

# Operation & Safety, Service & Maintenance & Illustrated Parts Manual Supplement

# JLG LOAD SENSING SYSTEM

## **Boom Lift Products**

P/N 3124287

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An Oshkosh Corporation Company

### SECTION A. INTRODUCTION - 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 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 VIOLA-TION.

The specific precautions to be observed during 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 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.

### A WARNING

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

#### B HYDRAULIC SYSTEM SAFETY

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

#### C MAINTENANCE

### A WARNING

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

- REMOVE ALL RINGS, WATCHES AND JEWELRY WHEN PERFORMING ANY MAINTENANCE.
- DO NOT WEAR LONG HAIR UNRESTRAINED, OR LOOSE-FITTING CLOTHING AND NECKTIES WHICH ARE APT TO BECOME CAUGHT ON OR ENTANGLED IN EQUIPMENT.
- OBSERVE AND OBEY ALL WARNINGS AND CAU-TIONS ON MACHINE AND IN SERVICE MANUAL.
- KEEP OIL, GREASE, WATER, ETC. WIPED FROM STANDING SURFACES AND HAND HOLDS.
- NEVER WORK UNDER AN ELEVATED BOOM UNTIL BOOM HAS BEEN SAFELY RESTRAINED FROM ANY MOVEMENT BY BLOCKING OR OVERHEAD SLING, OR BOOM SAFETY PROP HAS BEEN ENGAGED.
- BEFORE MAKING ADJUSTMENTS, LUBRICATING OR PERFORMING ANY OTHER MAINTENANCE, SHUT OFF ALL POWER CONTROLS.
- BATTERY SHOULD ALWAYS BE DISCONNECTED-DURING REPLACEMENT OF ELECTRICAL COMPO-NENTS.
- KEEP ALL SUPPORT EQUIPMENT AND ATTACH-MENTS STOWED IN THEIR PROPER PLACE.
- USE ONLY APPROVED, NONFLAMMABLE CLEANING SOLVENTS.

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### **SECTION 1. OPERATION**

**NOTE:** This manual is intended as a supplement to the individual machine's Operators and Safety Manual.

#### **1.1 INTRODUCTION & OPERATION**

**NOTE:** It is the responsibility of the owner/user/operator/lessor/lessee to read & understand this manual and the machine Operators & Safety Manual and to prevent overloading the platform. Do not operate a machine with a disconnected or inoperative Load Sensing System.

The JLG-designed Load Sensing System (LSS) measures platform load via four sensors mounted between the platform and support structure. If the actual platform load exceeds the selected Rated Load, the following will occur:

 The Overload Visual Warning Indicator will flash at the selected control position (platform or ground).



- 2. The Platform and Ground Alarms will sound 5 seconds On, and 2 seconds Off.
- 3. All normal movement will be prevented from the platform control position (optional ground control functions may be prevented).
- 4. Further movement is permitted by:
  - a. Removing the excess platform load until actual platform load is less than Rated Load.
  - b. Operation of the overriding emergency system (Auxiliary Power Unit).
  - c. By an authorized person at the ground control position (optional ground control functions may be prevented).

#### NOTICE

THE LOAD SENSING SYSTEM MUST BE CALIBRATED WHEN ONE OR MORE OF THE FOLLOWING CONDITIONS OCCUR:

- a. LSS System initial installation
- b. LSS Module replacement
- c. LSS Sensor removal or replacement
- d. Addition or removal of certain platform mounted accessories. (Refer to Calibration in Section 2)
- e. Platform is removed, replaced, repaired or shows evidence of impact.

#### NOTICE

THE LOAD SENSING SYSTEM REQUIRES PERIODIC FUNCTION VERIFICATION NOT TO EXCEED 6 MONTHS FROM PREVIOUS VERIFICATION. REFER TO TESTING & EVALUATION IN SECTION 2. Calibration of the Load Sensing System is performed by connecting the JLG Analyzer (Analyzer Kit, JLG part no. 2901443), to the Load Sensing System Module. All calibration procedures are menu driven through the use of the Analyzer. Note that Load Sensing System has an independent Analyzer connection located near the module.

#### 1.2 CONNECTING THE JLG CONTROL SYSTEM ANALYZER

- Connect the cable supplied with the analyzer, to the LSS control module located in the platform and connect the remaining end of the cable to the analyzer.
- **NOTE:** Do not confuse the Host Control System and LSS Module's Analyzer Connections.

The cable (shown below) has a four pin connector at each end of the cable; the cable cannot be connected backwards.



2. Power up the Control System by turning the key to the platform or ground position and pulling both emergency stop buttons on.

#### 1.3 USING THE ANALYZER

With the machine power on and the analyzer connected properly, the analyzer will display the following:



#### HELP: PRESS ENTER

At this point, using the **RIGHT** and **LEFT** arrow keys, you can move between the top level menu items. To select a displayed menu item, press **ENTER**. To cancel a selected menu item, press **ESC**.; then you will be able to scroll using the right and left arrow keys to select a different menu item.

The top level menus are as follows:

HELP DIAGNOSTICS ACCESS LEVEL PERSONALITIES MACHINE SETUP CALIBRATIONS

If you press **ENTER** at the **HELP: PRESS ENTER** display and there are no faults, the Analyzer will display **EVERY-THING OK**. In the event of a fault, the Analyzer will display **OVERLOADED**.

If ENTER is pressed again, the Analyzer will display LOGGED HELP, a record of the last 16 faults. Use the left and right arrow keys to scroll through the fault log. To return to the top level menu, press the ESC key twice.

When a top level menu entry is selected, a new set of menu items will be displayed as in the following.

DIAGNOSTICS: PLTLOAD PLTGROS OVERLOADED? CELL 1 CELL 2 CELL 3 CELL 4 SYSTEM VERSIONS

Pressing **ENTER** while viewing any of the above menu entries will display additional sub-menus. Typically, the sub-menu is where parameter information is displayed or changed. Refer to Figure 1-1., LSS Module Analyzer Flow Chart for menu layout. You may only view Personality settings while in Access Level 2. Access Level 1 is required to change Personality settings and calibrate.

The **ESC** key may be used to leave a sub-menu at any time.

#### 1.4 CHANGING ACCESS LEVEL USING THE ANALYZER

When the analyzer is first connected, you will be in Access Level 2 which enables you to only view most settings which cannot be changed until you enter a password to advance to a lower level. This ensures that a setting cannot be accidentally altered. To change the Access Level, the correct password must be entered. To enter the password, scroll to the **ACCESS LEVEL** menu. For example:



#### MENU: ACCESS LEVEL 2

Press ENTER to select the ACCESS LEVEL menu.

Using the **UP** or **DOWN** arrow keys, enter the first digit of the password, 3.

Then using the **RIGHT** arrow key, position the cursor to the right one space to enter the second digit of the password.

Use the **UP** or **DOWN** arrow key to enter the second digit of the password which is 33271.

Continue using the arrow keys until all the remaining digits of the password is shown.

Once the correct password is displayed, press **ENTER**. The Access Level should display the following, if the password was entered correctly:



#### MENU: ACCESS LEVEL 1

Repeat the above steps if the correct Access Level is not displayed or you can not adjust the personality settings.

