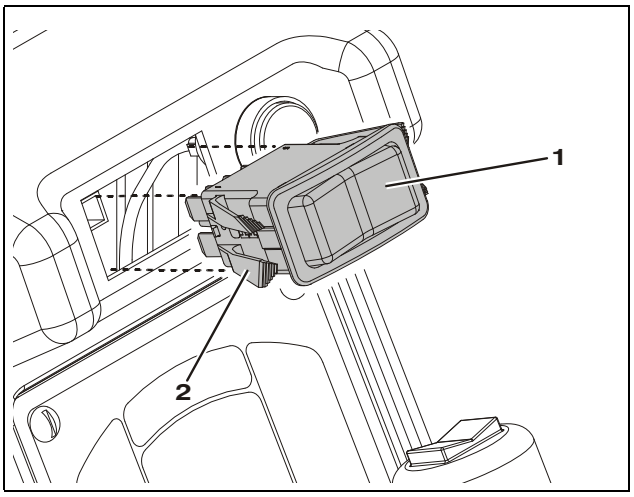


Platform Console - Display Module

1. Display/Controller Module (a)
2. Mounting Screws

Note: *(a) Unplug all connections on the back of the module before removing from console.*

Drive/Lift Mode Switch - Install/Remove

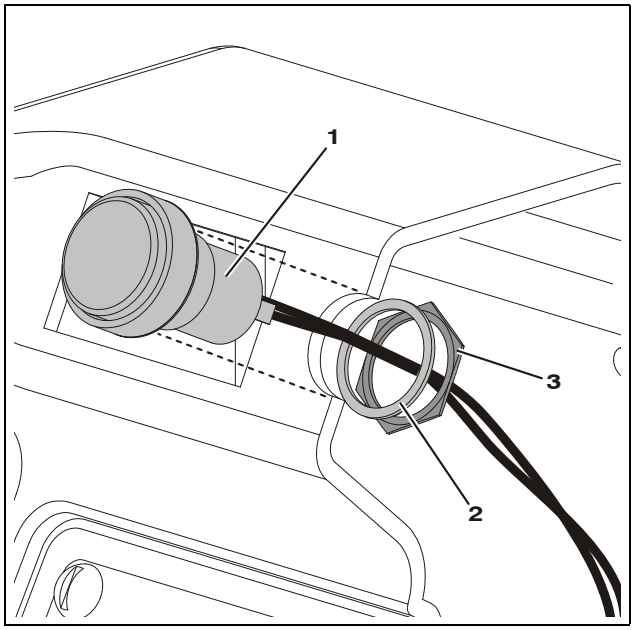


Platform Console - Drive/Lift Mode Select Switch

1. Switch Assembly (a)
2. Locking Tabs

Note: *(a) Remove rear cover, unplug switch wire, press tabs to remove.*

Horn Button Switch - Install/Remove

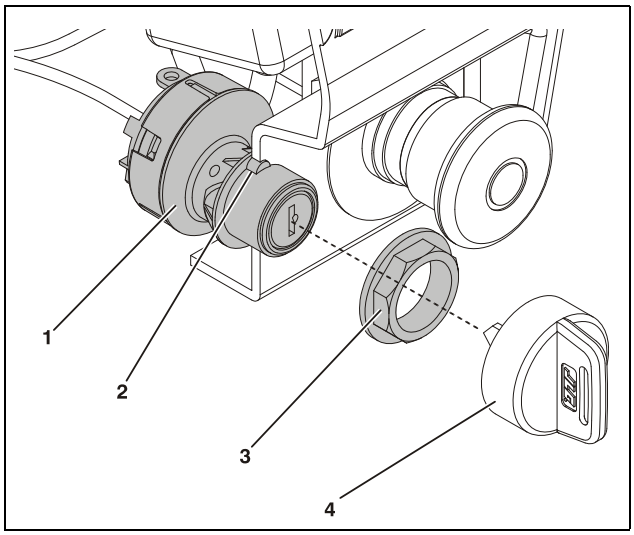


Platform Console - Horn Switch Installation

1. Horn Button Switch (a)
2. Lock Washer
3. Nut

Note: *(a) Remove rear cover, unplug wire, remove nut and lock washer then slide switch out of console.*

Key Switch - Install/Remove

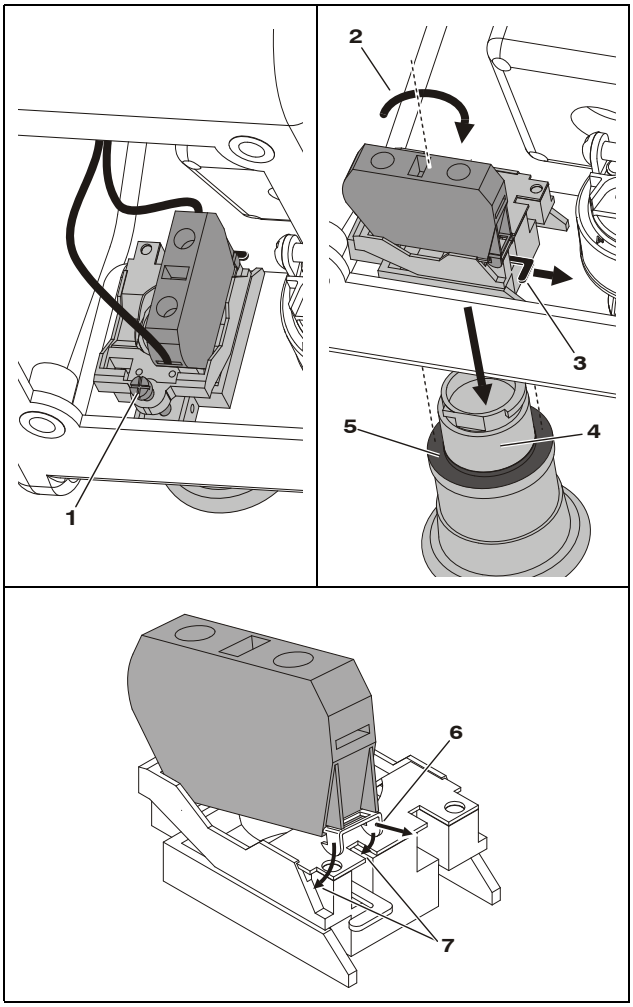


Platform Console - Key Switch Installaiton

1. Key Switch (a)
2. Notch
3. Attach Nut
4. Key

Note: *(a) Remove mounting bracket on bottom of console to gain access to the key switch assembly.*

E-Stop/ShutDown Switch - Install/Remove

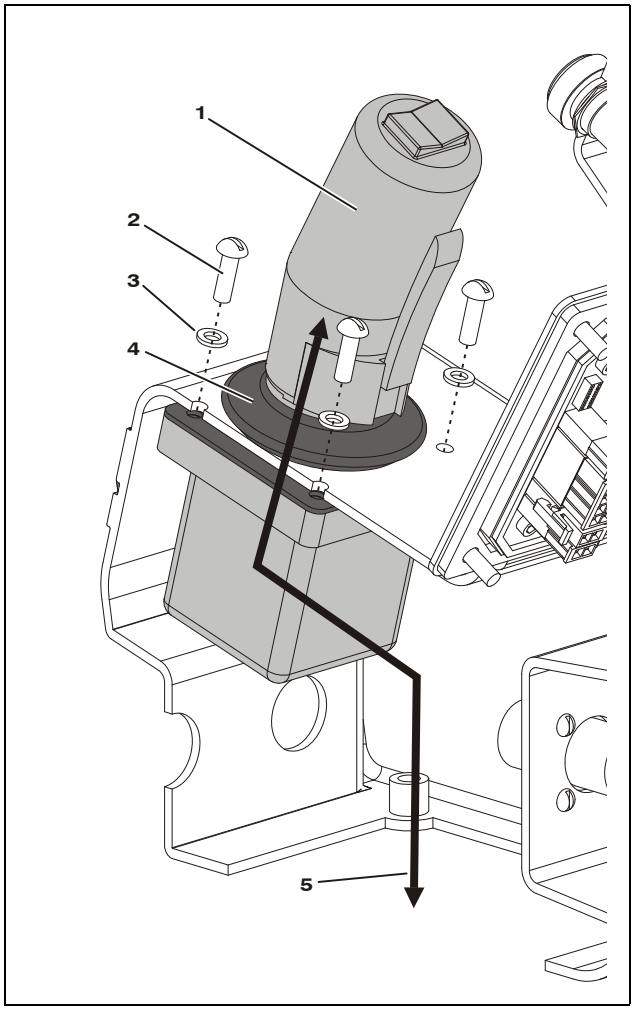


Platform Console - E-Stop Switch Installation

1. Loosen Switch Set Screw
2. Turn Switch 90°
3. Pull Spring-Loaded Release Lever Out
4. Remove Barrel Assembly
5. Barrel Seal
6. Switch to Body Retainer Hooks (a)
7. Switch Retainer Slots

Note: *(a) Use a small straight blade screwdriver to extend the spring-loaded retainer hooks (6) out and release the switch from the body.*

Joystick Assembly - Install/Remove



Platform Console - Joystick Installation

1. Joystick Assembly
2. Attach Screws (Qty.-4)
3. Nylon Washers (Qty.-4)
4. Rubber Boot/Gasket
5. Install/Remove through the Access Hole in Bottom of Housing. (a) (b)

Note: *(a) Remove the console mounting bracket.*
(b) Remove the key switch and e-stop switch to remove joystick assembly through access hole in bottom of console.

SECTION 5. MAST COMPONENTS

5.1 MAST COMPONENTS OVERVIEW

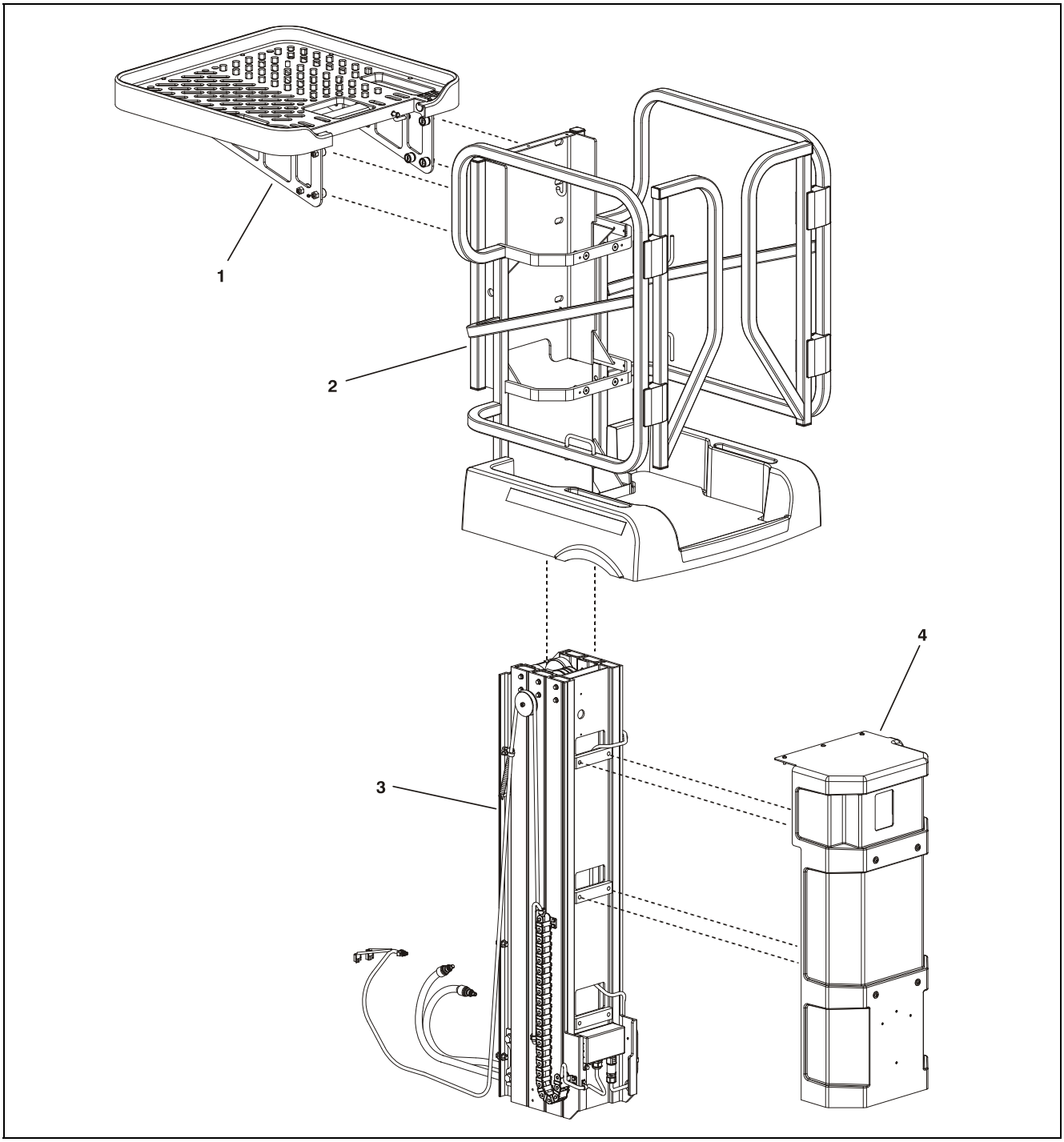
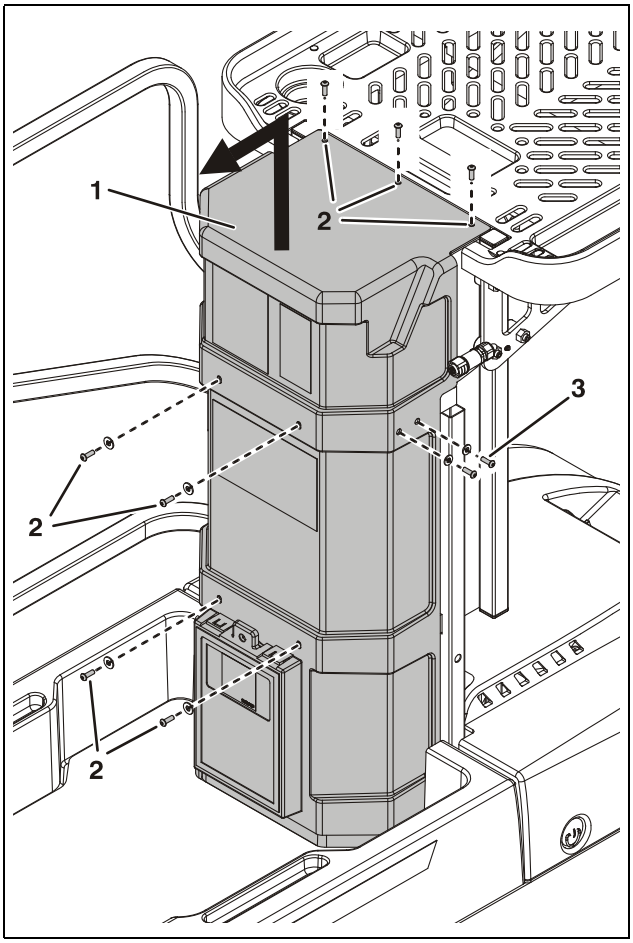


Figure 5-1. Mast Components.

1. Material Handling Tray
2. Platform Assembly
3. Mast Assembly
4. Platform Mast Cover

5.2 MAST COVER - INSTALL/REMOVE



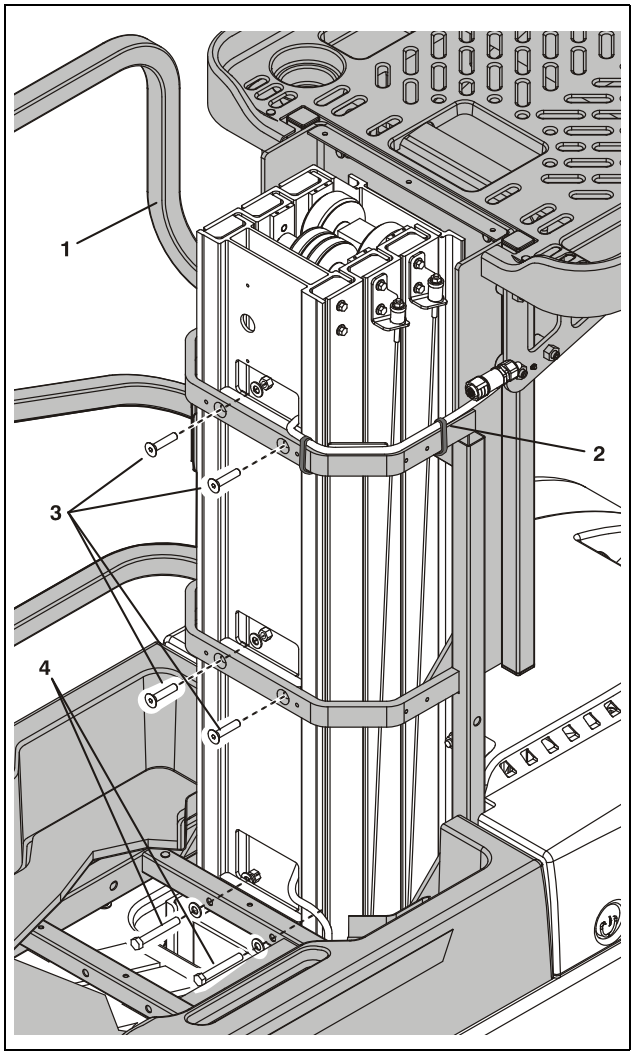
Mast Cover Installation

1. Mast Cover
2. Screws and Washers (a)
3. Platform Console Mounting Screws

Platform shown without right side rails for illustrative purposes only.

Note: *(a) Apply Loctite #242 to threads before final tightening.*

5.3 PLATFORM ASSEMBLY - INSTALL/ REMOVE



Platform Installation

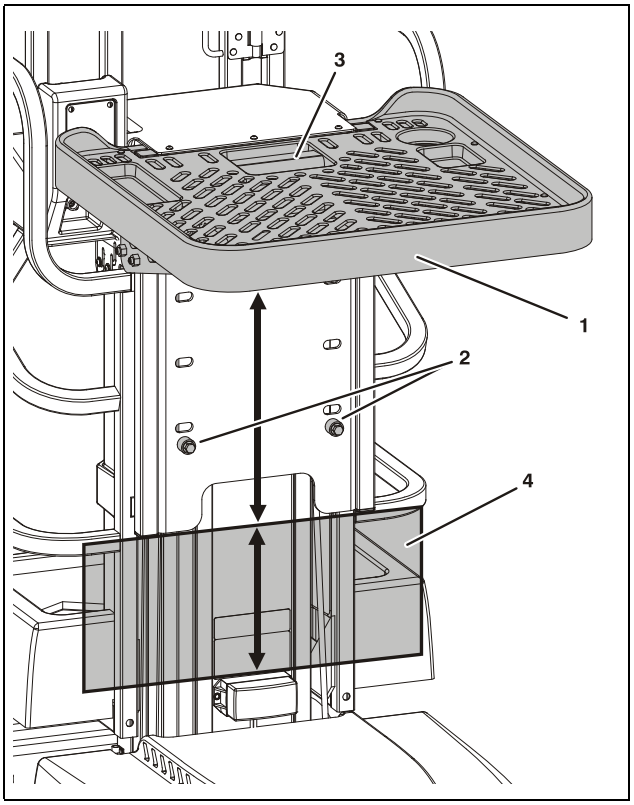
1. Platform/Material Tray Assembly
2. Tie Straps for Platform Console Harness
3. Countersunk Flat Head Socket Screws/Washers and Locknuts
4. Hex Head Screws/Washers and Locknuts (a)

Platform shown without right side rails and platform floor cutaway for illustrative purposes only.

Note: *(a) Raise platform and remove the hex head screw/washers and nuts (item 4).*
While under the platform, unplug the wiring harness to the foot enable switch and the entry gate interlock switches from the platform junction box.

Using suitable lifting equipment carefully lift the platform/material tray assembly off the mast assembly.

5.4 MATERIAL TRAY - INSTALL/REMOVE



Material Tray Installation

1. Material Tray Assembly
2. Tray Bottom Stops (b)
3. Tray Release Bar (c)
4. Raise Platform (a)

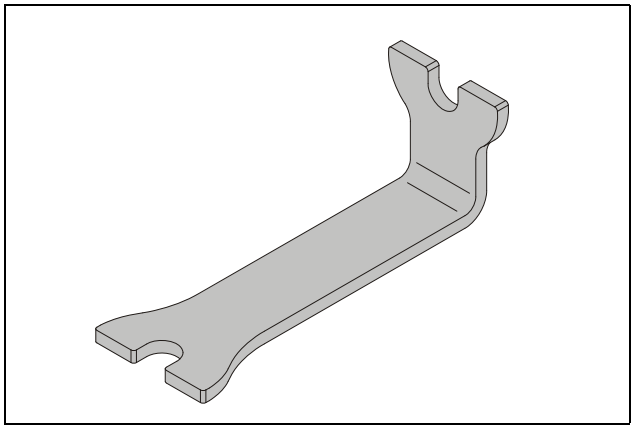
Note: *(a) Raise the platform approximately 2 ft. (60cm) when sliding the tray off the bottom of the mounting rails, tray will not clear beacon or hood without raising platform.*
(b) Remove stops to slide tray off the bottom of the mounting rails.
(c) Once bottom stops are removed carefully lower the tray to bottom and slide off of the mounting rails and move clear of machine. If tray is allowed to drop with stops removed damage to the amber beacon and hood could occur.

5.5 HYDRAULIC LINE - DISCONNECT - SPECIAL TOOL

The extend and return hydraulic lines on this machine require special tool JLG P/N-7027247 to remove them.

⚠ CAUTION

FULLY LOWER THE MAST TO RELIEVE PRESSURE IN THE SYSTEM BEFORE REMOVING ANY HYDRAULIC LINES. CAREFULLY LOOSEN REQUIRED FITTINGS, WEAR SAFETY PROTECTION EQUIPMENT WHEN WORKING WITH HYDRAULIC SYSTEMS.



Push Type Hydraulic Line Removal - SpecialTool - JLG P/N - 7027247

Tool Use

Use the 90° angled end of the tool on straight fittings, use the flat end of the tool on angled fittings.

1. Pull on hose to create a gap between the dust boot and the hose fitting shoulder.
2. Insert the disconnect too in the gap created between the dust boot and the hose fitting shoulder.
3. Gently push the hose assembly into the coupling body.
4. While maintaining slight pressure on the hose assembly, actuate the tool:
   - Pull up on tool when using the straight end.
   - Pull the tool in towards line when using the angled end.
5. Pull on hose assembly to complete disconnection.

5.6 MAST ASSEMBLY INSTALL/REMOVE

Mast Removal

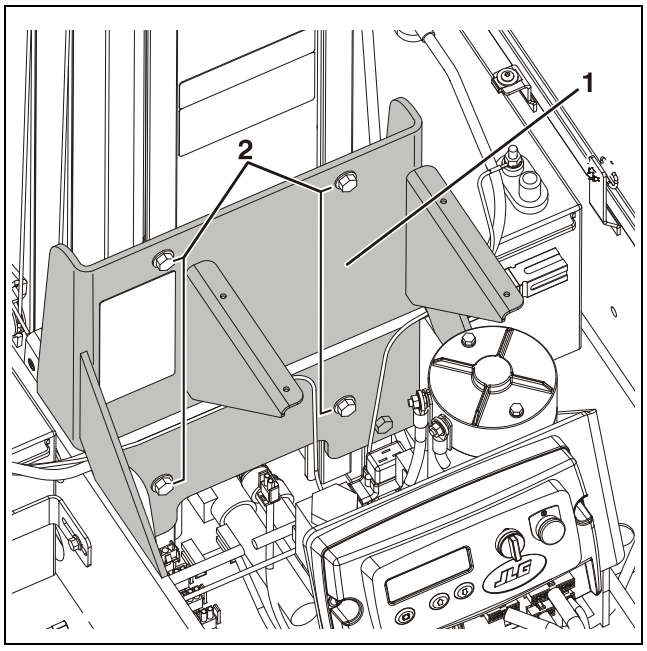
The following components must be removed from the machine before removing the mast assembly:

With Platform Elevated (approx. 4 ft. (1.2m)) Remove;

- Front Hood (See Section 3.2)
- Drive Motors Cover (See Section 3.2))
- Platform/Material Tray Assembly (See Section 5.3) - Remove the bottom bolts and unhook the enable foot switch and entry gate interlock wire harness from the platform junction box.

With Platform Completely Lowered - (If necessary, use Manual Descent Valve) Remove;

- Platform Control Console (See Section 4.2)
- Mast Cover (See Section 5.2)
- Platform/Material Tray Assembly (See Section 5.3)
- Battery Charger Assembly (See Section 3.7)



Mast Assembly Mounting Bolt Location

1. Mast Mounting Column (a)
2. Mounting Bolt/Washer/Nut Locations (b)

Notes: (a) Battery charger removed.
(b) Apply Loctite #271 to bolt threads on final assembly.

1. Unplug the platform control cable (P4) connector at the ground control module.
2. Unplug and remove the amber beacon mounted on the front of the mast assembly.
3. Disconnect and cap the hydraulic extend and return lines from the hydraulic cylinder either on the vavel block at the bottom of the cylinder or at the pump assembly. (See Section 5.5 following for special tool instructions).
4. Using an overhead crane or suitable lifting device capable of supporting the weight of the mast assembly, attach a sling strap to the mast.
5. Remove the four (4) mast attach bolts with washers and nuts securing the mast to the mounting column.

NOTE: *When lifting the mast out of the base frame be careful with the manual descent valve, extend and return lines protruding from the bottom front of the mast assembly.*

6. Carefully lift the mast off the base frame and place on a suitable work surface.

Mast Installation

To install the mast assembly reverse the Mast Removal instructions, however perform the following additional steps during re-assembly.

1. Once assembly is complete cycle the mast up and down several times, then check the oil level in the hydraulic reservoir.

5.7 MAST DISASSEMBLY PROCEDURE

The mast sections are constructed of extruded aluminum, protected with an anodized surface finish. The mast sections are interlocked into each other when assembled, by internally mounted slide pads at the top and bottom of each mast section. These slide pads run up and down in slide pad channels on each side of the mast.

The mast assembly contains the number of mast sections as shown following;

Table 5-1. Mast Component Features

Model	No. of Mast Sections	Extend/Retract Device
SSV-10	4	Chain

Mast Disassembly Procedure

1. After the mast assembly has been removed from the machine, lay the mast assembly down on a suitable work table with the platform mounting section on top, facing up.
2. Remove the sequencing cables, platform junction box and hardware from the sides of the mast assembly. Also remove the extend and return hydraulic lines from the bottom of the lift cylinder.

MAST SECTION-4 - REMOVAL (Platform Mount)

3. Remove chain adjust nuts from threaded ends of chain attached to the chain anchor plate *(lower)* on BOTTOM end of mast section-4 *(platform mounting section)*. Push threaded ends of chain through anchor plate.
4. At the TOP of mast section-3, pull chains out and allow to hang loose. *(Be certain floor surface is clean and free of any metal chips or debris which may stick to lubricated chains)*

NOTE: *When sliding mast sections apart, be careful not to scratch or score the anodized surface in the slide pad channels.*

5. Carefully slide mast section-4 out the BOTTOM of mast section-3 rails. Disassemble slide pads, shims and chain anchor plate from mast section-4, if necessary.

MAST SECTION-3 - REMOVAL

6. Remove chain adjust nuts from threaded ends of chains attached to the chain anchor plate (lower) on BOTTOM end of mast section-3. Push threaded ends of chains through anchor plate.
7. At TOP of mast section-2, pull chains out and allow to hang loose. *(Be certain floor surface is clean and*

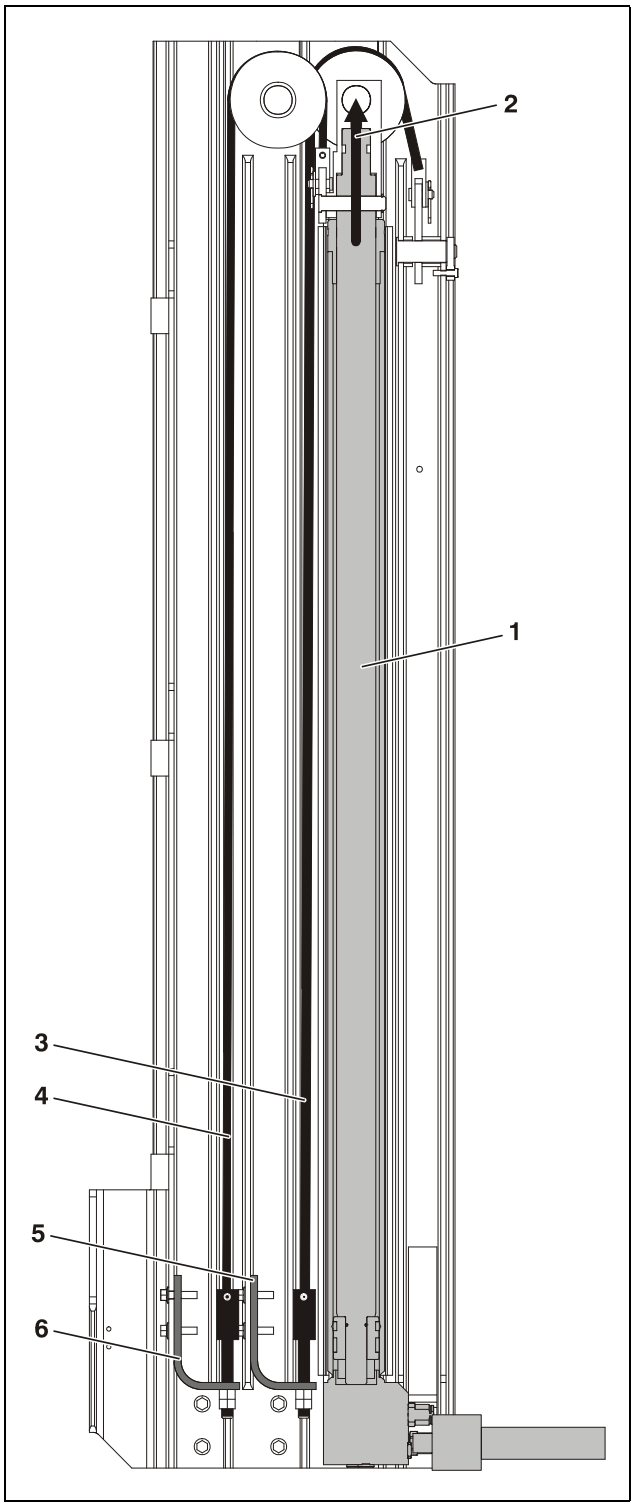


Figure 5-2. Mast Cut-a-Way View

1. Lift Cylinder
2. Cylinder Lift Point
3. Wide Chain Set
4. Narrow Chain Set
5. Section-3 - Lift Chain Anchor Bracket
6. Section-4 - Lift Chain Anchor Bracket

free of any metal chips or debris which may stick to lubricated chains)

NOTE: *When sliding mast sections apart, be careful not to scratch or score the anodized finish in the slide pad channels.*

8. Slide mast section-3 out the TOP of mast section-2 enough to allow removal of the sheave wheel assembly.

9. Remove countersunk-flathead screws securing chain sheave wheel assembly attach bars on both side rails at TOP of mast section-3 and remove sheave wheel assembly.

10. Carefully slide mast section-3 out BOTTOM of section-2. Remove slide pads, shims and cable anchor plate, if necessary.

MAST SECTION-2 - REMOVAL

NOTE: *Since the lift cylinder rod is still attached to the anchor block at the top of the section-2 mast assembly, you will need to temporarily uncap the extend and return hydraulic lines to allow mast section-2 to be extended in the next step. Capture any hydraulic fluid that may flow out of the lines and recap the lines once section is extended.*

11. Slide mast section-2 out TOP of mast section-1 far enough to allow access to the chain assembly anchor block/sheave wheel assembly.

12. On the underside of the mast assembly, remove the snap ring securing the anchor pin running through the small chain equalizer plate, the cylinder anchor block and the cylinder rod.

13. Push or lightly tap the anchor pin up and remove. Lay the small chain set aside.

14. Remove countersunk-flathead screws securing chain anchor block/sheave wheel assembly attach bars on both side rails at TOP of mast section-2 and remove the anchor block/sheave wheel assembly.

NOTE: *When sliding mast sections apart, be careful not to scratch or score the anodized finish in the slide pad channels.*

15. Carefully slide mast section-2 out the TOP of section-1. Remove slide pads and shims, if necessary.

MAST SECTION-1 - DISASSEMBLY

16. Remove the four (4) large screws (2 each side) attaching the lift cylinder mounting block to mast section-1. Slide the cylinder out of the mast section and move to a suitable work surface.

17. At the top end of mast section-1, remove the pin attaching the chain anchor block to the mast and remove chain/anchor block assemblies from the mast and lay aside.

18. Remove slide pads and shims from mast section-1, if necessary.

Mast disassembly should now be complete.

5.8 CYLINDER DISASSEMBLY

(See Figure 5-3.)

1. Before disassembling the cylinder, clean away all dirt and foreign substances from openings, particularly the head area.

NOTE: *Always protect the chrome surface of the cylinder rod during assembly and disassembly. Any damage to this surface will require replacement of the rod.*

2. Extend the rod until the piston bottoms out against the cylinder head.
3. Compress the head retraining ring enough to allow the cylinder head to be removed.
4. Carefully slide the head/rod/piston assembly out of the cylinder tube. A gentle tap on the head assembly may be required to remove the head from the cylinder tube.
5. Place the head/rod/piston assembly on a surface that will not damage the chrome.
6. Remove the piston locknut and separate the piston from the rod.
7. Slide the head off the rod from the piston end.

NOTE: *When removing the old seals use only blunt tools, be sure there are no sharp edges that may damage the seal grooves during removal. Scratching the groove may cause by-pass.*

8. Remove and discard all old seals.

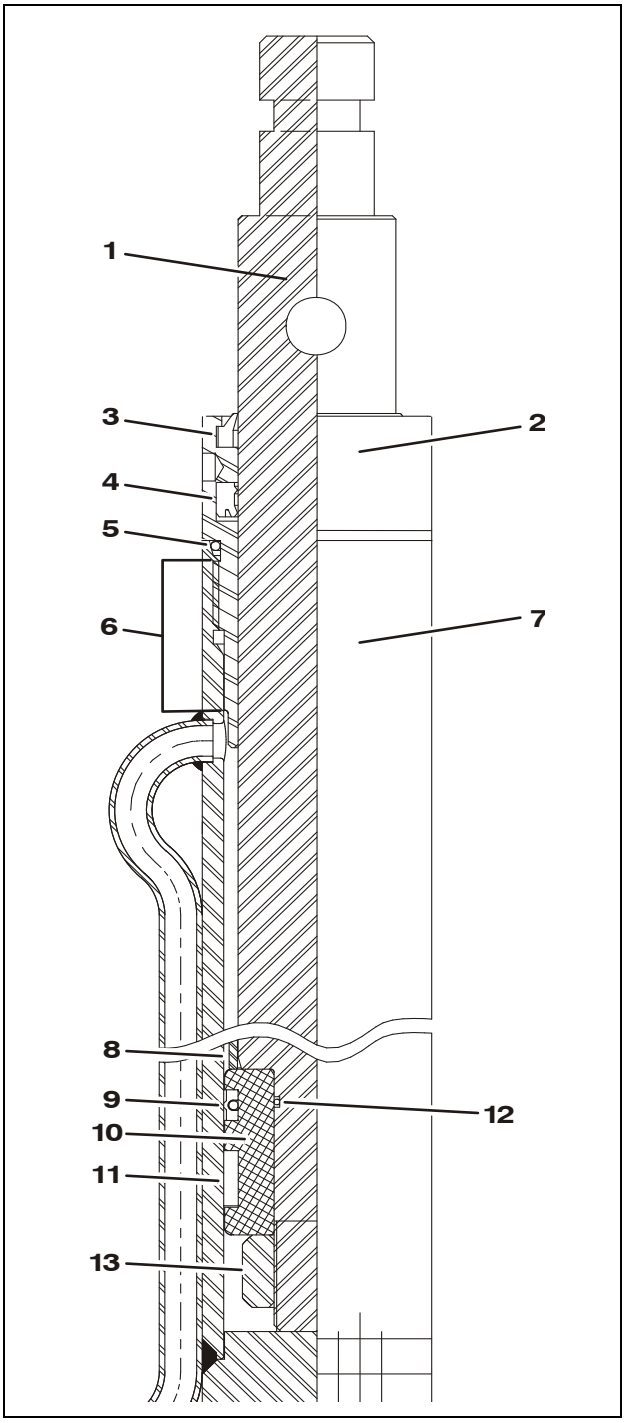


Figure 5-3. Lift Cylinder Component Cross-Section.

1. Cylinder Rod	**6.** Apply Anti-Seize	**10.** Piston
2. Cylinder Head	**7.** Cylinder Tube	**11.** Wear Ring
3. Rod Wiper	**8.** Spacer	**12.** Piston O-Ring
4. Rod Seal	**9.** Piston Seal	**13.** Piston Lock Nut (a)
5. O-Ring		

Note: (a) - Torque 100 - 120 ft. lbs.

Lift Cylinder Component Inspection

Cylinder Rod

There should be no scratches or pits deep enough to catch the fingernail. Pits that go to the base metal are unacceptable. Scratches that catch the fingernail but are not to the base metal, less than 0.5 inch long and primarily in the circumferential direction are acceptable provided they cannot cut the rod seal. Chrome should be present over the entire surface of the rod and the lack thereof is unacceptable. In the event that an unacceptable condition occurs, the rod should be repaired or replaced.

Cylinder Head

Visually inspect the inside bore for scratches or polishing. Deep scratches are unacceptable. Polishing indicates uneven loading and when this occurs, the bore should be checked for out-of-roundness. If out-of-roundness exceed 0.007", this is unacceptable. Check the condition of the dynamic seals (wiper, rod seals) looking particularly for metallic particles embedded in the seal surface. It is normal to cut the static seal on the retaining ring groove upon disassembly. Remove the rod seal, static o-ring and backup and rod wiper. Damage to the seal grooves, particularly on the sealing surfaces, is unacceptable. In the event that an unacceptable condition occurs, the head should be replaced.

Piston

Visually inspect the outside surface for scratches or polishing. Deep scratches are unacceptable. Polishing indicates uneven loading and when this occurs, the diameter should be checked for out-of-roundness. If out-of-roundness exceeds 0.007", this is unacceptable. Check the condition of the dynamic seals and bearings looking particularly for metallic particles embedded in the bearing and in the piston seal surface. Remove the seals and bearings. Damage to the seal grooves, particularly on the sealing surfaces, is unacceptable. In the event that an unacceptable condition occurs, the piston should be replaced.

Tube Assembly

Visually inspect the inside bore for scratches and pits. There should be no scratches or pits deep enough to catch the fingernail. Scratches that catch the fingernail but are less than 0.5 inch long and primarily in the circumferential direction are acceptable provided they cannot cut the piston seal. The roughness of the bore should be between 10 and 20 μ inches RMS. Significant variation (greater than 8 μ inches difference) are unacceptable. In the event that an unacceptable condition occurs, the tube assembly should be repaired or replaced.

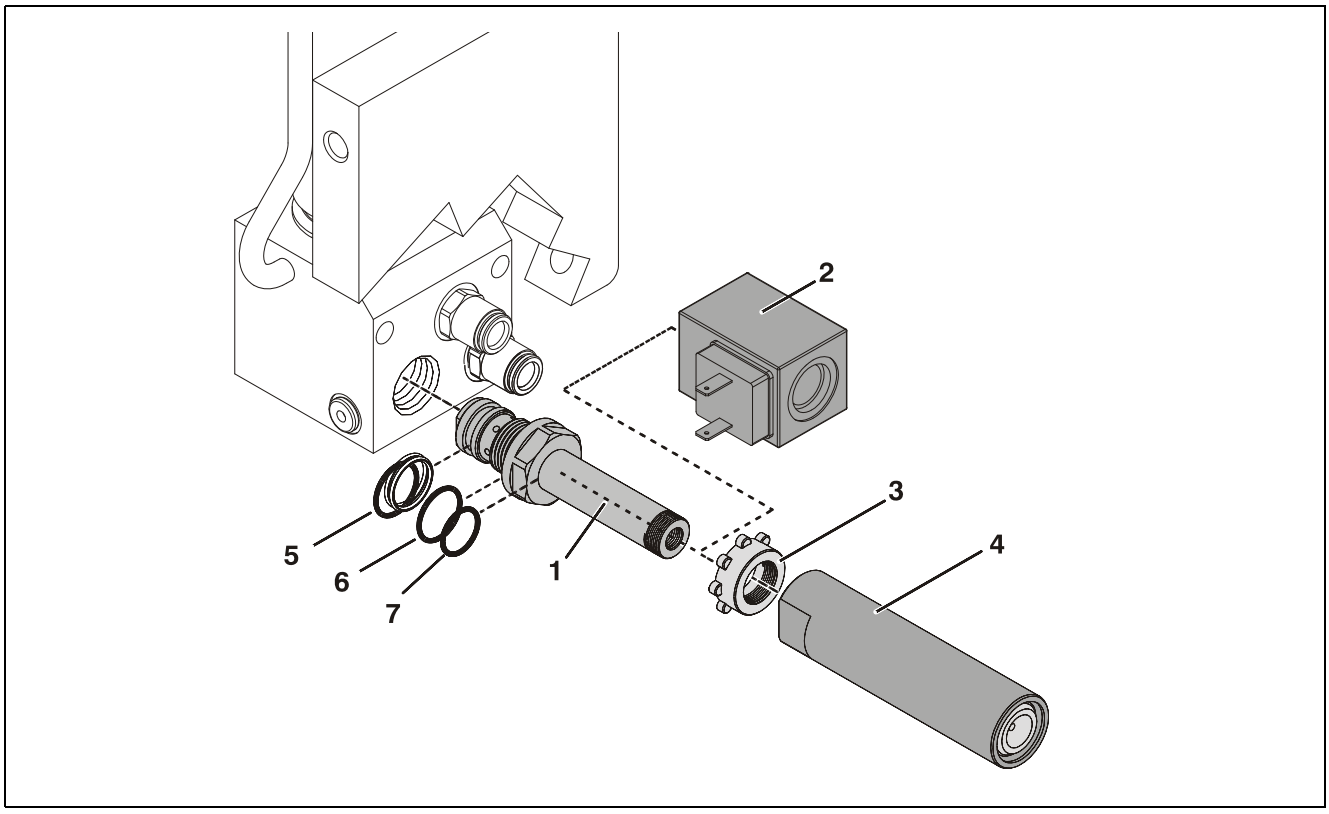
Cylinder Assembly

(See Figure 5-3.)