#### 1.5 VIEWING & ADJUSTING PARAMETERS USING THE HAND HELD ANALYZER

Once you have entered Access Level 1 and a personality item is selected, press the **UP** or **DOWN** arrow keys to adjust its value, for example:



#### PERSONALITIES: OVR DEBNCE 3.0s

There will be a minimum and maximum for the value to ensure efficient operation. The Value will not increase if the **UP** arrow is pressed when at the maximum value nor will the value decrease if the **DOWN** arrow is pressed and the value is at the minimum value for any particular personality. If the value does not change when pressing the up and down arrows, check the Access Level to ensure you are at Access Level 1.

#### 1.6 HELP MENU & FAULT CODES

The Help Menu is a troubleshooting tool to communicate detected System Faults to the technician. The following table documents the Faults for the Load Sensing System. To access the Help Menu, use the LEFT and RIGHT arrow keys to select HELP: PRESS ENTER from the Top Level Menu. Press the ENTER key to view the menu.

When accessing the Help Menu, the JLG Analyzer will display EVERYTHING OK if the platform is not overloaded and no difficulties are detected. Otherwise, the JLG Analyzer will display OVERLOADED.

In the event of difficulty, the user can press ENTER again to display Logged Help, which is a record of the last 16 Fault Messages. The following table lists each Help/ Logged Message, the Flash Code (for each Fault, the module will flash the two-digit code on its LED) triggered by the Fault, and a Description of the Situation (cause).

Help/Logged Message	Flash Code	Description of Situation
Everything OK	LED ON	The "Normal" Help Message
<min cal<="" td=""><td></td><td>Calibration attempt Unsuccessful, Empty Platform appears to weigh too little. Improper Model Selection (Machine Setup) may cause the LSS Module to expect the wrong Empty Platform Weight. This also may be caused by a damaged sensor or associated wiring. Finally, this condition may occur if mechanical interference between the platform and support structure exists (all weight must transfer through sensors).</td></min>		Calibration attempt Unsuccessful, Empty Platform appears to weigh too little. Improper Model Selection (Machine Setup) may cause the LSS Module to expect the wrong Empty Platform Weight. This also may be caused by a damaged sensor or associated wiring. Finally, this condition may occur if mechanical interference between the platform and support structure exists (all weight must transfer through sensors).
>MAX CAL		Calibration attempt Unsuccessful, Empty Platform appears to weigh too much. This situation has the same root causes as the " <min cal"="" fault="" message.<="" td=""></min>
BATT TOO LOW	4/1	Incoming Supply Voltage <9.0 Vdc. The control system's battery voltage is too low due to excessive electrical load or dis- charge.
BATT TOO HIGH	4/4	Incoming Supply Voltage >34.0 Vdc. The control system's battery voltage is too high. This may be due to over-charging or improper charger operation.
CELL #1 ERROR	8/1	Cell #1's Bridge <2V, >3V, or could not read Cell #1's Internal Memory. This situation indicates damage to the sensor or its wiring.
CELL #2 ERROR	8/2	Cell #2's Bridge <2V, >3V, or could not read Cell #2's Internal Memory. This situation indicates damage to the sensor or its wiring.
CELL #3 ERROR	8/3	Cell #3's Bridge <2V, >3V, or could not read Cell #3's Internal Memory. This situation indicates damage to the sensor or its wiring.
CELL #4 ERROR	8/4	Cell #4's Bridge <2V, >3V, or could not read Cell #4's Internal Memory. This situation indicates damage to the sensor or its wiring.
WATCHDOG RST	9/1	Microprocessor's Watchdog Timer Triggered. This is an indication that the LSS Module has been exposed to excessive electrical noise, or has experienced a hardware difficulty.
EEPROMERROR	9/2	Memory used to retain Personality/Machine Setup/Calibration has been corrupted and must be reset by verifying all entries and re-calibrating.
NOCAL	9/3	Calibration has not been successfully completed. A new LSS Module will display this message until properly calibrated.
INTERNAL ERR	9/9	Pin excitation <4.25 V. The sensors may be excessively loading the excitation supply, or the LSS Module may have hard- ware difficulty.
		High Side Driver Error. The load attached to OUT1 or OUT2 is shorted to battery or ground and has been detected by the LSS module.
		DRDY Interrupt from A/D missing. This may indicate an LSS Module hardware difficulty.

#### Table 1-1. LSS Fault Codes

#### 1.7 DIAGNOSTIC MENU

The Diagnostic Menu is another troubleshooting tool for the Load Sensing System. Sensor and status information is presented in real-time for the technician. Several submenus exist to organize the data.

Note that the Diagnostic Menu changes based on MODEL Parameter in the Machine Setup Menu (some displays are suppressed). The information presented in the following table will be proper when MODEL=BOOM LIFT (refer to Machine Setup Menu). To access the Diagnostic Menu, use the LEFT and RIGHT Arrow keys to select DIAGNOSTICS from the Top Level Menu. Press the ENTER key to view the menu.

Press the LEFT and RIGHT Arrow keys to view the displays and select the various sub-menus (CELL 1, CELL 2, etc.). To access a sub-menu, press the ENTER key. Once in a sub-menu, press the LEFT and RIGHT Arrow keys to view the various displays (just like a Top Level menu). To exit a sub-menu, press the ESC key.

The table below details the structure of the Diagnostic Menu, and describes the meaning of each piece of information presented.

Diagnostics Menu (Displayed on Analyzer 1 <sup>st</sup> Line)	Parameter (Displayed on Analyzer 2 <sup>nd</sup> Line)	Parameter Value (Displayed on Analyzer 2 <sup>nd</sup> Line)	Description
	PLTLOAD	±XXXX LBS or Kg	Displays (Total Measured Force – Empty Platform Calibration)
	PLTGROS	$\pm$ XXXX LBS or Kg	Displays Total Measured Force (Sum of Cells 1 thru 4 LOAD)
	OVERLOADED?	Yes / No	Displays Current LSS Module Overload Status
CELL 1:			
	LOAD	±XXXX LBS or Kg	Displays Calibrated Cell Reading in Current Units
	RDG	±XX.XXXX mV/V	Displays Cell Reading in mV/V
	INPUT	±XX.XXXX mV	Displays Cell Reading in mV
CELL 2:			
	LOAD	$\pm$ XXXX LBS or Kg	Displays Calibrated Cell Reading in Current Units
	RDG	$\pm$ XX.XXXX mV/V	Displays Cell Reading in mV/V
	INPUT	±XX.XXX mV	Displays Cell Reading in mV
CELL 3:			
	LOAD	$\pm$ XXXX LBS or Kg	Displays Calibrated Cell Reading in Current Units
	RDG	±XX.XXXX mV/V	Displays Cell Reading in mV/V
	INPUT	±XX.XXXX mV	Displays Cell Reading in mV
CELL 4:			
	LOAD	±XXXX LBS or Kg	Displays Calibrated Cell Reading in Current Units
	RDG	±XX.XXXX mV/V	Displays Cell Reading in mV/V
	INPUT	$\pm$ XX.XXX mV	Displays Cell Reading in mV
SYSTEM:			
	OVLOAD STAT	OFF/ON	State of Overload Status Digital Output
	WARNING	OFF/ON	State of Warning Digital Output
	750#CAPACITY	OFF/ON	State of Digital Input #1
	1000#CAPACITY	OFF/ON	State of Digital Input #2
	BATTERY	XX.XX V	Displays Current Battery Voltage
	EXCITE	X.XXXX V	Displays Load Cell Excitation Voltage
	TEMP	±XXX.X Deg C	Display the Temperature Sensed by the LSS Module

#### Table 1-2. Diagnostic Menu Descriptions

Diagnostics Menu (Displayed on Analyzer 1 <sup>st</sup> Line)	Parameter (Displayed on Analyzer 2 <sup>nd</sup> Line)	Parameter Value (Displayed on Analyzer 2 <sup>nd</sup> Line)	Description
VERSIONS:			
	SOFTWARE	PX.XX	Displays LSS Module Software Version
	HARDWARE	Х	Display LSS Module Hardware Revision
	ANALYZER	VX.XXXX	Displays Analyzer Software Version

#### Table 1-2. Diagnostic Menu Descriptions

#### **1.8 PERSONALITIES MENU**

The Personalities Menu is used to adjust aspects of the Load Sensing System's operation. A FACTORY sub-menu exists for access to unit-specific calibration information determined during the manufacturing process, should the need arise.