1. Rinse the inside of the tube with hydraulic fluid and allow to drain. A high-pressure rinse followed by a wipe with a lint-free rag is preferable. Clean all internal components of any foreign material.
2. Lubricate the head and all seals with hydraulic fluid prior to installation. Install the seal, wiper, o-ring, back-up ring, and retraining ring to the cylinder head.
3. Lubricate the piston and all components with hydraulic fluid. Install the seal and wear ring to the piston.

NOTE: *Re-check that seals are not twisted or pinched and are properly seated.*

4. Place the rod on a clean table. Install the static piston o-ring seal into the groove on the piston end of the rod.
5. Install the head followed by the piston onto the rod noting the proper orientation of each component. Torque the piston nut to 100-120 ft. lbs.
6. When the rod assembly is ready to be installed into the tube, liberally apply an anti-seize lubricant to the cylinder head surface which slides into the cylinder tube.
7. Next dip the entire rod assembly into hydraulic fluid and stuff this assembly into the tube. Watch the seals as they pass over the rod port *(if visible)* to be sure they are not nicked or cut.
8. Install the head until the retaining ring seats in it's groove.



Lift Down Valve and Manual Release Installation

1. Lift Down Valve (a)
2. Valve Solenoid (b)
3. Solenoid Retaining Nut
4. Manual Release Assembly
5. O-Ring with Backing Rings (a)
6. Valve O-Ring (a)
7. Solenoid O-Ring (a)

Notes: (a) Coat all o-rings with clean hydraulic fluid before assembling.
(b) Mount with electrical terminals pointing to right side of machine.

5.9 MAST ASSEMBLY

Assembly procedures for all mast sections is basically the same, carefully slide the mast sections together until mast ends are even. *(When sliding the mast sections together, be careful not to scratch the anodized surface in the wear pad channels).* Assemble the hardware to the bottom of mast section first, slide this section out the top of previous section and assemble hardware to the top of mast. Always install slide pad shims with slide pads inserted into the slide pad channels, *(ends of mast sections even).* Applying Krytox spray (JLG P/N-3020041) onto the slide pads and slide pad channels before assembly will help mast sections slide easier after slide pads have been properly shimmed.

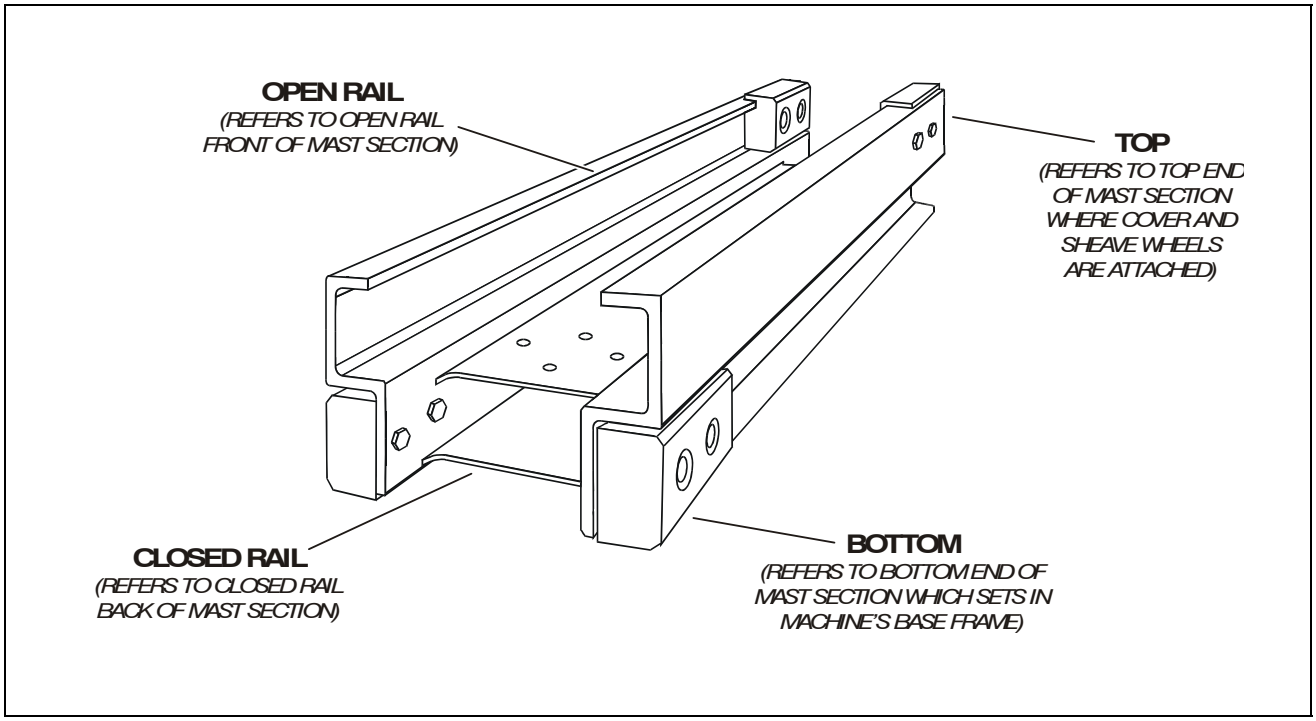
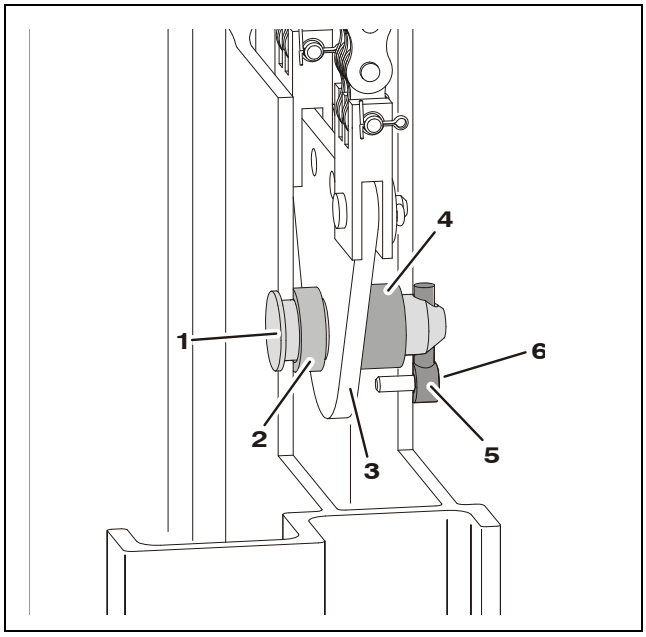


Figure 5-4. Mast Section - Assembly Reference.

MAST SECTION 1 - ASSEMBLY

1. Place mast section-1, rail (open) side up *(See Figure 5-4.)* on a clean, flat surface *(preferably a table or work bench capable of supporting the weight of the entire mast assembly)*. Slide mast out over end of work surface far enough to allow access to the chain anchor attach hole near the top of the mast.
2. Locate the two (2) single *(wide)* chain assemblies and attach to the large equalizer anchor plate *(if not already attached)*. Lay out the chain/anchor plate assembly with the anchor plate end towards top of the mast. *(Be certain floor surface is clean and free of any metal chips or debris which may stick to lubricated chains)*.
3. Insert the chain/anchor plate assembly end into the top of mast section-1 and secure using the large anchor plate attach pin, spacers, and pin keeper.



Top of Mast Section-1 - Upper Chain/Anchor Plate Installation (Mast Section-1 - Shown Cut-Away)

1. Anchor Plate Pin **2.** Short Spacer **3.** Chain/Anchor Plate Assy. **4.** Long Spacer **5.** Pin Keeper **6.** Keeper Screw (a)

Note: (a) Apply Loctite #242 to threads.

MAST SECTION 2 - ASSEMBLY

NOTE: *Before sliding mast sections together, spray the slide pad channels with Krytox lubricant spray, (JLG P/N-3020041). Be careful not to scratch or score the anodized finish in the slide pad channels.*

4. Locate mast section-2, carefully slide mast section-2 closed rail into section-1 open rail. Slide sections together until ends are even.
5. Insert slide pads into the slide pad channels at bottom end of mast between section-1 and -2, *(one on each side of the mast)*, with beveled surface facing out towards section-1.

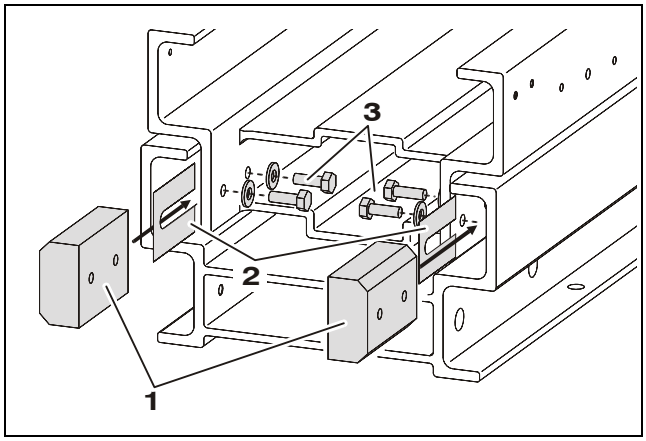


Figure 5-5. Bottom of Mast Section-2 - Slide Pad Installation

1. Slide Pads **2.** Shim Stock **3.** Slide Pad Bolts/Washers (a)

Note: (a) Apply Loctite #242 to threads.

6. Thread slide pad attaching bolts, (two (2) 1/4"-20UNC x 3/8" long hex head bolts, place a flat washer under head of each bolt), through holes in mast section-2 inside rail, into the slide pad inserts. Thread in enough to hold pad in place.
7. Shim slide pads using the following steps:

NOTE: *Always use the an even amount of shim material behind slide pads on both sides of the mast rails. This will keep mast sections centered in rail channels and prevent any distortion of the mast section.*

   a. Start with a .036" thick shim and a .075" thick shim per side at each slide pad.
   b. Slide shims into place between slide pad and mast rail. Tighten the slide pad mounting bolts, be sure there are no air gaps between shims, shim and mast or shim and slide pad when tightened.

c. Check mast section for side play. If play exists add .015" shims dividing the thickness equally between both sides of mast. Insert shims until the shims cannot be inserted halfway by hand with the mast pulled to the opposite side.

d. When mast slide pads are shimmed properly, there should be no side to side movement of slide pad in rail channel. Mast sections should be snug in channels but still be able to slide in channel by hand.

8. Insert slide pads into the slide pad channels *(top of mast)* between section-1 and -2, (*one on each side of the mast)*, with beveled surface facing in towards section-2.

NOTE: *Before fastening and shimming the slide pad on the top left side of the mast, install a sequence cable bracket against the mast under the flatwasher.*

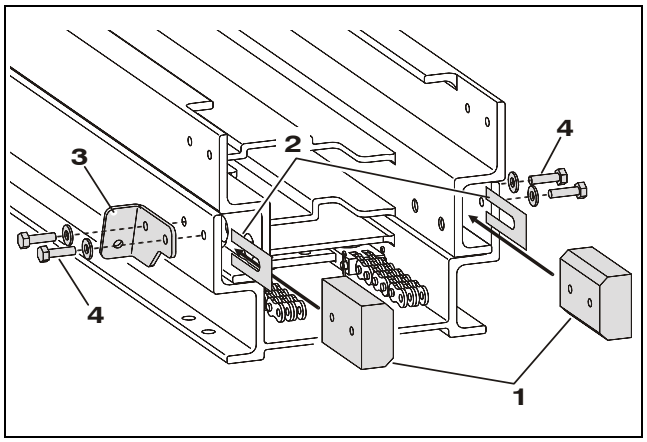


Figure 5-6. Top of Mast Section-2 - Slide Pad Installation

1. Slide Pads
2. Shim Stock
3. Sequence Cable Bracket
4. Slide Pad Bolts/Washers (a)

Note: (a) Apply Loctite #242 to threads.

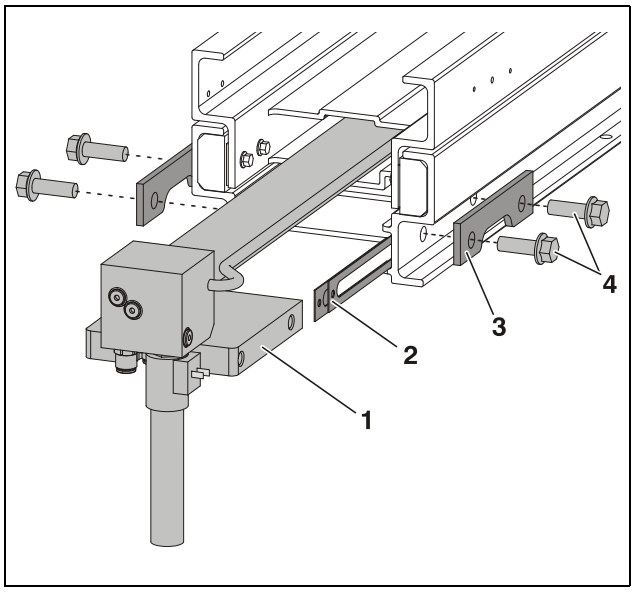
9. Thread slide pad attaching bolts, two (2) 1/4"-20UNC x 3/8" long hex head bolts, place a flat washer under head of each bolt, through holes in mast section-1 outside rail *(top of mast)* and into the slide pad inserts. Thread in enough to hold pad in place.

10. Shim per instructions in step 7, Mast Section 2 - Assembly.

11. Before installing the lift cylinder to mast section 1 and into mast section-2, extend the lift cylinder rod out the top of the lift cylinder approximately 1 ft. (31cm).

NOTE: *To extend the hydaulic cylinder the protective caps on the extend and return ports will need to be temporarily removed. Be careful not to nick or scour rod surface when extending, also catch any oil draining out of cylinder to avoid spillage onto work area.*

12. Install the lift cylinder mount into the bottom of Mast Section 1 and the cylinder into Section 2.



Bottom of Mast Section-2 - Cylinder Assembly Installation

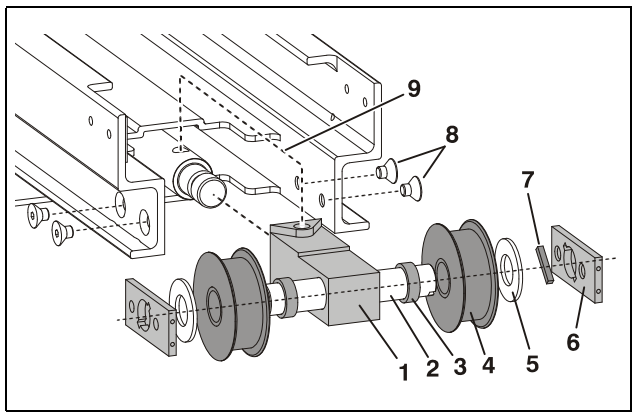
1. Cylinder Assembly
2. Shim Stock (a)
3. Cyl. Mount Reinforcement Plate
4. Cyl. Mount Bolts and Washers (b)

Note: *(a) Thickness as required both sides to center cylinder mount in mast assembly.*
(b) Apply Loctite #242 to threads.

13. At the bottom of mast section-1 check for side to side clearance of the cylinder mount. Use mounting shims of equal thickness on each side to center the mount in the closed rail portion, as necessary.

14. Install the mount reinforcement plates and mount bolt and washers. Apply Loctite #242 to threads of mounting bolts before final assembly.

15. Slide mast section-2 out of mast section-1 approximately one foot.



Top of Mast Section-2 - Chain Anchor/Sheave Wheel Installation

1. Anchor Block
2. Sheave Pin
3. Narrow Spacer Tube (a)
4. Sheave Wheels (Wide) (a)
5. Thrush Washers (a)
6. Sheave Pin Support Plates (a)
7. Key
8. Support Plate Screws (b)
9. Align Pin Holes

Note: *(a) Install one on both sides of anchor block.*
(b) Apply Loctite #242 to threads on final assembly.

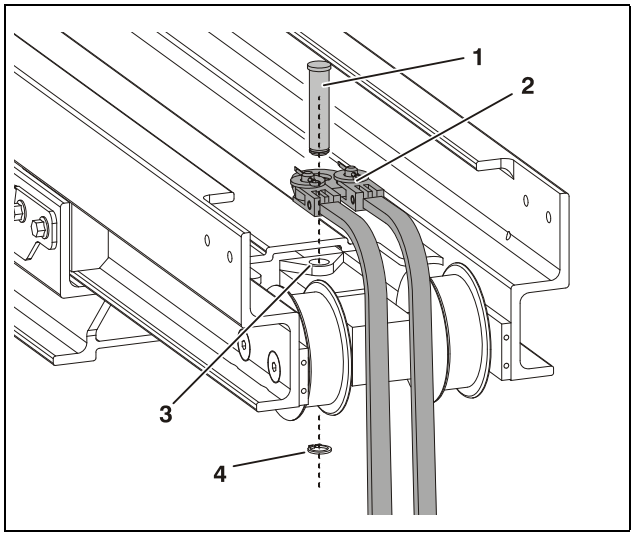
16. Assemble the chain sheave wheel assembly to the chain assembly anchor block which will attach to the cylinder rod and to mast section-2 using following steps;

- **a.** Insert sheave pin through anchor block assembly.
- **b.** Load one (1) narrow spacer tube onto the sheave pin on each side of the anchor block.
- **c.** Place sheave wheels *(for wide #544 chain)* on sheave pin, one each side of anchor block.
- **d.** On the outside of each sheave wheel, place a large thrust washer.
- **e.** Insert the key bar into the keyway on the end of the sheave wheel pin.
- **f.** Place a sheave pin support plate on each end of the shaft.
- **g.** Slide the whole anchor block/sheave wheel assembly into top of mast section-2. Slide the anchor block onto the top of the cylinder rod. Check that the hole in the cylinder rod aligns the the hole in the anchor block.
- **h.** Align the threaded holes in the sheave pin support bars with the mounting holes on each side of the top of mast section-2 mast and attach using two (2) 3/8"-16UNC x 1/2" long socket head-countersunk-flathead cap screws each side. Coat threads with Loctite #171 on final assembly.

17. Locate and assemble the narrow chains set *(#444)* and to the small (triangular shape) chain equalizer anchor plate using the pins, washers and cotter keys.

18. Lay out the chain*(#444)*/anchor plate assembly with anchor plate end towards mast, *(be certain floor surface is clean and free of any metal chip or debris which may stick to lubricated chains or lay chains in a clean bucket)*.

19. Assemble the chain/anchor plate assembly and the chain anchor block to the cylinder rod end using the anchor plate/block attach pin and snap ring.



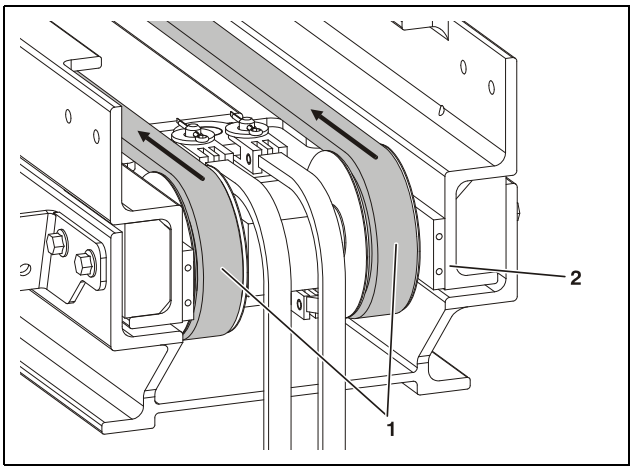
Top of Mast Section-2 - Narrow Chain Set Installation

1. Anchor Block Attach Pin
2. Narrow Chain Set
3. Hole Through Anchor Block
4. Snap Ring

20. Slide mast section-2 back into section-1 until top and bottom ends are even.

MAST SECTION 3 - ASSEMBLY

21. Lay the wide chain set attached to the top of mast section-1 into the open rail on mast section-2.



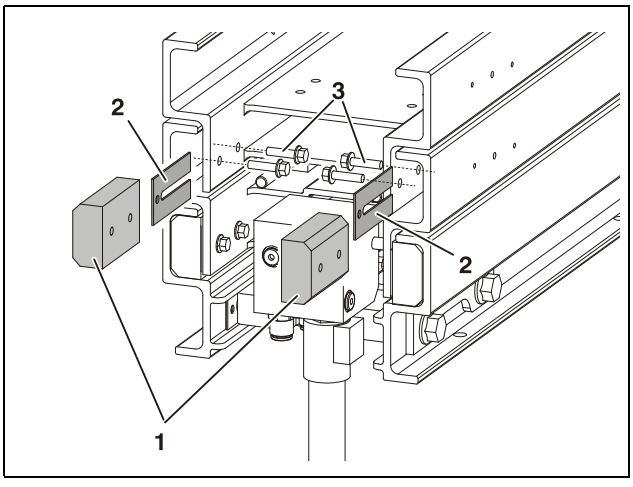
Top of Mast Section-2 - Slide Pad Installation

1. Wide Chain Set Attached to Mast Section-1.
2. Mast Section-2

NOTE: *Before sliding mast sections together, spray the slide pad channels with Krytox lubricant spray, (JLG P/N-3020041). Be careful not to scratch or score the anodized finish in the slide pad channels.*

22. Carefully slide mast section-3 into section-2 until ends are even.

23. At the bottom of mast section-3, install the slide pads between mast section-2. and 3. Shim per instructions in step 7, Mast Section 2 - Assembly.



Bottom of Mast Section-3 - Slide Pad Installation

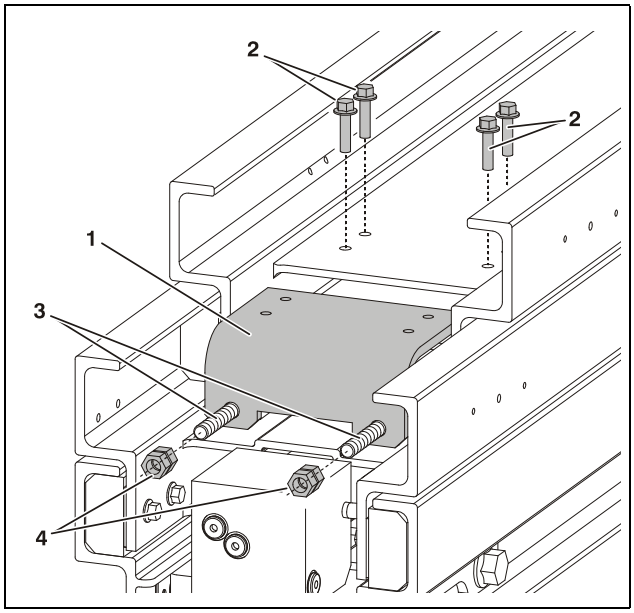
1. Slide Pads
2. Shim Stock
3. Shim Pad Screws

24. Push mast section-3 out the top of mast section-2 approximately 1 ft. (31cm).

25. Locate the lower chain anchor bracket *(one with the threaded attach holes horizontally aligned to outside of bracket)*.

26. Working at the bottom end of mast section-3, insert the threads (stud) ends of the (wide) chain set, now laying between mast section-2 and 3, into the holes of the lower chain anchor bracket. Loosely thread two (2) 3/8"-16UNC nuts onto the stud threads on each chain.

27. Slide the anchor plate into the closed rail at the bottom of mast section-3 and attach the anchor plate to the bottom of mast section-3 with four (4) 1/4"-20UNC x 3/4" long bolts. Apply Loctite #242 to threads on final assembly.

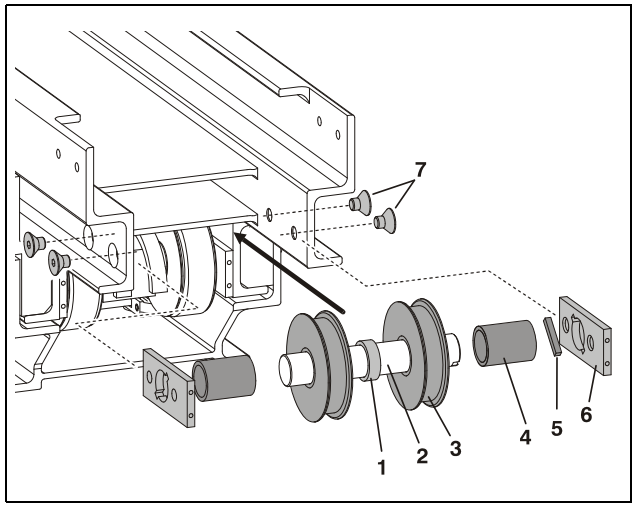


Bottom of Mast Section-3 - Chain Anchor Plate Installation

1. Lower Chain Anchor Bracket
2. Anchor Bracket Screws
3. Wide Chain Set Studs
4. Chain Adjust and Jam Nuts

Note:

28. At the top of mast section-3, assemble the chain sheaves *(for narrow chain assembly)* to top of mast section-3 as shown following;



Top of Mast Section-3 - Narrow Chain Sheave Wheel Installation

1. Narrow Spacer Tube
2. Sheave Pin
3. Sheave Wheels (Narrow) (a)
4. Wide Spacer Tube (a)
5. Key
6. Sheave Pin Support Plates (a)
7. Support Plate Screws (b)

Note: *(a) Install one on both sides of anchor block.*
(b) Apply Loctite #242 to threads on final assembly.

a. Slide the narrow spacer tube onto one of the remaining sheave pin.

b. Place the narrow chain sheave wheel assemblies, one on each side of the narrow spacer onto the sheave pin.

c. Place one wide spacer tube on the outside of each sheave wheel on the sheave pin.

d. Insert key into the keyway on the end of the sheave pin.

e. Place two (2) sheave pin support bars, one each end of sheave pin onto outside of spacer tubes.

f. Holding complete sheave wheel assembly, slide assembly into top of mast section-3 and align threaded holes in sheave pin support bars with holes in mast rails.

g. Attach to top of mast section-3 using two (2) 3/8"-16UNC x 1/2" long socket head-countersunk-flathead cap screws, each side. Coat threads with Loctite #171 and tighten.

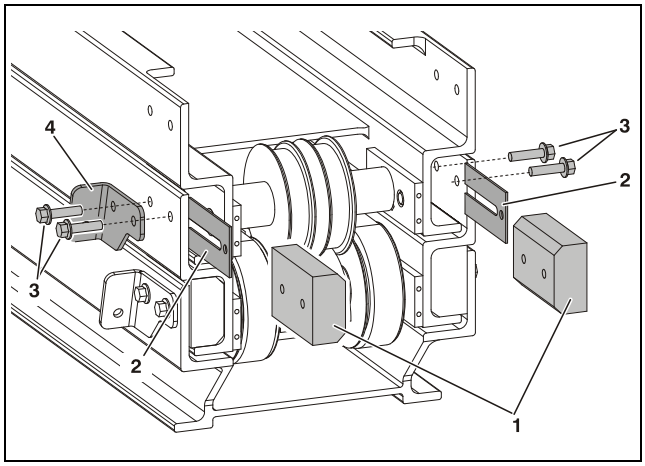
29. Slide the top of mast section-3 back in even with the top of mast section-2.

30. Insert slide pads into the top end mast rails between section-2 and -3, *(one on each side of the mast)*, with beveled surface facing inward towards section-3. *(Same as Figure 5-6.)*

NOTE: *Before fastening and shimming the slide pad on the top left side of the mast, install a sequence cable bracket against the mast under the flatwasher.*

31. Thread slide pad attaching bolts, two (2) 1/4"-20UNC x 3/8" long hex head bolts, place a flat washer under head of each bolt, through holes in outside rail, on top of mast section-2 and into the slide pad inserts. Thread in enough to hold pad in place.

32. Shim per instructions in step 7, Mast Section 2 - Assembly. Apply Loctite #242 to attach screw threads on final assembly.



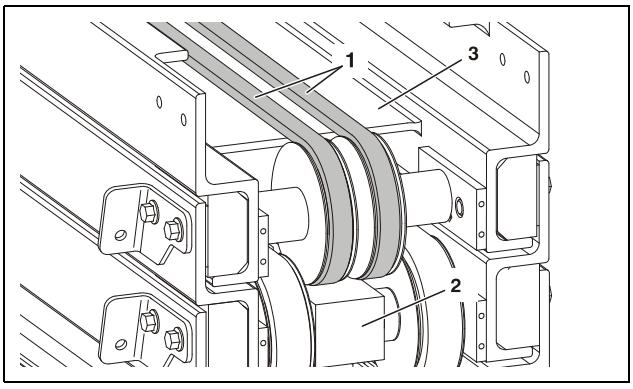
Top of Mast Section-3 - Top Slide Pad Installation

1. Slide Pads
2. Shim Stock
3. Slide Pad Attach Screws (a)
4. Upper Sequence Cable Bracket

Note: *(a) Apply Loctite #242 to attach screws on final assembly.*

MAST SECTION 4 - ASSEMBLY

33. Lay the narrow chain set attached to the cylinder attach anchor block at the top of mast section-2 into the open rail on mast section-3.



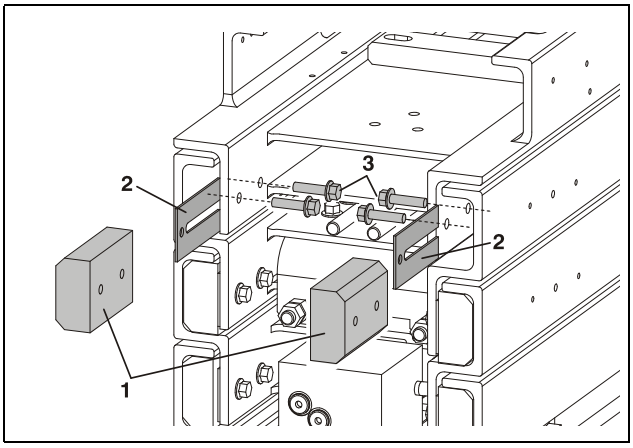
Top of Mast Section-3 - Narrow Chain Set Layout

1. Narrow Chain Set Attached to Chain Anchor Block on Mast Section-2.
2. Chain Anchor Block
3. Mast Section-3

NOTE: *Before sliding mast sections together, spray the slide pad channels with Krytox lubricant spray, (JLG P/N-3020041). Be careful not to scratch or score the anodized finish in the slide pad channels.*

34. Carefully slide mast section-4 into section-3 until ends are even.

35. At the bottom of mast section-4, install the slide pads between mast section-3. and 4. Shim per instructions in step 7, Mast Section 2 - Assembly. Apply Loctite #242 to the threads of the pad screws on final assembly.



Bottom of Mast Section-4 - Slide Pad Installation

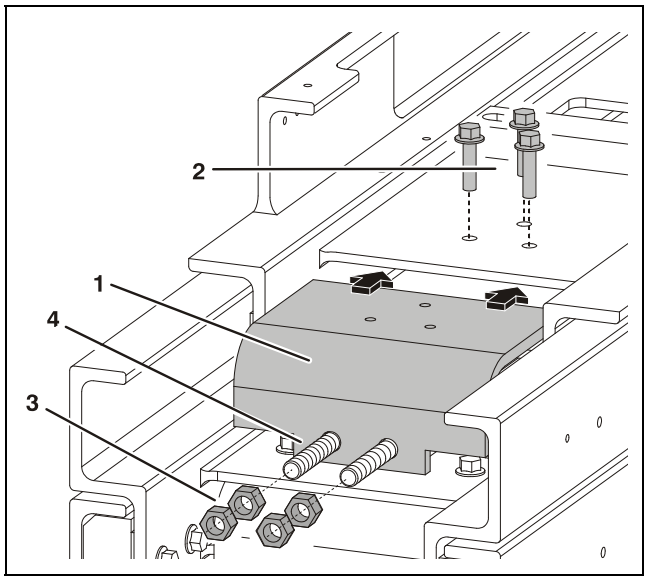
1. Slide Pads
2. Shim Stock
3. Shim Pad Screws (Apply Loctite #242)

36. Slide mast section-4 out the top of mast section-3 approximately 1 ft. (31cm).

37. Locate the lower chain anchor bracket *(one with the threaded attach holes in a triangular shape pattern)*.

38. Working at the bottom end of mast section-4, insert the threads (stud) ends of the (narrow) chain set, now laying between mast section-3 and 4, into the holes of the lower chain anchor bracket. Loosely thread two (2) 3/8"-16UNC nuts onto the stud threads on each chain.

39. Slide the anchor plate into the closed rail at the bottom of mast section-4 and attach the anchor plate to the bottom of mast section-4 with three (3) 1/4"-20UNC x 3/4" long bolts. Apply Loctite #242 to threads on final assembly.



Bottom of Mast Section-4 - Chain Anchor Installation

1. Lower Chain Anchor Bracket
2. Anchor Bracket Screws (a)
3. Narrow Chain Set Studs
4. Chain Adjust and Jam Nuts

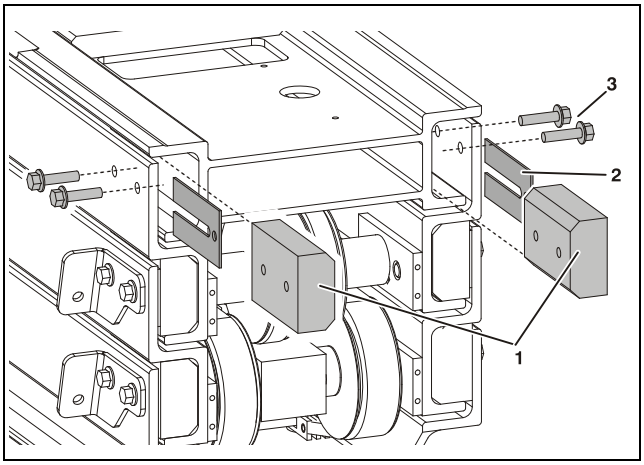
Note: *(a) Apply Loctite #242 to threads on final assembly.*

40. Slide the top of mast section-4 back in even with the top of mast section-3.

41. Insert slide pads into the top end mast rails between section-3 and -4, *(one on each side of the mast)*, with beveled surface facing inward towards section-3.

42. Thread slide pad attaching bolts, two (2) 1/4"-20UNC x 3/8" long hex head bolts through holes in outside rail, on top of mast section-2 and into the slide pad inserts. Thread in enough to hold pad in place.

43. Shim per instructions in step 7, Mast Section 2 - Assembly. Apply Loctite #242 to attach screw threads on final assembly.

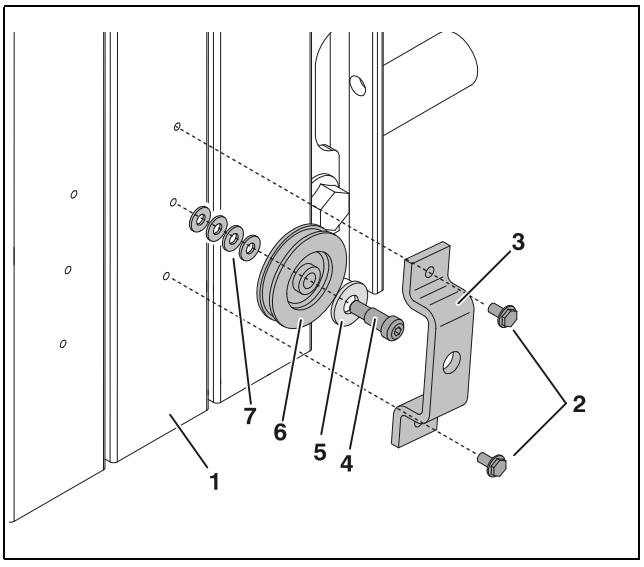


Top of Mast Section-4 - Slide Pad Installation

1. Slide Pads
2. Shim Stock
3. Slide Pad Attach Screws (a)

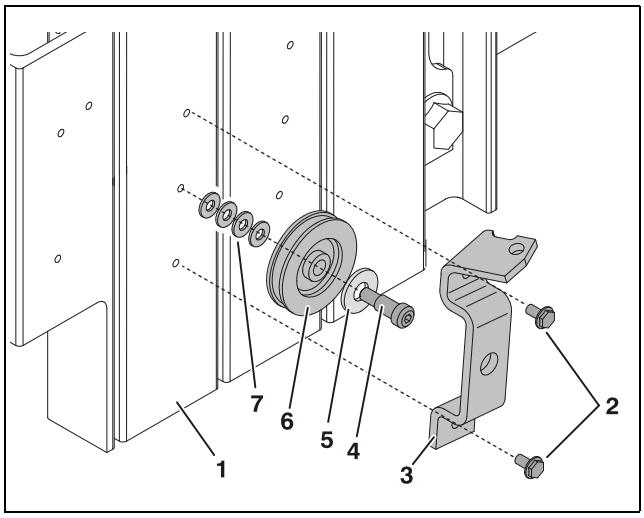
Note: *(a) Apply Loctite #242 to attach screws on final assembly.*

44. Attach the sequencing cables and hardware to the side of the mast assembly.



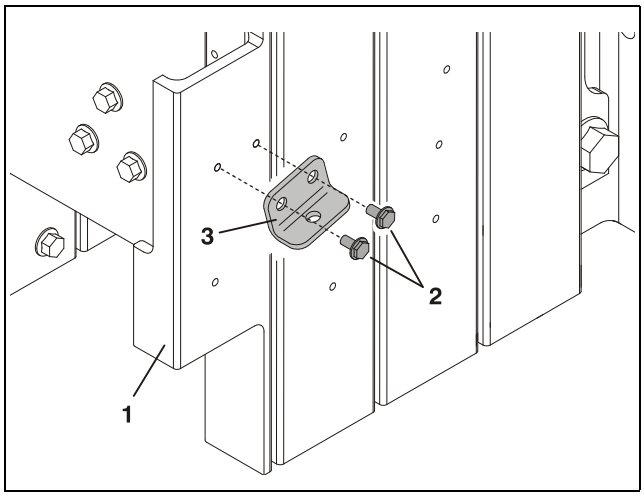
Side of Mast Section-2 - Lower Sequence Cable Bracket

1. Mast Section-2
2. Lower Bracket Attach Screws
3. Lower Bracket
4. Sheave Wheel Attach Bolt
5. Sheave Wheel Thrust Washer
6. Sequence Cable Sheave Wheel
7. Spacers (Qty. 4)



Side of Mast Section-3 - Lower Sequence Cable Bracket

1. Mast Section-3
2. Lower Bracket Attach Screws
3. Lower Bracket
4. Sheave Wheel Attach Bolt
5. Sheave Wheel Thrust Washer
6. Sequence Cable Sheave Wheel
7. Spacers (Qty. 4)



Side of Mast Section-4 - Lower Sequence Cable Bracket

1. Mast Section-4
2. Bracket Attach Screws
3. Lower Bracket

45. Install the platform junction box to ground control station wiring harness (See Figure 5-7.), including the platform junction box, powertrack assembly, harness cable sheave assembly, and harness spring tensioner to the side of the mast assembly. Also reference Section 4, Platform Junction Box Install/ Remove.

46. The mast assembly is now complete and ready to install onto the base frame.

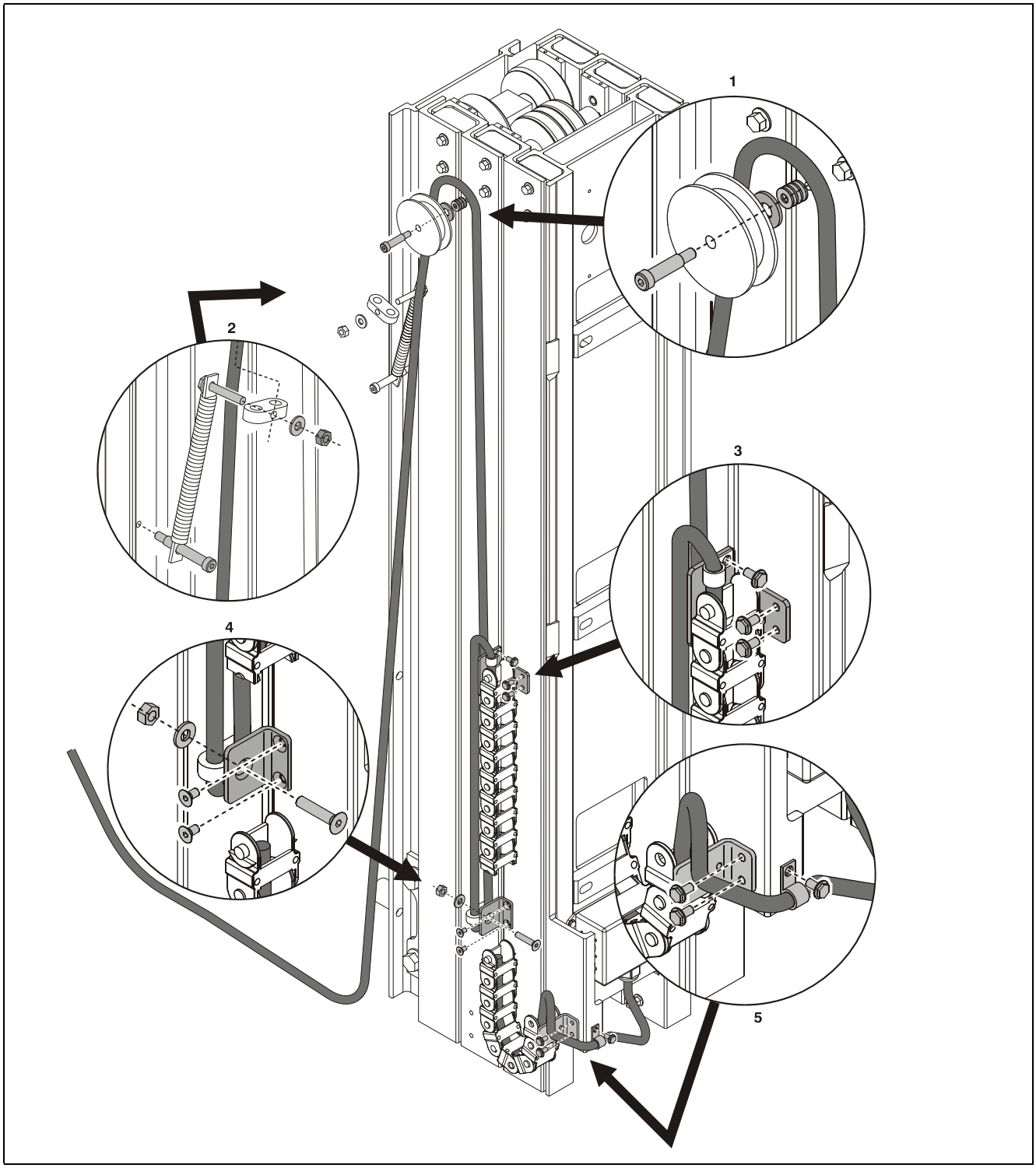


Figure 5-7. Platform Junction Box to Ground Control Station Wiring Harness.