#### NOTICE

DO NOT TAMPER WITH THE PARAMETERS WITHIN THE FAC-TORY SUB-MENU. THESE FACTORS ARE NOT ADJUSTED FOR NORMAL CALIBRATION. CONSULT THE FACTORY TO RESTORE THESE PARAMETERS (REFERENCE THE LSS MODULE'S UNIQUE SERIAL NUMBER). Note that the Personalities Menu changes based on MODEL Parameter in the Machine Setup Menu (some displays are suppressed). The information presented below will be proper when MODEL=BOOM LIFT (refer to Machine Setup Menu).

To access the Personalities Menu, use the LEFT and RIGHT Arrow keys to select PERSONALITIES from the Top Level Menu. Press the ENTER key to view the menu. Press the LEFT and RIGHT Arrow keys to view the displays.

The following table details the structure of the Personalities Menu, and describes the meaning of each parameter.

Submenu (Displayed on Analyzer 1st Line)	Parameter (Displayed on Analyzer 2 <sup>nd</sup> Line)	Default Values	Description
	OVERLD XXXX LBS (or KGS)	550 LBS	Displays/adjusts the Overload limit for this AWP*
	OVERLD2 XXXX LBS (or KGS)	825 LBS	Displays/adjusts an Alternate Overload limit for this AWP*
	OVERLD3 XXXX LBS (or KGS)	1100LBS	Displays/adjusts an Alternate Overload limit for this AWP*
	ACC'Y XXXX LBS (OR KGS)	0LBS	Displays/adjusts a de-rating for Accessories*
	OVRDBNCEXS	3 Sec	Displays/adjusts the de-bounce delay before an overload.
	OVRHOLDXS	5 Sec	Displays/adjusts the minimum delay before an overload can be released.
	CAP SEL DLY X S	1 Sec	Displays/adjusts the delay before a Capacity Select Digital Input is regarded.
FACTORY:			
	#1 GAIN X.XXXX		Displays/calibrates the LSS Module analog channel gain.
	#1 ZERO +X.XXXX mV		Displays/calibrates the LSS Module analog channel offset.
	#2 GAIN X.XXXX		Displays/calibrates the LSS Module analog channel gain.
	#2 ZERO +X.XXXX mV		Displays/calibrates the LSS Module analog channel offset.
	#3 GAIN X.XXXX		Displays/calibrates the LSS Module analog channel gain.
	#3 ZERO +X.XXXX mV		Displays/calibrates the LSS Module analog channel offset.
	#4 GAIN X.XXXX		Displays/calibrates the LSS Module analog channel gain.
	#4 ZERO +X.XXXX mV		Displays/calibrates the LSS Module analog channel offset.
	EXC GAIN X.XXXX		Displays/calibrates the LSS Module excitation measurement gain.
	TEMP OFFS ±XXX.X		Displays/calibrates the LSS Module's internal temp sensor.
* Refer to JLG Workstation in the Sky Accessories™ in Section 2.			

#### Table 1-3. Personality Parameters

#### **1.9 MACHINE SETUP MENU**

The Machine Setup Menu is used to configure the Load Sensing System for application on a particular JLG model, and select the desired force units (i.e. pounds or kilograms). In addition, the technician can trigger the LSS Module to restore Defaults to all Personalities Parameters by changing the MODEL to any other selection, and then re-selecting BOOM LIFT.

Note that Diagnostics and Personalities Menus change based on MODEL Parameter (some displays are suppressed).

To access the Machine Setup Menu, use the LEFT and RIGHT Arrow keys to select MACHINE SETUP from the Top Level Menu. Press the ENTER key to view the menu. Press the LEFT and RIGHT Arrow keys to view the displays.

The following table details the structure of the Machine Setup Menu, and describes the meaning of each parameter.

lable 1-4.	Machine	Setup	Menu
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Parameter (Displayed on Analyzer 2 <sup>nd</sup> Line)	Parameter Value (Displayed on Analyzer 2 <sup>nd</sup> Line)	Description
MODEL:	= BOOM LIFT =4069LE =3369LE =500RTS =260MRT	Displays/adjusts Model Selec- tion. Must be set to BOOM LIFT for this application.
UNITS:	=LBS =Kg	Displays/adjusts global force units

#### **1.10 CALIBRATION MENU**

The Calibration Menu is used to zero the Empty Platform weight.

To access the Calibration Menu, use the LEFT and RIGHT Arrow keys to select CALIBRATION from the Top Level Menu. Press the ENTER key to view the menu.

**NOTE:** The Calibration Menu is not available in Access Level 2.

Upon entry to the Calibration Menu, the LSS Module shall communicate to the Analyzer:



CALIBRATE: YES:ENTER, NO:ESC

Pressing the ESC key will return the user to the top level menu and not disturb the prior calibration information.

Pressing the ENTER key will confirm that the platform is empty (except for factory-installed options outside the Rated Load). The LSS Module will calculate the total of all load cell readings and ensure that the total is greater than 90 lbs. (41 kg), but less than 550 lbs.(250 kg). If successful, the Analyzer will show the following:



CALIBRATE: COMPLETE

If the empty platform weight is less than 90 lbs. (41 kg), the calibration attempt will be unsuccessful and the Analyzer will show the following:



If the empty platform weight is greater than 550 lbs.(250 kg), the calibration attempt will be unsuccessful and the Analyzer will show the following:



CALIBRATE: > MAX CAL



Figure 1-1. LSS Module Analyzer Flow Chart

#### 1.11 JLG ACCESSORIES, INCLUDING WORKSTATION IN THE SKY<sup>™</sup>

The Load Sensing System must be configured for proper operation with JLG approved Accessories. Calibration of the Load Sensing System can be performed with the Accessory mounted in the platform.

## JLG Approved Accessories (Except SkyGlazier)

A platform-mounted accessory slightly reduces the amount of load that can be carried before the vehicle becomes overloaded. This extra load must be accounted for to enable the accessory to be mounted during Calibration.

A De-Rating is provided for JLG Sky Accessories via decal and/or the JLG Workstation in the Sky<sup>TM</sup> Accessory Manual. This De-Rating must be entered into the LSS Module's ACC'Y Personality to cause the system to accurately indicate overload (by the De-Rating factor).

Example: Consider the case of the JLG SkyWelder (SkyCutter) with a De-Rating of 70LBS (32KG). Without De-Rating, the Load Sensing System will declare Overload at 550LBS (250KG) in the 500LBS Capacity Zone (110% of 500LBS) and at 1100LBS (499KG) in the 1000LBS Capacity Zone (110% of 1000LBS). When the De-Rating for Sky-Welder (SkyCutter) is entered into the ACC'Y Personality, the LSS will declare Overload 70LBS (32KG) earlier (480LBS or 218KG in the 500LBS Capacity Zone; 1030LBS or 467KG in the 1000LBS Capacity Zone).