1. Harness Sheave Wheel
2. Harness Spring Tensioner
3. Upper Powertrak Bracket
4. Mid Powertrak Bracket (Powertrak Shown Cutaway)
5. Lower Powertrak Bracket

5.10 MAST CHAINS AND SEQUENCING CABLES ADJUSTMENT

NOTE: *This procedure is to be performed with the mast mounted on the machine.*

Mast Chain/Cable Adjustment

(See Figure 5-8.)

The intention of this procedure is to assure equal load distribution between the individual chains of a mast section chain sets.

Adjust using the following procedure;

1. Remove the mast cover from the platform. See Section 5.2, Mast Cover - Install/Remove.
2. With mast completely lowered, step into the platform and bounce your weight up and down a few times to be certain platform is at the bottom of travel. Be certain the chain sets are seated in their sheaves properly at the top of each mast section.
3. Then with no load in the platform check the side profile of the top of the mast, the mast sections should all be even at the top and not stepped. *(See Figure 5-8.)*
4. If adjustment is required, adjust one mast section at a time starting from the front of the mast *(section-3)* and work towards the platform. *(only mast section-3 and 4 are adjustable)*
5. To adjust, elevate the platform until the chain anchor adjust and jam nuts are accessible at the front and bottom of each mast section.

⚠ WARNING

NEVER WORK UNDER AN ELEVATED PLATFORM UNTIL PLATFORM HAS BEEN SAFELY RESTRAINED FROM ANY MOVEMENT BY BLOCKING OR OVERHEAD SLING.

6. Start with the mast section which needs adjustment and loosen the bottom *(jam)* nut on each chain.
7. **Tighten** *(to raise mast section),* **or loosen** *(to lower mast section)* **the adjusting nut** against the anchor plate on each chain. Adjust the nut the amount required to raise or lower the top of the mast section to match the side profile shown in Figure 5-8. when the mast is retracted.

NOTE: *It is more important that the (threaded ends) studs are equal side to side on a mast section, than it is that the tension in the chains is equal. The chain equalizers will always assure equal tension, but if the adjustment isn't equal as described, the chains may tend to pull to one side or the other.*
The threaded end of the chain may need to be restrained while tightening the adjust nut to keep the chain from twisting.

8. Retract the mast all the way and check if the top of the mast sections appear as shown in Figure 5-8.
9. Repeat steps (1) through (7) for remaining mast sections.
10. Once mast section adjustment is completed, apply loctite #242 to the threads under the *(jam)* nuts that were loosened. Then re-tighten the loosened *(jam)* nuts until tight against the top *(adjust)* nut. Chain should have slight tension but should not be taut.
11. After all mast adjustments are complete, if necessary readjust the bumpers mounted on the base frame under the platform so the platform rests slightly above the base frame when it is lowered and empty.

Sequencing Cable Adjustment

1. Retract mast completely, and check each sequencing cable on outside of masts for excessive slack. Adjust only to remove slack from cable.
2. Tighten nylock-nut, at the sequence cable bracket located at the top of the mast, just enough to remove excessive slack from sequencing cable. The springs should not be compressed more than 25% after adjusting.

NOTE: *If slack cannot be adjusted out of the cable and adjust nut has completely compressed the spring, then either the mast side profile is not adjusted properly (even) or the the cable will have to be replaced due to stretching.*

After adjusting the mast chains and sequence cables, cycle mast up and down several times to verify adjustments are correct.

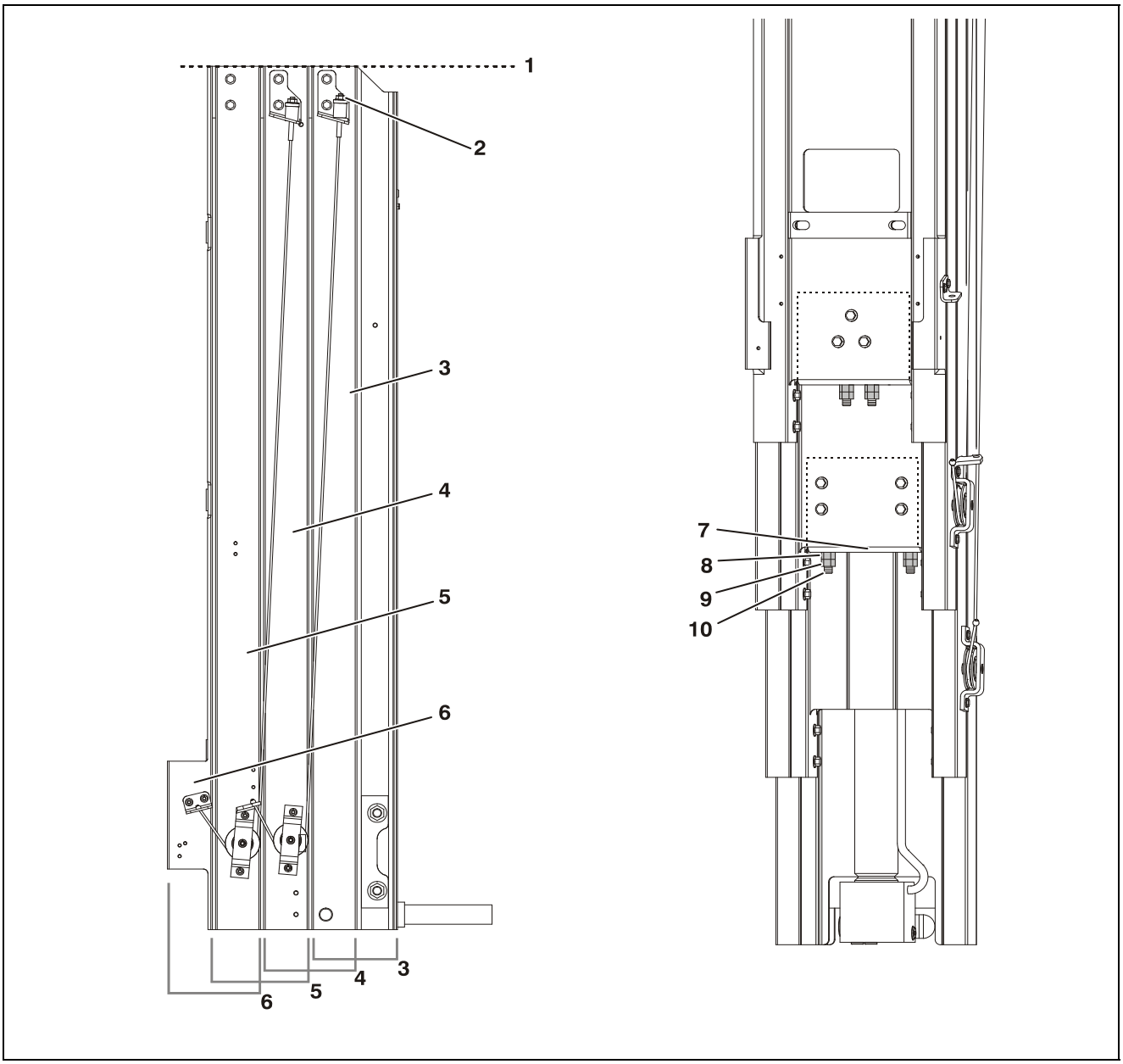


Figure 5-8. Mast Chain and Sequence Cable Adjustment Components.

1. Mast Side Profile - (Sections Even at Top)
2. Sequence Cable Adjust Nut
3. Mast Section - 1
4. Mast Section - 2
5. Mast Section - 3
6. Mast Section - 4
7. Chain Anchor Plate (Inside)
8. Chain Adjust Nut
9. Chain Lock (Jam) Nut
10. Threaded Chain End (Stud)

SECTION 6. TROUBLESHOOTING

6.1 GENERAL

This section contains troubleshooting information to be used for locating and correcting most operating problems. 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.

6.2 TROUBLESHOOTING INFORMATION

Troubleshooting procedures applicable to this machine are listed and defined starting with Section 6.5, TROUBLESHOOTING TABLES Index in this section of the manual.

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 the order listed in the troubleshooting tables.

It should be noted that there is no substitute for a thorough knowledge of the equipment and related systems.

It should be recognized that the majority of the problems arising in the machine will be centered in the hydraulic and electrical systems. For this reason, every effort has been made to ensure that all likely problems in these areas are given the fullest possible treatment. In the remaining machine groups, only those problems which are symptomatic of greater problems 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.

The first rule for troubleshooting any circuit that is hydraulically operated and electrically controlled is to determine if the circuit is lacking hydraulic oil and 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.

6.3 HYDRAULIC CIRCUIT CHECKS

(See Figure 6-4.)

The first reference for improper function of a hydraulic system, where the cause is not immediately apparent, should be the Hydraulic Diagram Circuit. The best place to begin the problem analysis is at the power source *(pump)*. Once it is determined that the pump is serviceable, then a systematic check of the circuit components, would follow.

NOTE: *For aid in troubleshooting, refer to Figure 6-4. for HYDRAULIC DIAGRAM circuit.*

6.4 ELECTRICAL CIRCUIT CHECKS

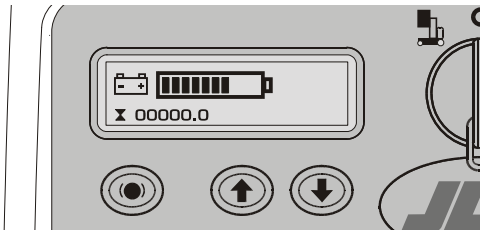
General

The drive system on the SSV Series machines requires a microprocessor controlled electrical circuit to operate smoothly and accurately. All platform control console functions are relayed to various machine components *(i.e. platform up/down, drive functions, etc.)* through the Ground Control Module microprocessor box *(mounted under the front hood)*. The Ground Control Module is pre-programmed with factory pre-set personality settings for each machine function.

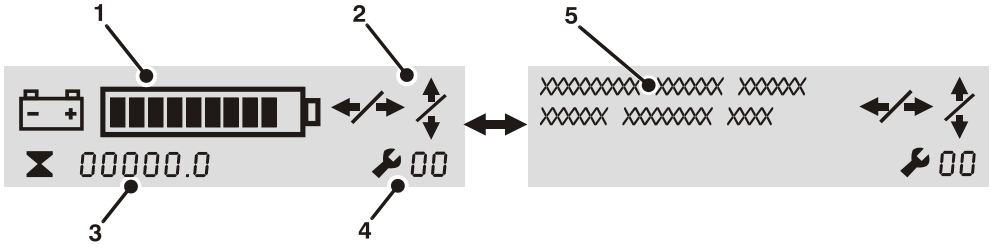
To help diagnose any problems with components plugged into the Ground Control Module, the module is designed with an internal fault code and text messaging system displayed on an LCD screen at the module. The platform control console also will display LED Flash Codes using the Battery Charge/LED strip on the console. When operating normally the LED panel on the platform control console indicates the battery voltage status using ten (10) LEDs *(red/yellow/green)*. If a malfunction to the machine's electrical components occurs, the platform console LED's will flash a number of LEDs to help indicate the problem to the Operator in the platform. The Fault Codes and LED Flash Codes are outlined in the following sub-sections of this chapter.

NOTE: *For aid in troubleshooting electrical problem, refer to Figure 6-3. for an ELECTRICAL DIAGRAM of the various circuits. Also for a pictorial overview of the connected components, See Figure 6-2. "Pictorial Overview of the Electrical System".*

Ground Control Module LCD Display



At power-up and during operation the LCD display on the Ground Control Module displays the current machine operating status. The following illustration explains the symbol indications.

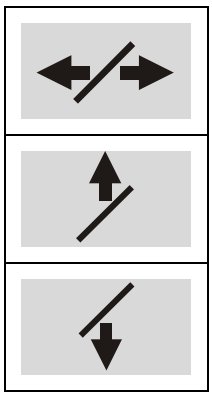


LCD Display Symbols

1. Battery Charge Indicator (BCI)
2. Function Display or Function Disable Indicators
3. Hour Meter Display
4. Fault Code Indicator
5. Fault Code Text Message Display (a)

Note: (a) When an Fault code is indicated the LCD screen will alternate between the text and symbol display modes.

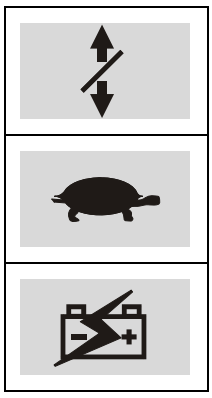
In the LCD Display Symbols illustration item (2) above, the Function Display or Function Disable Indicators will vary as shown following:



DRIVE Disabled

LIFT UP Disabled

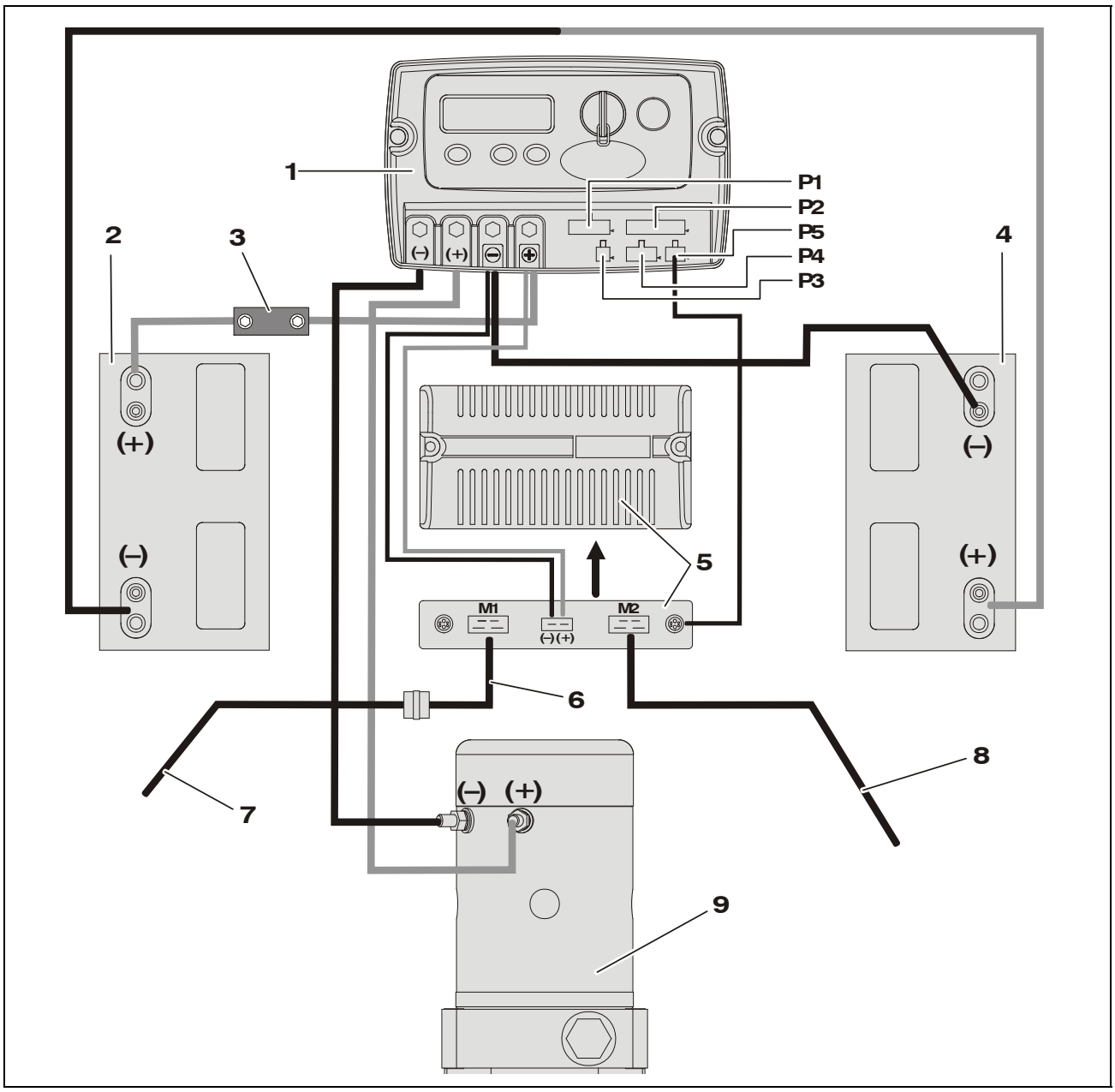
LIFT DOWN Disabled



Both LIFT UP and LIFT DOWN Disabled

Drive Speed Cut-Back (Turtle) Mode Engaged

Battery Charger Plugged In



1. Ground Control Module (a)
2. Left Side Battery (b) (c)
3. 175 Amp Fuse
4. Right Side Battery (b)
5. Traction Control Module (a)
6. Left Drive Motor Harness Reverser (a)
7. Power Cable To Left Drive Motor/Brake (a)
8. Power Cable To Right Drive Motor/Brake (a)
9. Hydraulic Pump/Motor/Tank Assembly (b)

Ground Control Module Plugs:
P1 - Horn, Alarm, Beacons, Lift Down Valve Harness (a)
P2 - Elevation/Speed, Charger Limit Switch Harness (a)
P3 - Programmable Security Lock Harness (Option) (a)
P4 - Platform Joystick Harness (a)
P5 - Joystick Protocol Harness to Traction Control Module (a)

Notes: (a) Apply di-electric grease JLG Part Number 3020038 to wiring harness terminals, to prevent moisture from entering module.
(b) Seal NEG (–) and POS (+) posts with battery grease to prevent corrosion.
(c) An quick-disconnect is installed on the left battery (+) POSITIVE cable for easier power disconnect when servicing machine.

(See Figure 6-3.) - This section Troubleshooting for complete machine wiring schematic.

Figure 6-1. Component Electrical Connections.

Table 6-1. LCD Display - Service Fault Code Conditions

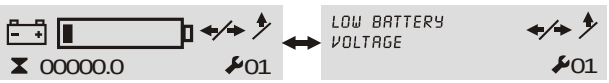
FAULT CODE	PLATFORM CONSOLE LEDs FLASHING	LCD SYMBOL SCREEN	LCD TEXT SCREEN	FAULT DESCRIPTION/ MACHINE CONDITION	TROUBLESHOOTING
—	—		—	Machine In Drive Speed Cut-Back (Turtle) Mode All The Time	See Table 6-5, Page 6-11
—	—			Brakes Released DRIVE Disabled	Engage Brakes - Press Brake Release Button on Ground Control Station
—	—		—	Charger AC Plugged In DRIVE Disabled	Unplug Charger AC Input Power Cord from Machine
—	—			Programmable Security Lock Password	Type in Code At PSL Key Pad See Operators Manual for Proper Operation
01	1			Low Battery Voltage	See Table 6-6, Page 6-12
02	2	RESERVED		RESERVED	
03	2	RESERVED		RESERVED	
04	3			Tilt Condition (Platform Elevated) DRIVE and Lift UP Disabled	See Table 6-7, Page 6-13
05	—	RESERVED		RESERVED	
06	—	RESERVED		RESERVED	
07	6			Left Drive Motor Disconnected DRIVE Disabled	See Table 6-8, Page 6-13
08	6			Right Drive Motor Disconnected DRIVE Disabled	SeeTable 6-9, Page 6-14
09	6			Left Brake Disconnected DRIVE, Lift UP/DOWN Disabled	See Table 6-10, Page 6-14

Table 6-1. LCD Display - Service Fault Code Conditions

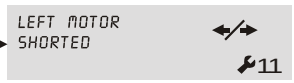
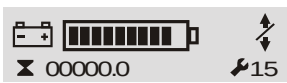
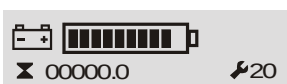
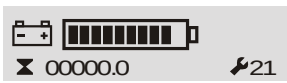
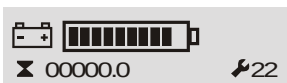
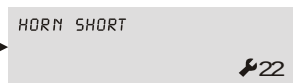
FAULT CODE	PLATFORM CONSOLE LEDs FLASHING	LCD SYMBOL SCREEN	LCD TEXT SCREEN	FAULT DESCRIPTION/ MACHINE CONDITION	FOR TROUBLESHOOTING REFER TO
10	6			Right Brake Disconnected DRIVE, Lift UP/DOWN Disabled	SeeTable 6-11, Page 6-14
11	6			Left Drive Motor Short Circuit DRIVE Disabled	See Table 6-12, Page 6-15
12	6			Right Drive Motor Short Circuit DRIVE Disabled	See Table 6-13, Page 6-15
13	6			Traction Module In Fold Back DRIVE Disabled	See Table 6-14, Page 6-15
14	7			Pump Motor Disconnected Lift UP Disabled	See Table 6-15, Page 6-16
15	7			Lift Down Valve Disconnected Lift UP/DOWN Disabled	See Table 6-16, Page 6-16
16	7			Down Valve or Down Valve Circuit Short Lift UP/DOWN Disabled	See Table 6-17, Page 6-17
17	7			Ground Control Module In Fold Back (Machine Stopped)	See Table 6-18, Page 6-17
18	—			Alarm or Alarm Circuit Short	See Table 6-19, Page 6-18
19	—			Alarm Disconnected	See Table 6-20, Page 6-18
20	—			Beacon or Beacon Circuit Short	See Table 6-21, Page 6-18
21	—			Beacon Disconnected	See Table 6-22, Page 6-19
22	—			Horn or Horn Circuit Short	See Table 6-23, Page 6-19

Table 6-1. LCD Display - Service Fault Code Conditions

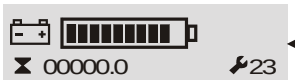
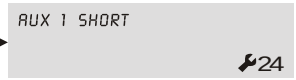
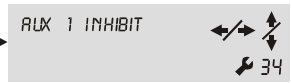
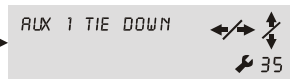
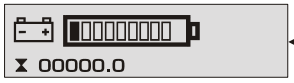
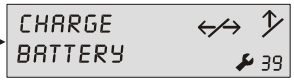
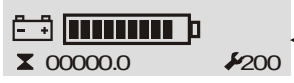
FAULT CODE	PLATFORM CONSOLE LEDs FLASHING	LCD SYMBOL SCREEN	LCD TEXT SCREEN	FAULT DESCRIPTION/ MACHINE CONDITION	FOR TROUBLESHOOTING REFER TO
23	—			Horn Disconnected	See Table 6-24, Page 6-20
24	—			Auxiliary #1 Circuit Short	See Table 6-25, Page 6-20
25	—			Auxiliary #1 Circuit Disconnected	SeeTable 6-26, Page 6-21
26	—			Auxiliary #2 Circuit Short	See Table 6-27, Page 6-21
27	—			Auxiliary #2 Circuit Disconnected	See Table 6-28, Page 6-22
28	—	RESERVED		RESERVED	
29	—	RESERVED		RESERVED	
30	6			Traction Module No Communication with Ground Control Module	See Table 6-29, Page 6-23
31	—			Platform Control Console No Communication with Ground Control Module	See Table 6-30, Page 6-24
32	7			Pump Motor Over Current LIFT UP Disabled	See Table 6-31, Page 6-24
33	—	RESERVED		RESERVED	
34	—			Auxiliary #1 - Inhibit LIFT UP/DOWN and DRIVE are Disabled	See Table 6-32, Page 6-25
35	—			Auxiliary #1 - Tie Down LIFT UP/DOWN and DRIVE are Disabled	See Table 6-33, Page 6-25
36	—	RESERVED		RESERVED	

Table 6-1. LCD Display - Service Fault Code Conditions

FAULT CODE	PLATFORM CONSOLE LEDs FLASHING	LCD SYMBOL SCREEN	LCD TEXT SCREEN	FAULT DESCRIPTION/ MACHINE CONDITION	FOR TROUBLESHOOTING REFER TO
37	—	RESERVED		RESERVED	
38	2			2 LEDs/BARS Flashing with an audible beep. Platform Lift-UP Function is Locked Out.	See Page 6-26
39	1			1 LED/BAR Flashing with an audible beep. Drive and Platform Lift-UP Functions Locked Out.	See Page 6-26
40	—	RESERVED		RESERVED	
41	—	RESERVED		RESERVED	
42	—	RESERVED		RESERVED	
43	—	RESERVED		RESERVED	
44	—	RESERVED		RESERVED	
45	—	RESERVED		RESERVED	
46	—	RESERVED		RESERVED	
100	10			Ground Control Module Fault Condition	See Table 6-34, Page 6-26
200	10			Platform Control Console Fault Condition	See Table 6-35, Page 6-27
300	10			Traction Control Module Fault Condition	See Table 6-36, Page 6-28
400	—	RESERVED		RESERVED	
401	—	RESERVED		RESERVED	

6.5 TROUBLESHOOTING TABLES INDEX

SPECIFICATIONS FOR VARIOUS COMPONENTS — PAGE

SPECIAL PIN EXTRACTOR TOOLS FOR ELECTRICAL CONNECTORS

FAULT CODE TROUBLESHOOTING TABLES

MAIN POWER CIRCUIT TROUBLESHOOTING

MAST TROUBLESHOOTING

HYDRAULIC LEAK TROUBLESHOOTING

BASE FRAME COMPONENTS TROUBLESHOOTING

DRIVE SYSTEM TROUBLESHOOTING

6.6 SPECIFICATIONS FOR VARIOUS COMPONENTS

The following table contains specifications for machine components.

Table 6-2. Ohm Ratings for Various Components

COMPONENT	NOMINAL RESISTANCE @ TEMPERATURE	RESISTANCE RANGE POSSIBLE
Pump Motor	0.2ohm - 0.4ohm @ 77deg F	0.12ohm - 0.49ohm
Brake Coil	44.7ohm - 52ohm @ 68deg F	31.4ohm - 65.3ohm
Drive Motor (Bodine)	.1 to .3ohm (Can change depending on the rotation of the armature and temperature.)	N/A

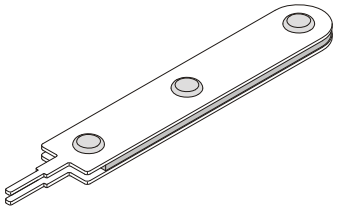
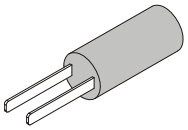
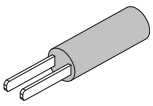
Table 6-3. Amperage Draw for Various Components

COMPONENT	AMPERAGE		
Ground Control Module	95 Amps @ room temperature with rated load		
Traction Control Module	LEVEL SURFACE (24V) (RATED LOAD)	15% GRADE (24V) (RATED LOAD)	NO LOAD (24V)
	7 to 11 Amps (per motor)	55 to 60 Amps (per motor)	3.5 to 4.8 Amps 78 to 86 RPM

6.7 SPECIAL PIN EXTRACTOR TOOLS FOR ELECTRICAL CONNECTORS

The following table contains pin extractor tools for machine electrical connector components.

Table 6-4. Special Pin Extractor Tools for Electrical Connectors

COMPONENT	DESCRIPTION	JLG PART NUMBER	ILLUSTRATION
Ground Control Station	For removal of electrical connector pins from the Ground Control Station connectors.	7016618	
Drive Motor	For removal of electrical connector pins from the Drive Motor main power connectors.	7002841	
Drive Motor Brake	For removal of electrical connector pins from the Drive Motor Brake power connectors.	7002842	

6.8 FAULT CODE TROUBLESHOOTING TABLES

Machine in Drive Speed Cut-Back (Turtle) Mode All The Time

Overview of Procedure

Under normal machine operation once the platform is elevated the machine's maximum drive speed is reduced to 1/4 the normal drive speed of when the platform is fully lowered. This is detected with a drive speed cut-back *(proximity)* switch mounted at the base of the mast assembly and a target mounted on the mast assembly. When the mast is elevated and the target raised the proximity switch then cuts back the machine drive speed. When machine is in the drive speed cut-back mode a turtle is displayed on the Ground Control Module LCD display.

Check For These Obvious Conditions First:

- Mast drive speed cut-back (proximity) switch and target plate secure and undamaged.

Table 6-5. Machine In Drive Speed Cut-Back (Turtle) Mode All The Time

STEP	ACTION	SPEC	YES	NO
1.	With the machine powered on and the platform fully lowered, check for continuity on the wires of the Cutback Proximity Switches. At the Ground Control Module, P2 connector, check continuity between pins-8 and 18 (switch 1) and pins-9 and 19 (switch 2).	—	Replace Ground Control Module	Repair or Replace Speed Cutback (Proximity) Switch

Code 01 - Low Battery Voltage

Check For These Obvious Conditions First:

- Battery cable ends loose or corroded at battery posts.
- Charger DC output wires from charger to batteries damaged or disconnected.

Table 6-6. Code 01 - Low Battery Voltage

STEP	ACTION	SPEC	YES	NO
1.	Does battery charger power up through diagnostic cycle when plugged in to an AC outlet?	—	Go To Step 2	See Battery/Battery Charger Servicing - Section 3 of this Manual
2.	Is the Abnormal (RED) LED lit when charger is in charge mode?	—	Go to Step 3	Charge Batteries Until 100% (Green) LED is lit. Go to Step 4
3.	Test Batteries. See Battery Condition in Section 3 of this Service Manual.	—	See Battery/Battery Charger Servicing - Section 3 of this Manual	Replace Battery
4.	Check Battery Condition. See Battery Condition in Section 3 of this Service Manual. Do the batteries pass condition tests?	—	—	Replace Batteries as Necessary

Code 02 - RESERVED

Code 03 - RESERVED

Code 04 - Tilt Condition

Check For These Obvious Conditions First:

- If machine is on a tilt of more than 1.5° in either or both the X or Y direction, this is normal operation. (DRIVE and LIFT UP are disabled when tilt is detected)
- Check if Ground Control Module is mounted securely to the mast support column.

Table 6-7. Code 04 - Tilt Condition

STEP	ACTION	SPEC	YES	NO
1.	Using a digital level check the actual level of the machines' resting surface in both the X and the Y directions. Does surface check within machine specification.	1.5° X and Y Direction	Go to Step 2	Drive Machine to Level Surface
2.	At the Ground Control Module, enter the programming mode (See Ground Control Programming, Section-3 of Service Manual) and check the tilt sensor X and Y readings. Are readings within machine specification?	1.5° X and Y Direction	Replace Ground Control Module	Go to Step 3
3.	Zero Tilt Sensor on a surface checked to within 0.0 degrees with a digital level in both the X and Y directions. (See Ground Control Programming, Section-3 of Service Manual).	—	—	—
NOTE: *If frequent calibration of the internal Tilt Sensor is required, replace the Ground Control Module.*				

Code 05 - RESERVED

Code 06 - RESERVED

Code 07- Left Drive Motor - Disconnected

Check For These Obvious Conditions First:

- Check left drive motor M1 connector at the Traction Control Module for secure and proper connection.

Table 6-8. Code 07 - Left Drive Motor - Disconnected

STEP	ACTION	SPEC	YES	NO
1.	Check resistance across positive (+) and negative (–) drive motor leads in M1 connector wiring harness going to the left drive motor. Is reading within spec?	.1 to .3 ohms	Replace Traction Module	Go to Step 2
2.	Repair or replace left drive motor wiring, brushes or motor. (For brush replacement, see Section 3 of this Service Manual)	—	—	—

Code 08 - Right Drive Motor - Disconnected

Check For These Obvious Conditions First:

- Check right drive motor M2 connector at the Traction Control Module for secure and proper connection.

Table 6-9. Code 08 - Right Drive Motor Disconnected

STEP	ACTION	SPEC	YES	NO
1.	Check resistance across positive (+) and negative (–) leads in M2 connector wiring harness going to the right drive motor. Is reading within spec?	.1 to .3 ohms	Replace Traction Module	Go to Step 2
2.	Repair or replace right drive motor wiring, brushes or motor. (For brush replacement, see Section 3 of this Service Manual)	—	—	—

Code 09 - Left Brake - Disconnected

Check For These Obvious Conditions First:

- Check left drive motor M1 connector at the Traction Control Module for secure and proper connection.

Table 6-10. Code 09 - Left Brake - Disconnected

STEP	ACTION	SPEC	YES	NO
1.	Check resistance across positive (+) and negative (–) leads in M1 connector wiring harness going to the left drive motor brake assembly. Is reading within spec?	See Table 6-2	Replace Traction Module	Go to Step 2
2.	Repair or replace left brake wiring or left brake assembly.	—	—	—

Code 10 - Right Brake - Disconnected

Check For These Obvious Conditions First:

- Check right drive motor M2 connector at the Traction Control Module for secure and proper connection.

Table 6-11. Code 10 - Right Brake - Disconnected

STEP	ACTION	SPEC	YES	NO
1.	Check resistance across positive (+) and negative (–) leads in M2 connector wiring harness going to the right drive motor brake assembly. Is reading within spec?	See Table 6-2	Replace Traction Module	Go to Step 2
2.	Repair or replace right brake wiring or right brake assembly.	—	—	—

Code 11 - Left Drive Motor - Short Circuit

Check For These Obvious Conditions First:

- Wiring harness from (M1) connector on Traction Control Module to Left Drive Motor for damage.

Table 6-12. Code 11 - Left Drive Motor - Short Circuit

STEP	ACTION	SPEC	YES	NO
1.	Remove the M1 connector from the Traction Control Module and check both the pins to the drive motor for any voltage. (Ground the meter to the Ground Control Module - Negative (–) lug.)	No Voltage	This circuit should be isolated. Repair or Replace Components as Required	Go to Step 2
2.	Check for continuity of both the pins to ground.	No Ground		Replace Traction Control Module

Code 12 - Right Drive Motor - Short Circuit

Check For These Obvious Conditions First:

- Wiring harness from (M2) connector on Traction Control Module to Left Drive Motor for damage.

Table 6-13. Code 12 - Right Drive Motor - Short Circuit

STEP	ACTION	SPEC	YES	NO
1.	Remove the M2 connector from the Traction Control Module and check both the pins to the drive motor for any voltage. (Ground the meter to the Ground Control Module - Negative (–) lug.)	No Voltage	This circuit should be isolated. Repair or Replace Components as Required	Go to Step 2
2.	Check for continuity of both the pins to the drive motor to ground.	No Ground		Replace Traction Control Module

Code 13 - Traction Module - In Fold Back

Check For These Obvious Conditions First:

- Machine is operating on a continuous grade or rough terrain.

Table 6-14. Code 13 - Traction Module - In Fold Back

STEP	ACTION	SPEC	YES	NO
1.	Allow machine to cool the traction module for 30 minutes. Does the machine operate OK after cooling.	—	—	Replace Traction Module
NOTE: *If this is a recurring problem compare current draw of your machine with Traction Control Module specifications in Table 6-3 - Amperage Draw for Various Components.*				

Code 14 - Pump Motor - Disconnected

Check For These Obvious Conditions First:

- Check the Positive (+)/Negative (–) cables from the Ground Control Module to the Pump Motor studs for loose or corroded connections.

Table 6-15. Code 14 - Pump Motor - Disconnected

STEP	ACTION	SPEC	YES	NO
1.	Check resistance across the positive (+) and negative (–) studs on the pump motor.	SeeTable 6-2	Replace Ground Control Module	Repair or Replace Pump Motor or Motor Brushes

Code 15 - Lift Down Valve - Disconnected

Check For These Obvious Conditions First:

- Inspect wire terminals on the lift down valve at the base of the lift cylinder for tight and secure connection.

Table 6-16. Code 15 - Lift Down Valve - Disconnected

STEP	ACTION	SPEC	YES	NO
1.	Check voltage at the P1 connector on the Ground Control Module between pin-10 and pin-3. Is reading within spec?	2 - 4 V DC	Replace Ground Control Module	Go to Step 2
2.	Check resistance between the terminals on the lift down valve, located at the base of the lift cylinder. Is reading within spec?	6 Ohms	Repair or Replace Wiring Harness from Ground Control Module	Replace the Lift Down Valve Solenoid
3.	With the terminals still removed from the lift down valve coil, check continuity of the wires from pins 10 and 3 on the P1 connector to the lift down valve.	.00 Ohms	—	Repair or Replace Wiring

Code 16 - Lift Down Valve - Short Circuit

Check For These Obvious Conditions First:

- Damaged wiring in the lift down valve wiring harness or a damaged lift down valve coil.

Table 6-17. Code 16 - Lift Down Valve - Short Circuit

STEP	ACTION	SPEC	YES	NO
1.	At the Ground Control Module, P1 connector, check the voltage across pins 10 and 3 to the lift down valve coil. Is reading within specification?	0 - 2V DC	Go to Step 2	Replace Ground Control Module
2.	Remove the wire terminals at the lift down valve coil. Check resistance reading of the coil. Is coil within specification?	6 Ohms	Go to Step 3	Replace Coil
3.	With the terminals still removed from the lift down valve coil, check continuity of the wires from pins 10 and 3 on the P1 connector to the lift down valve.	.00 Ohms	—	Repair or Replace Wiring

Code 17 - Ground Control Module - In Fold Back

Check For These Obvious Conditions First:

- Has machine been operating on a continuous grade or rough terrain for a long period of time.

Table 6-18. Code 17 - Ground Control Module - In Fold Back

STEP	ACTION	SPEC	YES	NO
1.	Allow Ground Control Module to cool for 30 minutes. Does the machine operate OK after cooling.	—	—	Replace Ground Control Module
NOTE: *If this is a recurring problem compare current draw of your machine with Ground Control Module specifications in Table 6-3 - Amperage Draw for Various Components.*				

Code 18 - Alarm - Short Circuit

Check For These Obvious Conditions First:

- Damaged wiring in the alarm wiring harness or a damaged alarm.

Table 6-19. Code 18 - Alarm - Short Circuit

STEP	ACTION	SPEC	YES	NO
1.	At the Ground Control Module, P1 connector, check the voltage across pins-13 and 6 to the alarm. Is reading within specification?	0 - 2V DC	Go to Step 2	Replace Ground Control Module
2.	Remove the wire terminals at the alarm, check continuity of each of the wires from pins 13 and 6 on the P1 connector to the alarm end.	—	Replace the Alarm	Repair or Replace Wiring

Code 19 - Alarm - Disconnected

Check For These Obvious Conditions First:

- Damaged wiring in the alarm wiring harness or a damaged alarm.
- Activate a function to check if alarm beeps.

Table 6-20. Code 19 - Alarm - Disconnected

STEP	ACTION	SPEC	YES	NO
1.	Check voltage at the P1 connector on the Ground Control Module between pin-13 and pin-6. Is reading within specification?	2 - 4V DC	Replace Ground Control Module	Go to Step 2
2.	Remove the wire terminals at the alarm, check continuity of each of the wires from pins 13 and 6 on the P1 connector to the alarm end.	—	Replace the Alarm	Repair or Replace Wiring

Code 20 - Beacon - Short Circuit

Check For These Obvious Conditions First:

- Damaged wiring in the beacon wiring harness or a damaged beacon unit.

Table 6-21. Code 20 - Beacon - Short Circuit

STEP	ACTION	SPEC	YES	NO
1.	At the Ground Control Module, P1 connector, check the voltage across pins-12 and 5 to the beacon. Is reading within specification?	0 - 2V DC	Go to Step 2	Replace Ground Control Module
2.	Remove the wire terminals at the beacon, check continuity of each of the wires from pins 12 and 5 on the P1 connector to the beacon end.	—	Replace the Beacon	Repair or Replace Wiring

Code 21 - Beacon - Disconnected

Check For These Obvious Conditions First:

- Is machine equipped with flashing amber beacon light.

Table 6-22. Code 21 - Beacon - Short Disconnected

STEP	ACTION	SPEC	YES	NO
1.	Is machine equipped with a flashing amber beacon light.	—	Go to Step 3	Got to Step 2
2.	At the Ground Control Module enter the programming mode, check if the Beacon light open circuit detection is enabled.	—	Disable It	Replace Ground Control Module
3.	Check voltage at the P1 connector on the Ground Control Module between pin-12 and pin-5. Is reading within specification?	2 - 4 V DC	Replace Ground Control Module	Go to Step 4
4.	Remove the wire terminals at the beacon, check continuity of each of the wires from pins-12 and 5 on the P1 connector to the beacon end.	—	Replace the Beacon	Repair or Replace Wiring

Code 22 - Horn - Short Circuit

Check For These Obvious Conditions First:

- Damaged wiring in the horn wiring harness or a damaged horn unit.

Table 6-23. Code 22 - Horn - Short Circuit

STEP	ACTION	SPEC	YES	NO
1.	At the Ground Control Module, P1 connector, check the voltage across pins-14 and 7 to the horn. Is reading within specification?	0 - 2V DC	Go to Step 2	Replace Ground Control Module
2.	Remove the wire terminals at the horn, check continuity of each of the wires from pins-14 and 7 on the P1 connector to the horn end.	—	Replace the Horn	Repair or Replace Wiring

Code 23 - Horn - Disconnected

Check For These Obvious Conditions First:

- Is machine equipped with a horn unit.

Table 6-24. Code 23 - Horn - Disconnected

STEP	ACTION	SPEC	YES	NO
1.	Is machine equipped with a horn unit.	—	Go to Step 3	Got to Step 2
2.	At the Ground Control Module enter the programming mode, check if the horn open circuit detection is enabled.	—	Disable It	Replace Ground Control Module
3.	Check voltage at the P1 connector on the Ground Control Module between pin-14 and pin-7. Is reading within specification?	2 - 4 V DC	Replace Ground Control Module	Go to Step 4
4.	Remove the wire terminals at the horn, check continuity of each of the wires from pins-14 and 7 on the P1 connector to the horn end.	—	Replace the Horn	Repair or Replace Wiring

Code 24 - Auxiliary #1 Circuit - Short Circuit

Check For These Obvious Conditions First:

- Damaged wiring in the Auxiliary #1 Component wiring harness or a damaged Component.

Table 6-25. Code 24 - Auxiliary #1 Circuit - Short Circuit

STEP	ACTION	SPEC	YES	NO
1.	At the Ground Control Module, P1 connector, check the voltage across pins-9 and 2 to the Aux. #1 component. Is reading within specification?	0 - 2V DC	Go to Step 2	Replace Ground Control Module
2.	Remove the wire terminals at the Aux. #1 component, check continuity of each of the wires from pins-9 and 2 on the P1 connector to the Aux. #2 component end.	—	Replace the Component	Repair or Replace Wiring

Code 25 - Auxiliary #1 Circuit - Disconnected

Check For These Obvious Conditions First:

- Is machine equipped with a component on the Auxiliary #1 circuit.