Procedurally, the Accessory should be mounted to the platform and the LSS Module's ACC'Y Personality should be set using the guidelines above. Calibration should be performed as outlined in this manual. During Testing & Evaluation, it should be noted that the LSS will declare Overload with less platform load (by the amount of the De-Rating).

#### **SkyGlazier Accessory**

This Accessory does not have a simple De-Rating since it has different impact on the 500LBS and 1000LBS Capacity Zones (Moment limits in 1000# Zone).

#### SKYGLAZIER (BASE ONLY)

When not using the SkyGlazier, recommended JLG vehicles can safely carry the SkyGlazier's Base without impact on normal capacity ratings.

Procedurally, mount the SkyGlazier's Base but not the Tray. Set the LSS Module's Personalities according to the table below and perform a Calibration.

Personality	Setting
OVERLD	550LBS (249KG)
OVERLD3	1100LBS (499KG)
ACC'Y	0LBS (0KG)

#### SKYGLAZIER (BASE & TRAY)

When using the SkyGlazier, recommended JLG vehicles can carry 400LBS (181KG) in the 500LBS Capacity Zone (Total Platform Weight with Tray Installed), and 750LBS (340KG) in the 1000LBS Capacity Zone (Total Platform Weight with Tray Installed).

Procedurally, mount the SkyGlazier's Base but not the Tray. Set the LSS Module's Personalities according to the table below and perform a Calibration.

Personality	Setting
OVERLD	450LBS (204KG)
OVERLD3	800LBS (363KG)
ACC'Y	0LBS (0KG)

K NOTES:	
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### **SECTION 2. SERVICE - ENGINE POWERED BOOM LIFTS**

This section is for servicing 400 Series, 450/510 Series, 600A Series, 600S Series, 800A Series, 800S Series, 1250AJP, & 1200/1350 Series Boom Lifts

#### 2.1 DESCRIPTION

The system consists of the LSS Module, four Shear Beam Load Cells (sensors), Wire Harness, and various brackets and fasteners. The LSS Module is mounted in the platform on a bracket beneath the console box (above the rotator). The Shear Beam Load Cells mount between the platform and the support structure in such a way that all support force for the platform is applied through them (for measurement). The four Shear Beam Load Cells plug directly into the LSS Module. The Wire Harness connects the LSS Module to the Host Control System.

#### 2.2 INSTALLATION

 Loosen the Fasteners that secure the Platform to the Support Structure. Maneuver the platform above a pair of saw-horses or other adequate supporting device capable of supporting up to 350lbs.(160 kg). Position the platform to a comfortable height. Loosen but do not remove the four 1/2 inch Shank (3/4 inch Head) Hex Bolts that secure the platform to the support.



2. <u>Separate the Platform and Support Structure.</u> Gently lower the platform onto the saw-horses or supporting device (using the Auxiliary Power Unit from Ground Control). Remove the fasteners that secure the platform to the support structure and discard the fasteners (new fasteners must be used for installation since all are torqued to specification).



 Mount the Shear Beam Load Cells to the Support <u>Structure</u>. Carefully examine the detail on Figure 2-2., Load Sensing System Installation (Sheet 2 of 2) that shows how the components are placed onto the platform support structure. Place one of the Shear Beam Load Cells on top of the support structure with the Orientation Arrow pointing downward (groove near the single mounting hole upward).





Figure 2-1. Load Sensing System Installation (Sheet 1 of 2)



Figure 2-2. Load Sensing System Installation (Sheet 2 of 2)

Insert the two 1/2 inch Shank (3/4 inch Head) Hex Bolts from above.



Install the Load Cell Guard Bracket (2 Left and 2 Right) and Washers below the support structure and secure the Hex Lock Nuts but do not completely tighten (all fasteners will be fully tightened in a subsequent step after alignment to minimize off-axis stress on the sensors).



Install the remaining three Shear Beam Load Cells in the same fashion. Label each sensor's connector to avoid confusion in a subsequent step (Front-Left, Front-Right, Rear-Left, Rear-Right).



4. Install the Wire Channels to the Support Structure. The channels mount to the Load Cell Guard Brackets and provide protection for the wiring beneath the platform. Mount the channels as shown on Figure 2-1., Load Sensing System Installation (Sheet 1 of 2) and Figure 2-2., Load Sensing System Installation (Sheet 2 of 2). The large opening is positioned toward the rear of the platform and provides clearance for the sensor's cable exit. The open part of the channel faces inward (away from the sensor).



Route the rear sensor wiring through the large opening in the channel. An additional shield is supplied for the two Rear Shear Beam Load Cells (to cover the sensor's cable exit). Mount the cable clamps inside the channel (3 small clamps per side) to properly retain the wiring within the channel. During this step, pull all four Shear Beam Load Cell wires through the channels toward the LSS Module mounting location. Excess wire length should not be allowed to hang below the platform (it will be bundled near the LSS Module).



5. Mount the Platform to the Shear Beam Load Cells. Carefully maneuver the platform support structure toward the platform (using the Auxiliary Power Unit from Ground Control). Make final adjustments by sliding the platform on the saw-horses or barrels. Ensure that sensor wiring is not damaged during this step. Study the Installation Drawing's detail regarding how components are placed. From below, insert the 5/8 inch Shank bolts (15/16" Head) with washers that mount the Platform to the Shear Beam Load Cells. Place the spacer bushing on top of the Shear Beam Load Cells (between the platform and sensor), with the beveled feature toward the sensor. Secure the Hex Lock Nut on top of the platform but do not completely tighten.



- 6. Torque all Fasteners to Specification. First, ensure that the platform is resting completely on the platform support structure (adjust using the Auxiliary Power Unit from Ground Control). Torque the two 1/2 inch Shank (3/4 inch Head) bolts between the platform support structure and the Shear Beam Load Cell to 75ft-lbs (105 Nm) (do all four sensors), ensuring that the access holes in the Load Cell Guard Brackets for the 5/8 inch Shank (15/16 inch Head) between the platform and Shear Beam Load Cell to 50 ft-lbs (68 Nm) (do all four sensors).
- Mount the LSS Module to the Platform. Secure the LSS Module to the bracket with the hardware described in the Installation Drawing. Next, mount the assembly to the platform mid-rail (drill mid-rail if necessary).



8. Install the Shear Beam Load Cell Connections. Locate the connector from the Rear-Right Shear Beam Load Cell (orientation from the normal operator's position while using platform control console). Install the Rear-Right connector into the LSS Module's J8 by carefully rotating the molded portion of the connector until the keys align, and then tightening the knurled barrel. Tighten it first by hand (avoid cross-threading), and then carefully secure it with a small pair of locking pliers. The connector must be secured in this fashion to compress its O-ring seal and assure moisture resistance, but must not be over-tightened such that it damages the LSS Module. Install the Rear-Left into J7, the Front-Right into J6, and the Front-Left into J5. Neatly bundle the excess wire using wire ties so it can be stowed in the region below the LSS Module mounting location. Ensure that the excess wire length stays within the platform envelope and does not interfere with hydraulic hose movement at the rotator.