Table 6-26. Code 25 - Auxiliary #1 Circuit - Disconnected

STEP	ACTION	SPEC	YES	NO
1.	Is machine equipped with a component on the Auxiliary #1 circuit.	—	Go to Step 3	Got to Step 2
2.	At the Ground Control Module enter the programming mode, check if the Auxiliary #1 open circuit detection is enabled.	Default = NO	Disable It	Replace Ground Control Module
3.	Check voltage at the P1 connector on the Ground Control Module between pin-9 and pin-2. Is reading within specification?	2 - 4 V DC	Replace Ground Control Module	Go to Step 4
4.	Remove the wire terminals at the Aux. #1 component, check continuity of each of the wires from pins-9 and 2 on the P1 connector to the Aux. #1 component.	—	Replace the Component	Repair or Replace Wiring

Code 26 - Auxiliary #2 - Short Circuit

Check For These Obvious Conditions First:

- Damaged wiring in the Auxiliary #2 Component wiring harness or a damaged Component.

Table 6-27. Code 26 - Auxiliary #2 - Short Circuit

STEP	ACTION	SPEC	YES	NO
1.	At the Ground Control Module, P1 connector, check the voltage across pins-8 and 1 to the Aux. #2 component. Is reading within specification?	0 - 2V DC	Go to Step 2	Replace Ground Control Module
2.	Remove the wire terminals at the Aux. #2 component, check continuity of each of the wires from pins-8 and 1 on the P1 connector to the Aux. #2 component end.	—	Replace the Component	Repair or Replace Wiring

Code 27 - Auxiliary #2 - Disconnected

Check For These Obvious Conditions First:

- Is machine equipped with a component on the Auxiliary #2 circuit.

Table 6-28. Code 27 - Auxiliary #2 - Disconnected

STEP	ACTION	SPEC	YES	NO
1.	Is machine equipped with a component on the Auxiliary #2 circuit.	—	Go to Step 3	Got to Step 2
2.	At the Ground Control Module enter the programming mode, check if the Auxiliary #2 open circuit detection is enabled.	Default = NO	Disable It	Replace Ground Control Module
3.	Check voltage at the P1 connector on the Ground Control Module between pin-8 and pin-1. Is reading within specification?	2 - 4 V DC	Replace Ground Control Module	Go to Step 4
4.	Remove the wire terminals at the Aux. #2 component, check continuity of each of the wires from pins-8 and 1 on the P1 connector to the Aux. #2 component.	—	Replace the Component	Repair or Replace Wiring

Code 28 - RESERVED

Code 29 - RESERVED

Code 30 - Traction Module - No Communication with Ground Control Module

Check For These Obvious Conditions First:

- Check if the communications cable connections, P5 connector on the Ground Control Module and round plug on the Traction Control Module are seated properly in their sockets at each end.
- Check the Positive (+) (RED) and Negative (–) (BLACK) power cable connections from the Ground Control Module to the Traction Control Module are tight and secure at both ends.

Table 6-29. Code 30 - Traction Module - No Communication with Ground Control Module

STEP	ACTION	SPEC	YES	NO
1.	Check the voltage reading at the main power Positive (+)/Negative (–) cable connection on the Traction Control Module.	24v DC	Go to Step 2	Repair or Replace Positive (+) or Negative (–) Cable
2.	Remove the communications cable, P5 connector at the Ground Control Module and round connector at the Traction Control Module. Check continuity of all three (3) wires in the communications cable from end to end. P5 - Pins 2, 3, and 4.	—	Go to Step 3	Repair or Replace Wire(s)
3.	With communications cable disconnected at both ends, check for continuity between Pins 2, 3, and 4 of the P5 connector end.	—	Repair or Replace Wires	Go to Step 4
4.	Plug the communications cable on the Traction Control Module to the round socket on the opposite end of the module. Does this fix problem?	—	Done	Replace Traction Control Module
5.	Unplug the P5 connector at the Ground Control Module. Check voltage between pins 2 (– lead-in) and 5 (+ lead-in). Is voltage within spec.	4.5v DC	Done	Replace Ground Control Module

Code 31 - Platform Control Console - No Communication with Ground Control Module

Check For These Obvious Conditions First:

- Check the harness connection at the P4 connector on the Ground Control Module and the harness connection at the other end on the Platform Junction Box.

Table 6-30. Code 31 - Platform Control Console - No Communication with Ground Control Module

STEP	ACTION	SPEC	YES	NO
1.	Check if LEDs are illuminated on the Platform Control Console.	—	Go To Step 2	Go to Step 3
2.	Remove the 9 pin Platform Control Console connector from the side of the Platform Junction Box and the P4 connector at the Ground Control Module. Check continuity from the P4 connector, pin-5 to Junction Box pin-3 and P4, pin-9 to Junction Box pin-4.	—	Repair or Replace Platform Control Console	Repair or Replace Wiring
3.	Remove the 9 pin Platform Control Console connector from the side of the Platform Junction Box. Check the voltage across pins-1 and 5 in the Junction Box connector.	24V DC	Repair or Replace Platform Control Console	Go to Step 4
4.	Check voltage across pins-10 and 2 on connector P4 at the Ground Control Module.	24V DC	Go to Step 5	Replace Ground Control Module
5.	Check continuity of P4 connector, pin-10 to Platform Junction Box pin-1. Also P4 connector, pin-2 to Platform Junction Box, pin-5.	—	Repair or Replace Wires	

Code 32 - Pump Motor - Over Current

Check For These Obvious Conditions First:

- Platform overload condition.
- Obstruction in mast system.
- Pump Positive (+) and Negative (–) connections are secure and undamaged.
- Crushed or kinked hydraulic lines.
- Hydraulic leaks.

Table 6-31. Code 32 - Pump Motor - Over Current

STEP	ACTION	SPEC	YES	NO
1.	Check current draw of pump motor by elevating the platform to full height and load pump by continuing to press the UP button. Is reading within spec?	Less than 145 Amps	Go to Step 2	Go to Step 3
2.	Did unit give a 32 Fault Code while performing Step 1?	—	Replace Ground Control Module	—
3.	Is the pump hydraulic pressure setting within specification as show in Section 1.6 of this Service Manual?	See Section 1.6	Go to Step 4	Adjust to Specification
4.	Check pump motor brushes and rotor commutator for abnormal wear.	—	Replace as Required	Replace Pump Motor

Code 33 - RESERVED

Code 34 - Auxiliary #2 - Inhibit

Check For These Obvious Conditions First:

- Open Platform Gate.
- No Pressure on the Platform Footswitch.

Table 6-32. Code 34 - Auxiliary #2 - Inhibit

STEP	ACTION	SPEC	YES	NO
1.	At the Ground Control Module, P1 connector, check the voltage across pins-8 and 1 to the Aux. #2 component. Is reading within specification?	0 - 2V DC	Go to Step 2	Replace Ground Control Module
2.	Remove the wire terminals at the Aux. #2 component, check continuity of each of the wires from pins-8 and 1 on the P1 connector to the Aux. #2 component end.	—	Replace the Component	Repair or Replace Wiring

Code 35 - Auxiliary #2 - Tie Down

Check For These Obvious Conditions First:

- Pressure on the Platform Footswitch during machine power up.

Table 6-33. Code 35 - Auxiliary #2 - Tie Down

STEP	ACTION	SPEC	YES	NO
1.	At the Ground Control Module, P1 connector, check the voltage across pins-8 and 1 to the Aux. #2 component. Is reading within specification?	0 - 2V DC	Go to Step 2	Replace Ground Control Module
2.	Remove the wire terminals at the Aux. #2 component, check continuity of each of the wires from pins-8 and 1 on the P1 connector to the Aux. #2 component end.	—	Replace the Component	Repair or Replace Wiring

Code 36 - RESERVED

Code 37 - RESERVED

Code 38 - Battery Voltage Low - Warning Level 2 - Two (2) LED/LCDs lit

To maximize battery life, it is recommended that the factory supplied batteries be charged continuously for a minimum of 4 hours or until 8 bars are lit on the ground station LCD Display before operating the machine. When drained to Warning Level 2, batteries must be charged until 8 bars are lit on the ground station LCD display to clear the fault code. Failure to do so, will result in a fault code 39.

Code 39 - Battery Voltage Low - Warning Level 3 - One (1) LED/LCDs lit

To maximize battery life, it is recommended that the factory supplied batteries be charged continuously for a minimum of 4 hours or until 8 bars are lit on the ground station LCD Display before operating the machine. When drained to Warning Level 1, batteries must be charged until 8 bars are lit on the ground station LCD display to clear the fault code.

Code 40 - RESERVED

Codes 41 thru 46 - RESERVED

Codes (100 - 199) Ground Control Module - Fault Condition

Check For These Obvious Conditions First:

- That all battery and harness connectors secure and undamaged on Ground Control Module.
- Batteries have sufficient charge.
- Confirm that the static ground strap attached under base frame is secure and undamaged.

Table 6-34. Codes (100 - 199) Ground Control Module - Fault Condition

STEP	ACTION	SPEC	YES	NO
1.	Recycle machine power 5 times allowing a 10 second interval between each power recycle. Does fault clear?	—	Done	Go to Step 2
2.	Which code number is displaying?	Code 103	Go to Step 3	Replace Ground Control Module
		Code 119	Go to Step 5	
3.	Confirm that both installed batteries are 12 Volt DC.	12V DC	Go to Step 4	Replace with proper Batteries
4.	Check battery voltage while charger is operating. Is voltage within specification?	Maximum of 31 Volts DC	Replace Ground Control Module	Repair or Replace Battery Charger

Table 6-34. Codes (100 - 199) Ground Control Module - Fault Condition

5.	Remove the communications cable, P5 connector at the Ground Control Module and round connector at the Traction Control Module. Check continuity of all three (3) wires in the communications cable from end to end. P5 - Pins 2, 3, and 4.	—	Go to Step 6	Repair or Replace Wire(s)
6.	With communications cable still disconnected at both ends, check for continuity between Pins 2, 3, and 4 at the P5 connector end.	—	Repair or Replace Wires	Go to Step 7
7.	Plug the communications cable on the Traction Control Module to the round socket on the opposite end of the module. Does this fix problem?	—	Done	Replace Ground Control Module

Codes (200 - 299) Platform Control Console - Fault Condition

Check For These Obvious Conditions First:

- Damage to Platform Control Console wiring harness.
- Secure harness connections from Platform Control Console to Platform Junction Box to Ground Control Module.
- Confirm that the static ground strap attached under base frame is secure and undamaged.

Table 6-35. Code (200 - 299) Platform Control Console - Fault Condition

STEP	ACTION	SPEC	YES	NO
1.	Recycle machine power 5 times allowing a 10 second interval between each power recycle. Does fault clear?	—	Done	Go to Step 2
2.	Which 200 code number is displaying?	Code - 200/207/213	Go to Step 3	Replace Platform Control Module
		Code - 202/205/206	Go to Step 4	
3.	Remove the 9 pin Platform Control Module connector from the side of the Platform Junction Box and the P4 connector at the Ground Control Module. Check continuity from the P4 connector, pin-5 to Junction Box pin-3 and P4, pin-9 to Junction Box pin-4. Is there continuity on these wires?	—	Replace Platform Control Module	Repair or Replace Wiring
4.	Perform the Joystick Calibration Procedure in Section 4.5 of this Service Manual. Does this clear the fault code?	—	Done	Replace Platform Control Module

Codes (300 - 399) Traction Control Module - Fault Condition

Check For These Obvious Conditions First:

- Damage to Traction Control Module wiring harness.
- Confirm that the static ground strap attached under base frame is secure and undamaged.

Table 6-36. Codes (300 - 399) Traction Control Module - Fault Condition

STEP	ACTION	SPEC	YES	NO
1.	Recycle machine power 5 times allowing a 10 second interval between each power recycle. Does fault clear?	—	Done	Go to Step 2
2.	Is a code number displaying on the Ground Control Station?	Code - 316	Go to Step 3	Replace Traction Control Module
		Code - 325	Go to Step 5	—
3.	Confirm that both installed batteries are 12 Volt DC.	12V DC	Go to Step 4	Replace with proper Batteries
4.	Check battery voltage while charger is operating. Is voltage within specification?	Maximum of 31 Volts DC	Replace Traction Control Module	Repair or Replace Battery Charger
5.	Check for short in harness wires from Ground Control Station connector P5 to Traction Module *(round din plug)*. *Note: This harness contains 6 wires only 3 are used, (See Figure 6-3.) Electrical Diagram.*	—	Repair or Replace Wiring	—

6.9 MAIN POWER CIRCUIT TROUBLESHOOTING

Machine Will Not Power Up

Check For These Obvious Conditions First:

- Battery voltage is 24 volts. (Sufficient Charge in Batteries to Operate Machine)
- Positive (+) and negative (–) battery cable connections clean and tight at both the Batteries and the Ground Control Module lugs.
- Main Power Selector Switch (key) positioned to either Platform or Ground Control Mode.
- Emergency stop buttons on both the Ground Control Module and the Platform Control Console in the RESET position (out).

Table 6-37. Machine Will Not Power UP.

STEP	ACTION	SPEC	YES	NO
1.	Check for 24V DC at the positive (+) and negative (–) main power cable connections on the Ground Control Module.	24V DC	Go to Step 2	Replace the 175 Amp Inline Fuse on the Positive power cable
2.	Check continuity of the Emergency Stop wires running to the Platform Control Console, pins-10 and 1 on the P4 connector at the Ground Control Module.	—	Replace the Ground Control Module	Go to Step 3
3.	Remove the 9-pin Platform Control Console connector at the Platform Junction Box and check continuity between pins-1 and 2 to the Emergency Stop Switch in the Platform Control Console cable.	—	Go to Step 4	Replace the Platform Control Console
4.	Check continuity of the wires running from the P4 connector on Ground Control Module to the Platform Junction Box; P4 connector, Pin-1 to Junction Box Pin-2 and P4 connector, Pin-10 to Junction Box Pin-1	—	Replace Platform Control Console	Repair or Replace Wiring

6.10 MAST TROUBLESHOOTING

Platform Will Not Lower Manually

Check For These Obvious Conditions First:

- Is there an obstruction in the mast assembly?
- Is there a restricted hydraulic line (smashed)?
- Are the mast slide pads shimmed properly (not too tight), per Mast Assembly procedure in Service Manual?

Table 6-38. Platform Will Not Lower Manually.

STEP	ACTION	SPEC	YES	NO
1.	Check to see of the platform will lower from the Ground Control Station in Ground Control Mode.	—	Repair or Replace the Manual Descent Control Valve	Go to Step 2
2.	Check to see if the lift down valve is opening completely.	—	Go to Step 3	Replace the Lift Down Valve
3.	Check the flow valve in the lift cylinder for a restriction.	—	Clean or Replace Flow Valve	Consult Factory

Platform Lift Up And Down Jerky

Overview Of Procedure

The following procedure suggests areas on the machine which might attribute to erratic movement of the platform during lift up and down.

Check For These Obvious Conditions First:

- If mast is not running smooth or has tight and rough spots, refer to the Mast Section Rebuild.
- Hydraulic oil level in reservoir tank at full level.
- Hydraulic oil is not milky (presence of water), or foamy (full of air).

Table 6-39. Platform Lift Up and Down Jerky

STEP	ACTION	SPEC	YES	NO
	CONTROLS (ELECTRICAL)			
1.	Is platform control console, platform enable, up or down pad defective or worn out?	—	Replace pad	Go to Step 2
2.	Loose connections, ground and power.	—	Repair connection	Go to Step 3
3.	Valve solenoid keeps opening and closing.	—	Repair Connection or Replace Valve	Go to Step 4
4.	Problem internal to the Ground Control Module.	—	Replace Module	Go to Step 5

Table 6-39. Platform Lift Up and Down Jerky (Continued)

STEP	ACTION	SPEC	YES	NO
HYDRAULIC				
5.	Is the hydraulic valve working properly.	—	Go to Step 6	Replace Valve
6.	Pump drive cavatating.	—	Replace Pump	Go to Step 7
7.	Lift cylinder	—	Rebuild or Replace Cylinder	—

Mast Noisy When Lifting And Lowering

Overview Of Procedure

This procedure examines components of the mast itself and as well as it's lifting components for dirt, debris, proper lubrication and operation.

Table 6-40. Mast Noisy when Lifting and Lowering.

STEP	ACTION	SPEC	YES	NO
1.	Do slide pads and slide pad channels need to be cleaned of dust, dirt, or other debris?	—	Clean Pads and Channels	Go to Step 2
2.	Do mast chains need to be lubricated per JLG specification in the Service Manual?	—	Lubricate as Required	Go to Step 3
3.	Are the chain/cable sheave wheels dry and need lubrication? Note: Plastic wheels will howl on the sheave pin when they are dry. Sheave wheels may seize to the sheave pin and the pin may turn in the pin retainer blocks.	—	Lubricate or Replace Sheave Pins and Wheels	Go to Step 4
4.	Are the sequence cables (located on the side of mast) chattering when the springs are compressed? Note: This noise is normal at the sequence cable sheave wheels when the mast is completely lowered. However if the sequence cable chattering is happening no matter what position the mast is in, it could be a result of the mast being shimmed to tight or dirt and debris in the slide pad channels causing the mast to be tight.	—	Clean Slide Pads/ Channels or Re-shim Mast per Service Manual	Go to Step 5
5.	Is the bore of the lift cylinder dry?	—	Replace Packing or Lift Cylinder	Go to Step 6
6.	Are the bearings in the lift pump motor and pump drive worn?	—	Repair or Replace Pump	Go to Step 7
7.	Are the hydraulic lines vibrating together?	—	Adjust the Position of the Lines	Go to Step 8
8.	Check if the pump motor is loose to it's mounting plate.	—	Tighten pump mounting fasteners	Go to Step 9
9.	Hydraulic oil could be cavatating inside the pump.	—	Repair or Replace Pump	—

Platform (Mast) Won't Stay Elevated

Overview Of Procedure

The following procedure requests that the lift down, dump, and pump internal valves be checked to see if any are stuck open, it also examines the lift down and dump valve circuits. Also suggests that the lift cylinder packing could be leaking internally.

Check For These Obvious Conditions First:

- Manual descent valve is closed tight.

Table 6-41. Platform (Mast) Won't Stay Elevated.

STEP	ACTION	SPEC	YES	NO
1.	Is the lift down valve stuck open?	—	Repair or Clean Valve	Go to Step 2
2.	Lift down valves could be open due to incorrect electrical signal.	—	Check Pump Valve Electrical Circuit	Go to Step 3
3.	Oil could be passing around the lift cylinder bore packing.	—	Replace or Rebuild the Lift Cylinder	—

Platform (Mast) Descends Too Slowly

Overview Of Procedure

The following procedure examines the mast some hydraulic components for obstructions and defects.

Table 6-42. Platform (Mast) Descends Too Slowly.

STEP	ACTION	SPEC	YES	NO
1.	Check mast slide pads shimmed to tight.	—	Reshim Mast	Go to Step 2
2.	Is there an obstruction in the mast?	—	Remove Obstruction	Go to Step 3
3.	The lift cylinder packing could be too tight in the bore of the cylinder barrel.	—	Rebuild or Replace Cylinder	Go to Step 4
4.	Check if the lift down valve is opening completely.	—	Clean or Replace Valve	Go to Step 5
5.	Is there a restricted hydraulic line (smashed)?	—	Replace Hydraulic Line	Go to Step6
6.	Check the flow valve in the cylinder valve block for a restriction, i.e. dirt.	—	Clean or Replace Flow Valve	—

6.11 HYDRAULIC LEAK TROUBLESHOOTING

Miscellaneous Hydraulic Leak Troubleshooting

Overview Of Procedure

This series of steps gives remedies for various areas of the machine where leaks could occur.

Table 6-43. Hydraulic Leak Troubleshooting

STEP	ACTION	SPEC	YES	NO
1.	Oil leaking around the lift cylinder rod.	—	Replace the Seal at the end of the Piston and Cylinder Barrel	—
2.	Oil leaking around the cylinder extend or return line fittings.	—	Tighten or Replace Fittings	—
3.	Oil leaking around the hydraulic lines.	—	Tighten or Replace Hydraulic Lines	—
4.	Oil leaking around the lift down valve.	—	Tighten Cartridge in Pump Case	—
5.	Oil leaking around the (Red) manual descent valve.	—	Replace Lift Down Valve	—

Note: Do not overtighten the nut on the solenoid in step 5.

6.12 BASE FRAME COMPONENTS TROUBLESHOOTING

Caster Wheels Not Operating Freely

Check For These Obvious Conditions First:

- Is machine operating on a smooth, level surface?

Table 6-44. Caster Wheels Not Operating Freely.

STEP	ACTION	SPEC	YES	NO
1.	Is the caster rotating freely?	—	Go to Step 2	Lubricate or Replace Caster Housing
2.	Is the wheel spinning freely?	—	Go to Step 3	Lubricate or Replace Wheel
3.	Is debris stuck in the rubber wheel?	—	Remove Debris or Replace Wheel	—

6.13 DRIVE SYSTEM TROUBLESHOOTING

Won't Climb Grade

Overview Of Procedure

The following procedure checks the drive motor and attached components for component failure, misadjustment due to wear.