Wire the Load Sensing System to the Host Control System. Ensure that the Host Control System is powered-down by depressing the EMS at the Ground Control station. From the wire harness provided, insert the Black 12-position Deutsch connector into J2 on the LSS Module (System Interface -Communication) to install the JLG Analyzer connection. For single capacity vehicles, do not connect the Red/Yellow wire. For dual capacity vehicles, remove the orange contact wedge from the Grey 12-position Deutsch connector and insert the Red/Yellow wire into Socket 9 for vehicles with 500LB / 750LB (230kg / 340kg) Rated Loads or Socket 8 for vehicles with 500LB / 1000LB (230kg / 450kg) Rated Loads. Replace the orange contact wedge, install sealing plugs in the unused sockets, and insert the Grey 12position Deutsch connector into J1 on the LSS Module (System Interface – Power & Digital).



Route the harness from the Grey 12-position Deutsch connector into the Platform Console Box via a strain relief connector.



Terminate the four harness wires inside the Platform Console Box according to the Wiring Diagram for the Load Sensing System. Match the wire colors and numbers from the LSS harness to those of the Host Control System.



10. <u>Install the Overload Lamp at Ground Control if nec-</u> essary. Open the Main Terminal Box and ensure that the Overload Lamp is installed in the Indicator Panel.

Alternately, observe the Ground Control's Indicator Panel for the Overload Symbol during Power-Up with the Keyswitch in the Ground position. If it is



present, skip this step in the procedure. To install the Overload Lamp, first review the AMP Connector section of the vehicle's Service Manual for detailed instructions regarding the connector system.

Next, mount the lamp by inserting it into the opening behind the Overload Symbol and rotating it until it locks. Route the lamp's Brown/White and Black wires from



the door toward the Ground Module's J4 connector and secure with wire ties. Remove the J4 Connector (Blue) from the Ground Module by releasing the locking tab with a 3/16 inch (4.8mm) wide screwdriver blade. Pry the red wedge lock to the open position for contact loading, but do not remove it.



Remove the sealing plugs with a small pair of pliers by rotating them back and forth during removal. Insert the Brown/White wire into J4-14 (lamp output), and the Black into J4-32 (ground). (If J4-32 is already used, connect the Black wire to the ground on the last indicator lamp in the chain.) Close the red wedge lock by squeezing it uniformly inward. Install the J4 connector back into the Ground Module and ensure that the locking tab clicks into position.

 Setup the Host Control System to enable the Load Sensing System. Power-up the Host Control System by resetting the EMS at the Ground Control station. Plug the JLG Analyzer into the Host Control System's Analyzer Connection at the Ground or Platform (do not confuse the Host Control System and LSS Module's Analyzer Connections).



Enter the Access Level 1 Password (33271). Next, proceed to the MACHINE SETUP, LOAD sub-menu and select "2=CUTOUT PLT". Press the RIGHT ARROW to view the MACHINE SETUP, LOAD TYPE sub-menu. Set it to "1=4 UNDER BASKET" to select the Load Sensing System with four Shear Beam Load Cells beneath the platform. At this point, it is likely that the Host Control System's Visual and Audible Warnings for the Load Sensing System will be active (since the LSS Module is un-calibrated).

12. <u>Perform a Calibration of the Load Sensing System.</u> Refer to the Calibration procedure in this manual to prepare the Load Sensing System for use.

#### 2.3 CALIBRATION

#### Procedure

- Plug the JLG Analyzer into the LSS Module and enter the Access Level 1 Password. Do not confuse the Host Control System and LSS Module's Analyzer Connections. The Host Control System's connection is mounted beneath the Platform Console Box, and the LSS Module's connection hangs from a short harness near the module. Proceed to the ACCESS LEVEL menu and enter the Access Level 1 Password (33271).
- Level the Platform. The platform should be approximately level for calibration. Level the platform from Ground Control (if necessary) to within <u>+</u>5 degrees.
- Configure the LSS Module for Boom Lift mode and <u>Desired Units.</u> Proceed to the LSS Module's MACHINE SETUP, MODEL sub-menu and select "MODEL=BOOM LIFT". Press the RIGHT ARROW to view the Units Selection. Select "UNITS=LBS" for platform load measurement in Pounds, and "UNITS=KG" for measurement in Kilograms.
- 4. <u>Remove everything except JLG Accessories from</u> <u>the Platform.</u> Empty the platform to allow the Load Sensing System to record its weight during calibration. All tools, debris, and customer-installed devices shall be removed. Permanently-fixed JLG Accessories shall remain and their contribution toward Rated Load will be accounted for in the next step.

- 5. <u>Configure the LSS Module for JLG Accessories.</u> The contribution of each permanently-fixed JLG Accessory toward Rated Load must be determined. JLG Accessories are decaled with their effective contribution toward Rated Load. If this decal is missing, reference the appropriate manual for the JLG Accessory or consult the table within this manual. Once determined, the contributions of all permanently-fixed JLG Accessories mounted in the platform of the vehicle shall be **added together** and entered in the Analyzer's PERSONALITIES, ACC'Y display (using the proper units).
- Execute a Calibration via the JLG Analyzer. Proceed to the Analyzer's CALIBRATION top level menu and press ENTER. Press ESC to abort a calibration or ENTER to calibrate (tare). If successful, the Analyzer will display "COMPLETE". If unsuccessful, a message will be displayed that will help lead to a resolution (reference the Troubleshooting section of this manual). Press ESC to return to the top level menu.

#### **Testing & Evaluation**

Refer to the Troubleshooting section of this manual if the Load Sensing System fails to meet these guidelines.

- 1. <u>Plug the JLG Analyzer into the LSS Module.</u> Do not confuse the Host Control System and LSS Module's Analyzer Connections. The Host Control System's connection is mounted beneath the Platform Console Box, and the LSS Module's connection hangs from a short harness near the module.
- Level the Platform. The platform should be approximately level for analysis, or the guidelines below will not be applicable. Level the platform from Ground Control (if necessary) to within <u>+</u>5 degrees.
- Observe the Empty Platform Weight. Proceed to the DIAGNOSTICS, PLTLOAD sub-menu and observe the measured platform load. All tools, debris, and customer-installed devices shall be removed during evaluation. Ideally, the PLTLOAD should be zero but can vary ±15lbs (± 7kg). Further, the reading should be stable and should not vary by more than ±2lbs (±1kg) (unless there is heavy influence from wind or vibration).

- 4. Use the Technician's Weight to Evaluate. The technician should enter the platform and record the PLT-LOAD reading while standing in the center of the platform, and then each corner. The average of the readings should be the estimated weight of the technician. The range of the readings should be no more than 20lbs (9kg) (max PLTLOAD reading min PLT-LOAD reading).
- 5. Confirm Host Control System Warnings and Interlocks. Using the vehicle's keyswitch, select Platform Mode and power-up. Start the vehicle's engine and ensure that all controls are functional and the Load Sensing System's Overload Visual and Audible Warnings are not active. Simulate an Overload by unplugging the Shear Beam Load Cell connected to J5 on the LSS Module (the most easily accessed). The Overload Visual Warning should flash, and the Audible Warning (at Platform and Ground) should sound for 5 seconds On, and 2 seconds Off. With the engine running, all control should be prevented. Cycle the Platform EMS to stop the engine and then power-up again. The Overload Visual and Audible Warning should continue. Confirm that controls are responsive when using the Auxiliary Power Unit for emergency movement. Install the disconnected Shear Beam Load Cell back in J5 on the LSS Module. The Overload Visual and Audible Warnings should cease and normal control function should return. Switch the vehicle's keyswitch to Ground Mode and repeat the above procedure. The Overload Visual Warning at the Ground Controls should flash, and the Audible Warning (at Platform and Ground) should sound for 5 seconds On, 2 seconds Off. However, the controls should remain functional when using the engine and the Auxiliary Power Unit (if the Host Controls System's MACHINE SETUP, LOAD is set to "2=CUTOUT PLT". If set to "3=CUT-OUT ALL", then Ground Controls will be prevented when using the engine as in the platform). Re-fit the Shear Beam Load Cell to J5 on the LSS Module and carefully tighten by hand, and then with a small pair of locking pliers to seat the O-ring seal.
- 6. Confirm Host Control System Capacity Indication (optional for vehicles with Dual Capacity Ratings). For vehicles equipped with a Capacity Select switch on the Platform Console Box, it is necessary to examine an additional interface between the Load Sensing System and the Host Control System. Using the vehicle keyswitch, select Platform Mode and power-up. If necessary, put the boom in the transport position (completely stowed) and center the Jib Plus (if equipped). Place the Capacity Select switch in the 500lbs (230kg)position and ensure that the proper indicator illuminates on the Platform Console Box. Plug the JLG Analyzer into the LSS Module's Analyzer connection and proceed to the DIAGNOSTICS, SYSTEM submenu. Ensure that the 750# (340kg) CAPACITY and 1000# (450kg) CAPACITY displays indicate OFF. Place the Capacity Select switch in the 750lbs/1000lbs (340kg/450kg) position (if so equipped) and ensure that the proper indicator illuminates on the Platform Console Box (but does not flash). For vehicles with 750lbs (340kg) capacity, ensure that the 750# (340kg) CAPACITY display indicates ON but the 1000# (450kg) CAPACITY indicates OFF. For vehicles with 1000lbs capacity, ensure that the 750# (340kg) CAPACITY display indicates OFF but the 1000# CAPACITY indicates ON.
- Confirm Load Sensing System Performance with <u>Calibrated Weights.</u> Operate the vehicle from Ground Control and place the boom in the transport position (fully stowed) for safety. Plug the JLG Analyzer into the LSS Module's connection and proceed to the DIAGNOSTICS, PLTLOAD display. Place 500lbs (230kg) in the platform and ensure that PLT-LOAD is with <u>+</u>5% of the actual weight. For Dual Capacity vehicles, do the same for the alternate capacity (750LBS or 1000LBS [340kg or 450kg]).

#### 2.4 TROUBLESHOOTING

The following tables are furnished to provide possible resolutions for common difficulties. Difficulties are classified as General, Calibration, Measurement Performance, and Host System Functionality.

Difficulty	Possible Resolution
JLG Analyzer does not display "HELP: PRESS ENTER" when connected to LSS Module's connection, but the module's LED is lit or flashing.	The JLG Analyzer is failing to communicate with the LSS Module, but the LSS Module is powered (indicated by module's LED). Investigate JLG Analyzer serial communication and power supply connections.
	<ol> <li>If the Analyzer displays "CONNECTING" or "CONNECTION ERROR" after a short interval, examine the Analyzer harness on J2. J2-2 should connect to Pin 3 on the Analyzer, and J2-11 should connect to Pin 2.</li> </ol>
	<ol> <li>If the Analyzer does not display anything (and there is no backlighting), examine the Analyzer's power supply. Remove the harness connection from J2 and ensure that J2-1 has approximately 12V, and J2-12 is 0V. The harness should connect J2-1 to Pin 1 on the Analyzer, and J2-12 to Pin 4 on the Analyzer.</li> </ol>
	3. The JLG Analyzer is suspect. Substitute to determine cause of failure.
	4. The LSS Module is suspect. Substitute to determine cause of failure.
LED on LSS Module does not	The LSS Module is un-powered, a short exists, or the device is damaged.
light.	<ol> <li>LSS Module's power supply is improper. Check for the presence of approximately 12V on J1-1, and 0V on J1-2. The module's power supply comes from the Platform Console Box. Use to the Wiring Diagram to trace the conductors to their source.</li> </ol>
	2. There is a short circuit on the reference voltage present on J5-J8. Unplug the con- nectors one at a time and observe if the module begins to function after a particular connection is removed. If so, carefully inspect the wiring between the module and that sensor.
	<ol> <li>There is a short circuit on the pre-regulated supply for the JLG Analyzer present on J2-1. Unplug J2's connector and observe whether the module begins to function. If so, examine the Analyzer harness for defect.</li> </ol>
	4. The LSS Module is suspect. Substitute to determine cause of failure.

Table 2-1	ISS	Troubleshooting	Chart -	General
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Difficulty	Possible Resolution	
JLG Analyzer displays " <min after="" attempt="" cal"="" is<br="">made to Calibrate.</min>	The LSS Module expected the empty platform to weight more for calibration.	
	<ol> <li>The platform is resting on the ground or another obstruction during calibration. The platform's weight must be transferred through the Shear Beam Load Cells and into the support structure for an accurate calibration.</li> </ol>	
	<ol> <li>The wrong Model Selection was made under the LSS Module's MACHINE SETUP, MODEL. This should be set to "MODEL=BOOM LIFT". Improper selection may lead the LSS Module to expect different empty platform weights.</li> </ol>	
	<ol> <li>One or more shear beams are improperly mounted (there is interference between the platform and support structure) or upside down. Refer to the Installation portion of this manual to resolve the issue.</li> </ol>	
	<ol> <li>The calibration difficulty may be a result of a Measurement Performance issue. Review the Possible Resolutions under that category.</li> </ol>	
JLG Analyzer displays ">MAX	The LSS Module expects the empty platform to weigh less for calibration.	
CAL" after attempt is made to Calibrate.	<ol> <li>Tools, debris, or customer-installed accessories have not been removed before cal- ibration. The LSS Module must tare an empty platform and its optional JLG Acces- sories.</li> </ol>	
	<ol> <li>The wrong Model Selection was made under the LSS Module's MACHINE SETUP, MODEL. This should be set to "MODEL=BOOM LIFT". Improper selection may lead the LSS Module to expect different empty platform weights.</li> </ol>	
	<ol> <li>One or more shear beams are improperly mounted (there is interference between the platform and support structure) or upside down. Refer to the Installation portion of this manual to resolve the issue.</li> </ol>	
	<ol> <li>The calibration difficulty may be a result of a Measurement Performance issue. Review the Possible Resolutions under that category.</li> </ol>	