Check For These Obvious Conditions First:

- Batteries are Fully Charged (24 Volts)
- Speed Control is Set to Maximum
- Is Grade within the Maximum Allowable Specification of 20% Grade
- Does the Travel Surface allow for Proper Drive Wheel Traction
- Is Platform Load within the Maximum Rated Capacity

Table 6-45. Won't Climb Grade

STEP	ACTION	SPEC	YES	NO
1.	Does machine drive straight on a level surface?	—	Go to Step 2	Refer to Machine Won't Drive Straight (Table 6-47)
2.	Are both the left and right drive motor, slip-clutches, located between the drive motor and the drive wheels, working properly?	—	Go to Step 3	Repair, Replace or Adjust Slip Clutch
3.	Do the left and right drive motor brakes release properly and allow the drive wheels to rotate freely?	—	Go to Step 4	Dragging? Repair, Replace or Adjust Brakes
4.	Check the amperage output of the on the drive motor leads. They should not exceed 100 amps while pulling a grade.	—	Controller will Shut Drive Down and will flash a 7 LED Code	Go to Step 5
5.	Check the condition of the drive motor brushes.	—	OK, go to Step 6	Worn down, replace brushes or drive motor
6.	If all above is OK, Drive motors are working properly. Consult Factory.	—	—	—

Machine Drives in Opposite Direction

Table 6-46. Machine Drive in Opposite Direction

STEP	ACTION	SPEC	YES	NO
1.	At the Traction Control Module, check if the left drive motor power lead is plugged into the M1 socket. ***NOTE:*** *The left drive motor power lead uses a reverser harness between the module and the power lead to the motor.*	—	Go to Step 2	Switch the Left and Right Drive Motor Power Leads at the Traction Module
2.	Remove the Right Drive Motor power lead at the Traction Control Module (M2) and check if the WHITE wire is connected to the positive (+) terminal and the BLACK wire is connected to the negative (–) terminal. (Reference Figure 6-3., Electrical Diagram. (1870182_D)	—	Go to Step 3	Rewire as Necessary
3.	Remove the Left Drive Motor power lead at the Traction Control Module (M1) and check if the BLACK wire is connected to the positive (+) terminal and the WHITE wire is connected to the negative (–) terminal. The Left Motor Power lead is reversed from the Right Motor lead due to the reverser harness. (Reference Figure 6-3., Electrical Diagram. (1870182_D)	—	Consult Factory	Rewire as Necessary

Machine Won't Drive Straight

Overview Of Procedure

The following procedure examines the drive motor assembly weldments attaching the drive motors to the base frame. Also internal components of the drive motors, gear box and a check of the components between the gear box and the drive wheels.

Check For These Obvious Conditions First:

- Battery voltage 24 volts. (Fully charge batteries)
- Nothing is lodged between one of the wheels and the base frame.
- A caster wheel on the front of the machine is seized up, creating resistance.

Table 6-47. Machine Won't Drive Straight.

STEP	ACTION	SPEC	YES	NO
1.	Check for the following on the drive assembly, drive attachment weldments; is bent, has broken welds, or loose hardware.	—	Repair/Replace/ Tighten weldment	Go to Step 2
2.	Check for the following on the drive assembly, drive motor mounting plates; are bent, are square with drive weldments, or is hardware loose?	—	Repair/Replace/ Tighten weldment	Go to Step 3
3.	Check for the following on the drive assembly, drive motor hardware; is hardware loose, flange bearing - bad/loose, slip clutch - check torque settings or adjustment.	—	Repair/Replace/ Tighten component	Go to Step 4
4.	Check the left and right drive motor brakes for loose hardware & not releasing properly.	—	Tighten or Adjust per procedure in this Service Manual	Go to Step 5
5.	Is the electrical signal and amperage draw to the drive motors equal? Check with machine on level surface.	See Table 6-3.	Recheck Steps 1 thru 5	Go to Step 6
6.	Check the drive motor brushes, do they need replaced?	—	Replace per procedure in this Service Manual	Go to Step 7
7.	Is joystick control defective? If possible, swap out with another platform control.	—	Repair/Replace Platform control	Go to Step 8
8.	Is the Traction Control Module defective or connections not tight? If possible, swap out with another Traction Control Module.	—	Tighten Connections or Replace Traction Control Module	Go to Step 9
9.	Inside the drive motor gear box check if; the drive shaft is excessively loose & condition of drive shaft bearings. Are any gears broken or gear teeth excessively worn.	—	Repair/Replace gear box components per procedure in this Service Manual	

Noise From Drive Assembly

Overview Of Procedure

The following procedure examines the drive motor assembly weldments attaching the drive motors to the base frame. Also internal components of the drive motors, gear box and a check of the components between the gear box and the drive wheels.

Check For These Obvious Conditions First:

- Battery voltage 24 volts. (Fully charge batteries)
- Nothing is lodged between one of the wheels and the base frame.
- A caster wheel on the front of the machine is seized up, creating resistance.

Table 6-48. Noise from Drive Assembly.

STEP	ACTION	SPEC	YES	NO
1.	Check for the following on the drive assembly, drive attachment weldment; is bent, has broken welds, or loose hardware.	—	Repair/Replace/ Tighten weldment	Go to Step 2
2.	Check for the following on the drive assembly, drive motor hardware; is hardware loose, flange bearing - bad.	—	Repair/Replace/ Tighten Component	Go to Step 3
3.	Check the left and right drive motor brakes for loose hardware & not releasing properly.	—	Tighten or Adjust per procedure in this Service Manual	Go to Step 4
4.	Is the electrical signal and amperage draw to the drive motors equal? Check with machine on level surface.	See Table 6-3.	Recheck Steps 1 thru 5	Go to Step 5
5.	Check the drive motor brushes, do they need replaced?	—	Replace per procedure in this Service Manual	Go to Step 6
6.	Inside the drive motor gear box check if; the drive shaft is excessively loose & condition of drive shaft bearings. Are any gears broken or gear teeth excessively worn.	—	Repair/Replace gear box components per procedure in this Service Manual	

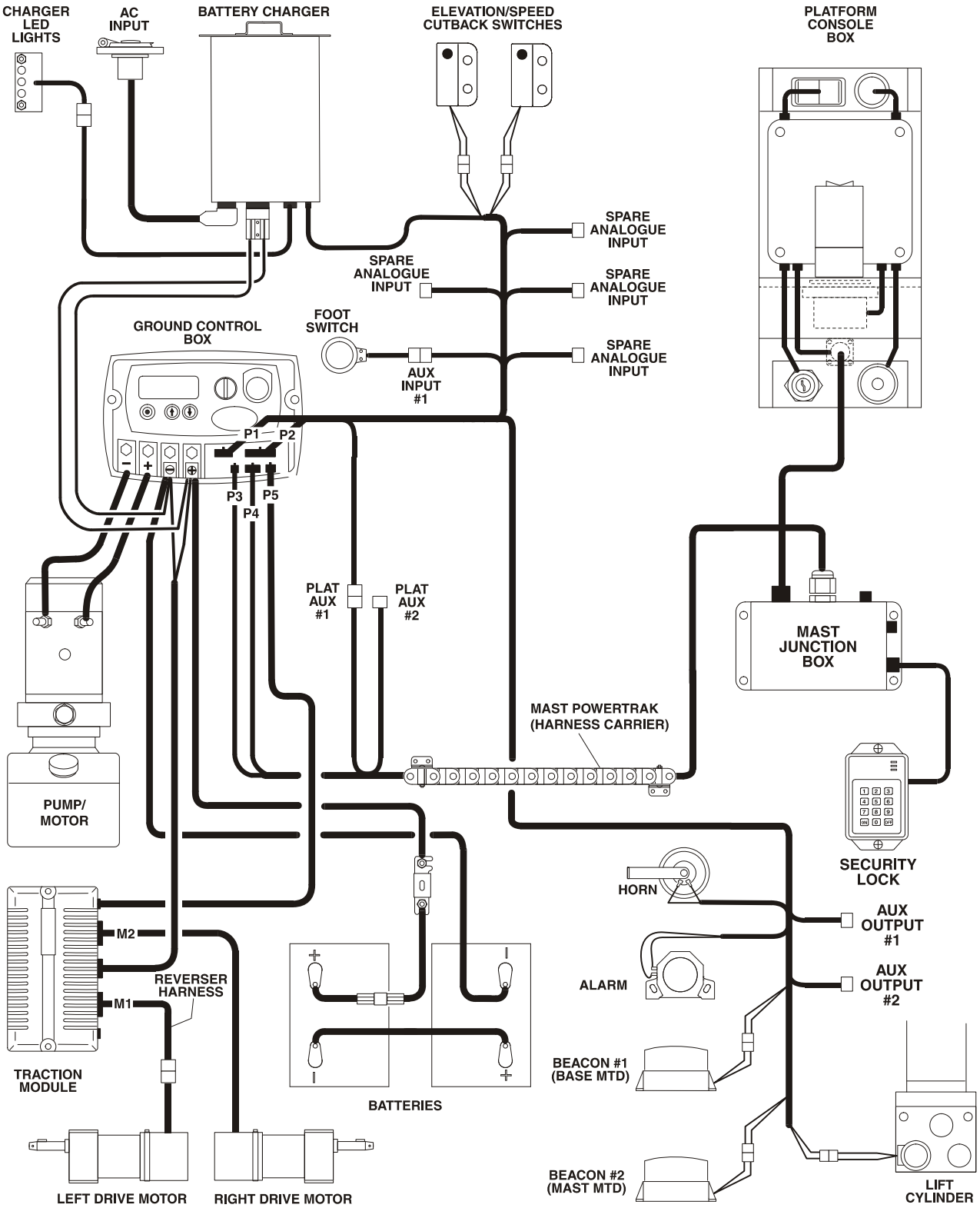
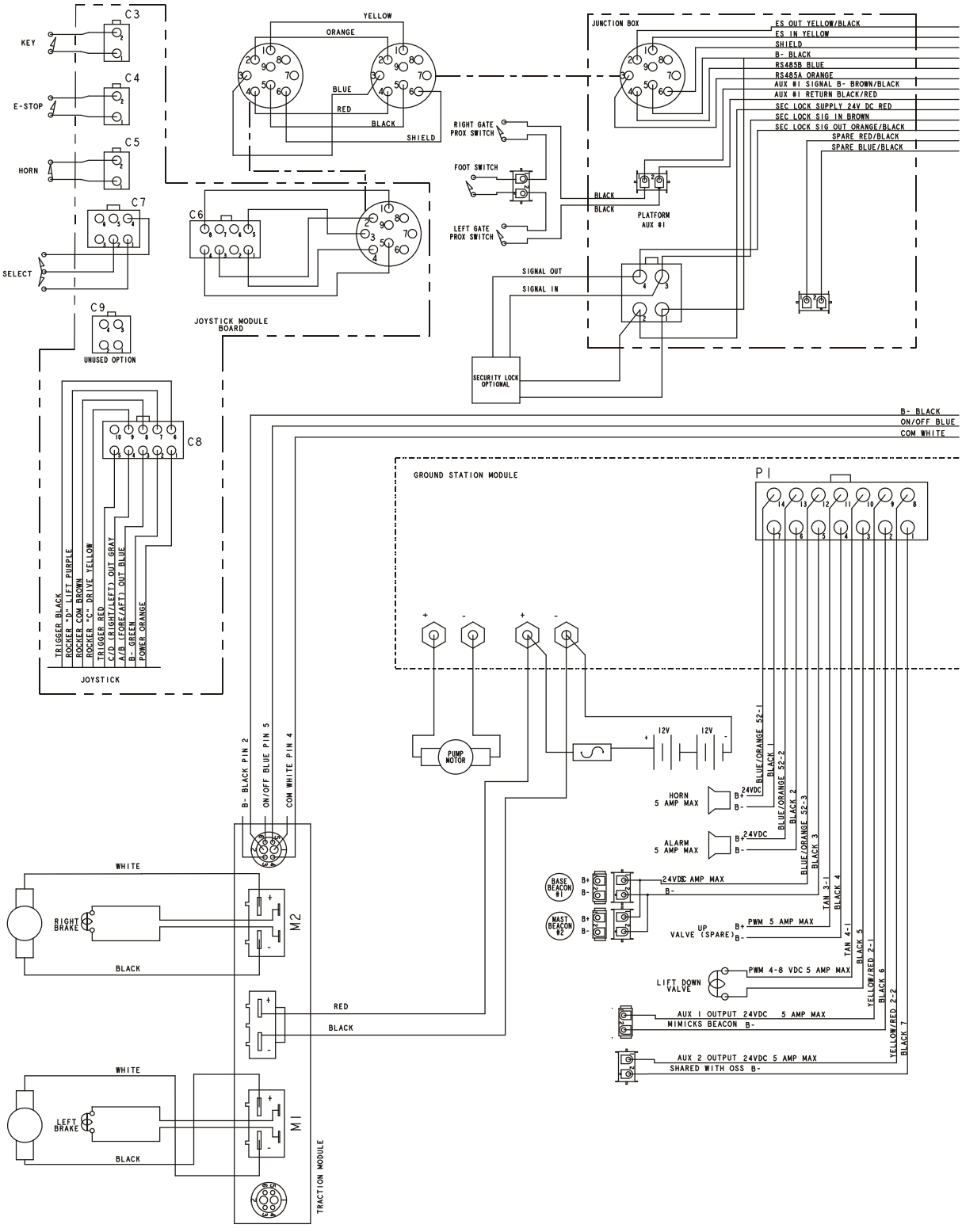
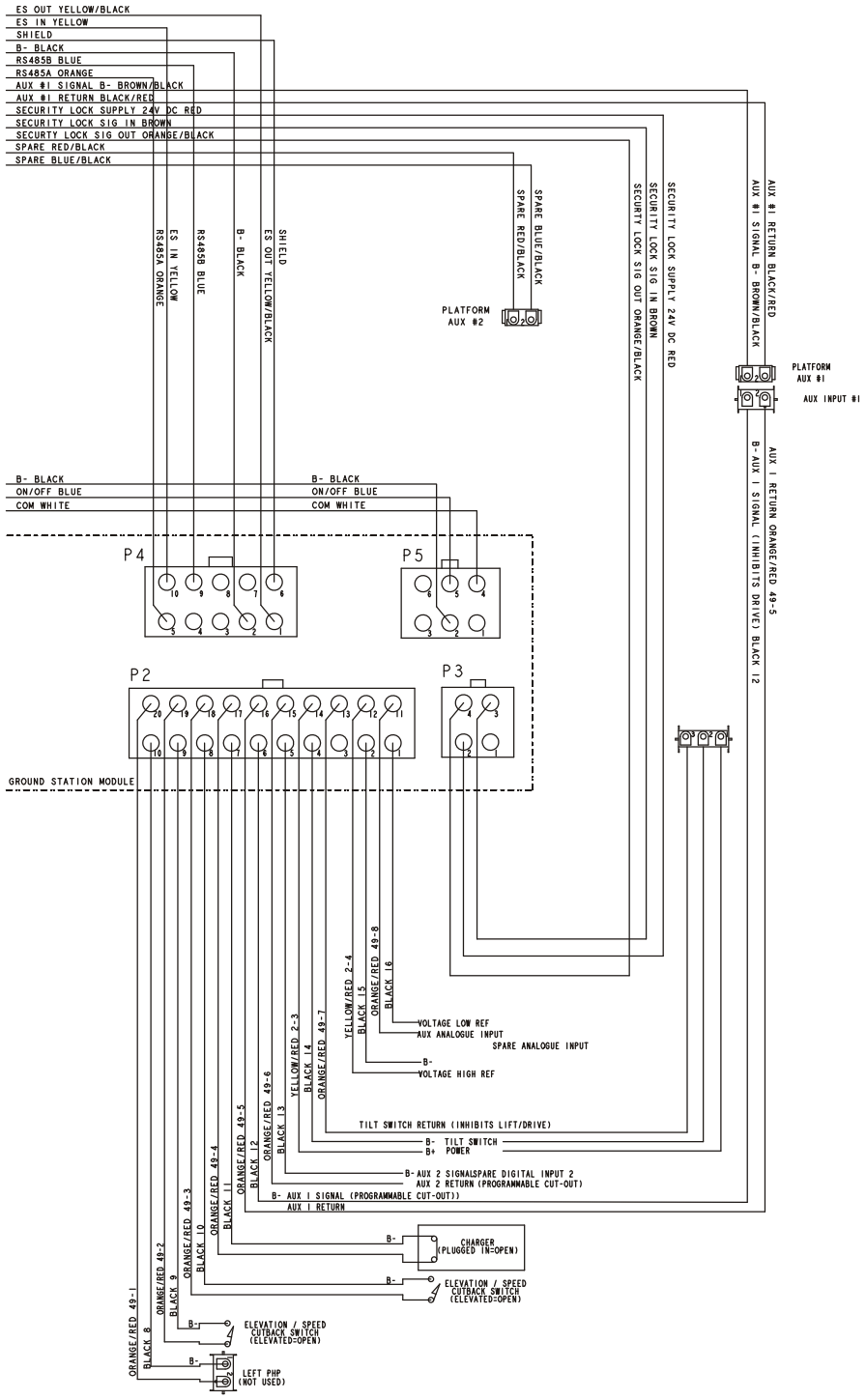


Figure 6-2. SSV-10 - Overview of Electrical System Components.



1870182 D

Figure 6-3. Electrical Diagram. (1870182_D)



1870182 D

Figure 6-3. Electrical Diagram. (1870182_D)

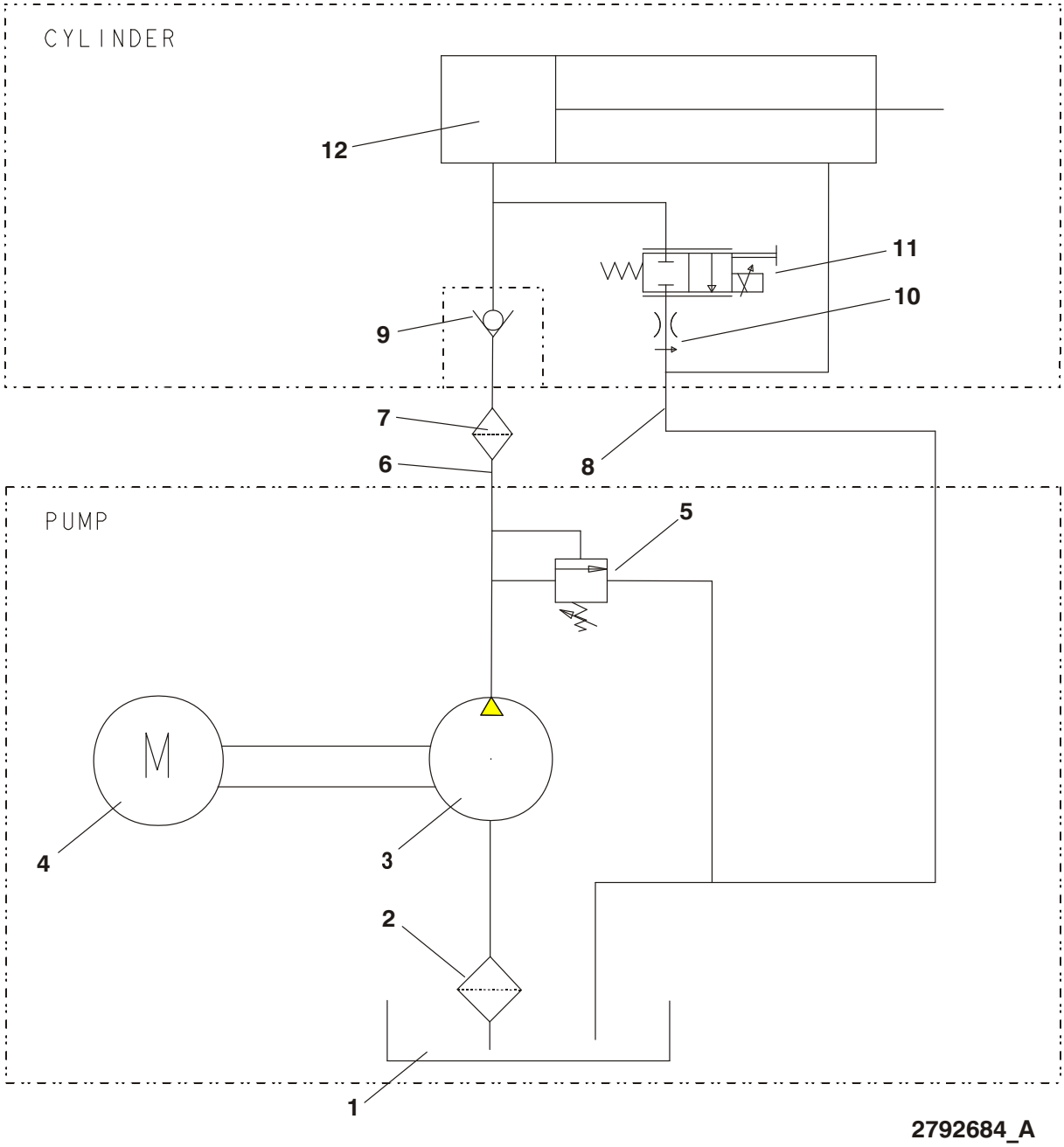


Figure 6-4. Hydraulic Diagram. (2792684_A)

1. Tank
2. Filter Screen
3. Pump
4. Pump Motor
5. Pressure Adjust Valve
6. Extend Line
7. Hydraulic Filter
8. Return Line
9. Check Valve
10. Pressure Compensator - Flow Control Valve
11. Manual Decent Valve
12. Lift Cylinder

CALIFORNIAN PROPOSITION 65

BATTERY WARNING

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm.

Batteries also contain other harmful chemicals known to the State of California.

WASH HANDS AFTER HANDLING!

3121187

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