Difficulty	Possible Resolution	
Empty Platform Weight (DIAG- NOSTICS, PLTLOAD) is not within $\pm$ 15lbs ( $\pm$ 7kg) of zero. or Platform Load readings (DIAG- NOTICS, PLTLOAD) are unsta- ble by more than $\pm$ 2lbs ( $\pm$ 1kg) (without the influence of vibra- tion or wind).	<ol> <li>The LSS Module is unable to properly measure the platform weight.</li> <li>One of the Shear Beam Load Cells is not properly plugged into the LSS Module. Since the connectors seal with an O-ring and are located in a crowded area, it is possible that the connectors are threaded together, but poor electrical contact is made. Attempt to wiggle the molded portion of each connector on J5-J8. If properly tightened, the molded portion should not move. Also, examined each Shear Beam Load Cell's readings via the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL 1-4, LOAD displays and determine if the readings are reasonable. Note that it is possible to have only two sensors carrying all of the platform load due to fit between the platform and support structure (this is normal).</li> </ol>	
or There are large variations in Platform Load (DIAGNOS- TICS, PLTLOAD) based on the location of the load. Tolerance to variations is 20lbs for an evaluation using the techni- cian's weight, and $\pm 5\%$ of Rated Load when using cali- based evaluation	2. Wiring leading to one of the Shear Beam Load Cells is damaged. Examine each sensor's reading using the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL 1-4, LOAD displays and determine if the readings are reasonable and responsive to slight downward pressure above the sensor being viewed. Carefully inspect sensor wiring where it passes through cable clamps for signs of damage. Inspect wiring where damage to the channel is apparent. If damage to the sensor's cordset is found, replace the appropriate Shear Beam Load Cell since the cordset is not serviceable (connector is molded for moisture resistance; cordset is soldered into sensor beneath welded stainless steel cover).	
(continued)	3. One of the Shear Beam Load Cells was not assembled properly during installation. Examine each sensor's reading using the JLG Analyzer. Proceed to the DIAGNOS-TICS, CELL 1-4, LOAD displays and determine if the readings are reasonable. It is often helpful to apply slight downward pressure above the sensor being examined and observe that its output increases (increasing force measurement; decreasing means the sensor is mounted upside-down). Compare the order of assembly to the detail on the Installation Drawing and ensure that the only contact between the platform and the support is through the sensor bodies (nothing else touches except wires). Re-assemble according to print if necessary. (continued)	

#### Table 2-3. LSS Troubleshooting Chart - Measurement Performance

Difficulty	Possible Resolution
Empty Platform Weight (DIAG- NOSTICS, PLTLOAD) is not within <u>+</u> 15lbs (±7kg) of zero. <b>or</b> Platform Load readings (DIAG-	4. Improper procedure was used when tightening the fasteners for the Shear Beam Load Cells. Failure to regard the notes in the Installation guide can result in large off-axis forces on the sensors (which disturb the primary measurement axis readings). Loosen all fasteners and sequentially torque them as recommended in the Installation guide (new fasteners are recommended to achieve proper torque).
NOTICS, PLTLOAD) are unsta- ble by more than <u>+</u> 2lbs (±1kg) (without the influence of vibra- tion or wind). <b>or</b>	5. Damage to the platform or support structure has occurred or one of the components is out-of-tolerance (not planar). When the fasteners are torqued to specification, the sensors are disturbed by large off-axis forces (which disturb the primary measurement axis readings). Loosen all fasteners and observe whether the platform or support were drawn-up by the fasteners (they should both be planar and match up accurately). Resolution is to replace the damaged or faulty component. Watch for Shear Beam Load Cell damage (yield) as a result of this difficulty.
Platform Load (DIAGNOS- TICS, PLTLOAD) based on the location of the load. Tolerance to variations is 20lbs for an evaluation using the techni- cian's weight, and <u>+</u> 5% of Rated Load when using cali- brated weights.	6. One of the Shear Beam Load Cells is contaminated by debris or moisture. Examine each sensor's reading using the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL 1-4, LOAD displays and determine if the readings are reasonable and stable (not changing by more than <u>+</u> 2lbs (±1kg) (without the influence of vibration or wind). Lack of measurement stability is a key indication of contamination. Unplug the appropriate connector (J5 is CELL 1, J6 is CELL 2, J7 is CELL 3, and J8 is CELL 4) and inspect for dirt or moisture. Look carefully into the female connector on the sensor's cordset for evidence of contamination. Debris should be brushed away with a soft bristle brush (do not introduce any cleaners as they will leave conductive residue). Moisture should be allowed to evaporate or accelerated with a heat-gun (use low heat and be carefully to not melt connector materials). Moisture intrusion into the molded portion of the connector (capillary action into the wire bundle) or the Shear Beam Load Cell itself will require replacement of the sensor.
	7. One of the Shear Beam Load Cells has been mechanically damaged (yielded). Any Shear Beam Load Cell that is physically deformed or has damage to one of the stainless steel covers should be replaced immediately. It is also possible to have invisible mechanical damage resulting from an extreme overload (>6000lbs [>2722kg]). This can be detected by removing all fasteners that mount the platform and supporting the platform on two saw-horses or barrels (no weight resting on the Shear Beam Load Cells). Examine each sensor's reading using the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL 1-4, LOAD displays and observe whether the unloaded sensors read with ±15lbs (±7kg) of zero (individually). Replace sensors that read excessive force when physically unloaded.
	8. The LSS Module is suspect. Interchange the Shear Beam Load Cell connections (J5- J8) and observe the results via the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL 1-4, LOAD displays and observe the readings. If the problem seems to remain with a particular sensor, carefully re-examine the issues above. If the problems seems to remain with a particular LSS Module channel, substitute another module.

Table 2-3. LSS	3 Troubleshooting	<b>Chart - Measurement</b>	Performance
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Difficulty	Possible Resolution
The Visual and Audible Over- load Warnings fail to sound	The Host Control System is failing to regard the overload signal from the LSS Module, or the signal is shorted.
when platform is loaded beyond Rated Load, or when simulated by unplugging a Shear Beam Load Cell from the LSS Module. Controls remain functional at Platform and Ground Control positions.	<ol> <li>The Load Sensing System must be enabled within the Host Control System. Plug the JLG Analyzer into the Host Control System, enter the Access Level 1 password (33271), and examine the MACHINE SETUP, LOAD sub-menu. The selection "2=CUTOUT PLT" should be displayed for European Community compliance (plat- form controls prevented during overload, ground controls remain operational). In country- or customer-specific circumstance, the selection "3=CUTOUT ALL" is used (platform and ground controls prevented during overload).</li> </ol>
	2. The signal between the LSS Module and the Host Control System is shorted. The Platform Module's J1-20 is an input, and it connected to the J1-5 output on the LSS Module To examine the status of this signal, plug the JLG Analyzer into the Host Control System, enter the Access Level 1 password (33271), and examine the DIAGNOSTICS, SYSTEM, LOAD display. The display will indicate "OK" when the Platform Module's input is energized (approximately 12V), and "OVERLOADED" when it is de-energized (0V). Refer to the Wiring Diagram for Load Sensing System for details
	3. Observe the LSS Module's assessment of overload using the JLG Analyzer plugged into the LSS Module's connection. Proceed to the DIAGNOSTICS, OVERLOADED? display. The display should indicate "OVERLOADED? N" when the platform is empty, and "OVERLOADED? Y" when the platform is overloaded. If the assessment is improper, the difficulty may be a result of a General or Measurement Performance issue. Review the Possible Resolutions under those categories.
	<ol> <li>If the LSS Module's J1-5 Output does not appears to coincide with the DIAGNOS- TICS, OVERLOADED? display, then the LSS Module is suspect. Substitute to deter- mine cause of failure.</li> </ol>
The Visual and Audible Over- load Warnings sound even when the platform is empty.	The LSS Module is un-powered, un-calibrated, or is experiencing a Measurement Perfor- mance difficulty. Alternately, the Host Control System is not receiving the proper signal from the LSS Module.
Controls are prevented in the same manner as when over- loaded.	<ol> <li>Ensure that the LSS Module is powered. The LSS Module's LED will be lit or flash if the module is powered. If not, ensure that approximately 12V is present between J1- 1 and J1-2 on the LSS Module (J1-1 is positive). Trace the Ignition and Ground sup- ply wires into the Platform Console Box's Wiring Harness using the Wiring Diagram to locate the difficulty.</li> </ol>
	2. Plug a JLG Analyzer into the LSS Module's connection and ensure that the Host Control System is powered-up. When HELP:PRESS ENTER is displayed, press the ENTER key on the Analyzer. If "EVERYTHING OK" is displayed, it is probable that the Overload Signal from the LSS Module is not reaching the Host Control System. This signal is present on LSS Module's J1-5 and is approximately 12V normally, and 0V during an overload. This signal eventually reaches the Platform Module's J1-20. Refer to the Wiring Diagram for wire color, number, and terminal information.
	<ol> <li>If the Analyzer displayed "OVERLOADED" in the previous step, press the ENTER key again. If "NO CAL" is displayed, the Load Sensing System has not been prop- erly calibrated. Refer to the Calibration portion of this manual.</li> </ol>
	<ol> <li>If another fault is displayed, refer to the portion of this manual that describes Fault Messages and their causes.</li> </ol>
	<ol> <li>The difficulty may be a result of a Measurement Performance issue. Review the Pos- sible Resolutions under those categories.</li> </ol>

Table 2-4.	LSS Troubleshooting	g Chart - Host S	ystem Functionality
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Difficulty	Possible Resolution
The Ground Audible Warning fails to sound, but the Platform Audible Warning sounds prop- erly.	The Host Control System's Ground Alarm is missing or improperly installed. Verify that the device is mounted. Verify wiring from the Main Terminal Box and Ground Module according to the proper Host Control System documentation. The Ground Alarm is energized from J2-27 on the Ground Module (approximately 12V). Ensure that the ground termination is proper (0V).
Controls remain functional at the Ground Control position during an overload, or when simulated by unplugging a Shear Beam from the LSS Module. The Control at the Platform Control position are prevented when using the engine, but not when using the Auxiliary Power Unit.	The Host Control System is configured to prevent platform controls only in the event of overload (as required for EN280 compliance). Alternately, the Host Control System can be configured to prevent ground and platform controls for country- or customer-specific circumstances. Plug the JLG Analyzer into the LSS Module's connection and enter the Access Level 1 password (33271). Proceed to the MACHINE SETUP, LOAD sub-menu. Set this parameter to "2=CUTOUT PLT" to prevent platform controls in the event of overload. Set this parameter to "3=CUTOUT ALL" to prevent platform and ground controls in the event of overload.
When the Capacity Select switch is set for 750lbs/1000lbs (340kg/450kg), Visual and Audible Overload Warnings sound and controls are pre- vented when the platform is loaded beyond 500lbs (230kg). Alternately, the Visual and Audible Overload Warnings do not sound and controls are not prevented when the platform is loaded beyond 500lbs (230kg) but the Capacity Select switch is set for 500lbs (230kg). (Dual Capacity vehicles only).	<ul> <li>There is a malfunction associated with the Capacity Select signal between the Host Control System and LSS Module. This signal is controlled by the Host Control System and is an input to the LSS Module. When the Capacity Select switch is set to 500lbs (230kg), this signal is de-energized (0V). The signal is energized (12V) when the Capacity Select switch is set to 750lbs/1000lbs (340kg/450kg). This signal will be connected to J1-8 on the LSS Module for vehicles that carry up to 750lbs (340kg), and J1-9 for vehicles that carry up to 1000lbs (450kg).</li> <li>1. Observe operation of the Platform Console Box's Capacity Indicator Lamps. Place the boom in the transport position (fully stowed) and center the Jib Plus (if equipped) to enable selection of both capacities. Set the keyswitch to the Platform position and power-up. When the Capacity Select switch on the Platform Console Box is in the 500lbs (230kg) position, ensure that the 500lbs (230kg) Indicator Lamp is lit. When the Capacity Select switch is in the 750lbs/1000lbs (340kg/450kg) position, ensure that the 750lbs/1000lbs (340kg/450kg) position, ensure that J2-12 on the Platform Module is de-energized (0V) when the Capacity Select switch is in the 500lbs (230kg) position. Ensure that J2-12 on the Platform Module is energized (12V) when the Capacity Select switch is in the 750lbs/1000lbs (340kg/450kg) position. Ensure that J2-13 on the Platform Module is energized (12V) when the Capacity Select switch is in the 750lbs/1000lbs (340kg/450kg) position. Finally, is may be necessary to consult documentation for the Host Control System to determine if another safety interlock is preventing the vehicle from entering the 750lbs/1000lbs (340kg/450kg). Poly position. Finally, is may be necessary to consult documentation for the Host Control System to determine if another safety interlock is preventing the vehicle from entering the 750lbs/1000lbs (340kg/450kg) mode.</li> <li>2. Remove the J1 (Grey) connector from the LSS Module and measure voltage on this signa</li></ul>

Pin	Signal	Description
1	VBAT	Positive Power Supply from Host Control System (12-24V)
2	GND	Negative Power Supply from Host Control System (0V)
3	GND-2	Connects to GND
4	N/C	Unused
5	DO1	Overload Indicator Output (Normal=VBAT / Over- load=0V)
6	DO2	Warning Indicator Output (Normal=0V / Over- loaded=VBAT for 5 Sec, 0V for 2 Sec)
7	DI3	Unused
8	DI2	Select OVERLD3 Personality Rating (No=0V/ Yes=VBAT)
9	DI1	Select OVERLD2 Personality Rating (No=0V/ Yes=VBAT)
10	GND-2	Connects to GND
11	VBAT-2	Connects to VBAT
12	VBAT-2	Connects to VBAT

## Table 2-5. LSS Module System Interface Connector -Power & Digital (J1 - Grey)

## Table 2-6. LSS Module System Interface Connector – Communication (J1 - Black)

Pin	Signal	Description	
1	APWR	Pre-Regulated Supply for JLG Analyzer (Analyzer	
		Pin 1; approx. 12V)	
2	ТХ	RS-232 for JLG Analyzer (Analyzer Pin 3)	
3	TRP1	120 Ohm CANbus Terminator	
4	CANH-1	CANbus Interface High	
5	CANS-1	CANbus Shield Termination (Not same as GND)	
6	CANH-2	Connects to CANH-1	
7	CANL-2	Connects to CANL-1	
8	CANS-2	Connects to CANS-1	
9	CANL-1	CANbus Interface Low	
10	TRP2	120 Ohm CANbus Terminator	
11	RX	RS-232 for JLG Analyzer (Analyzer Pin 2)	
12	GND	Ground for JLG Analyzer (Analyzer Pin 4)	

## Table 2-7. LSS Module Load Cell Connector Pinout (J5,<br/>J6, J7, J8)

Pin	Signal	Description	
1	+ Signal	Positive Sensor Output (approx. 2.5V)	
2	Cal Clock	Serial Clock to Sensor's Integrated Memory	
3	- Excitation	Negative Sensor Supply Voltage (approx. 0V)	
4	+Excitation	Positive Sensor Supply Voltage (approx. 5V)	
5	- Signal	Negative Sensor Output (approx. 2.5V)	
6	Cal Data	Serial Data from Sensor's Integral Memory	



**NOTE:** Physical connector as viewed looking into the cable end

Figure 2-3. LSS Module Load Cell Connector Pinout (J5, J6, J7, J8)



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### **SECTION 3. SERVICE - ELECTRIC POWERED BOOM LIFTS**

This section is for servicing E300 Series, E/M400 Series, E/M450 Series, & E/M600 Series Boom Lifts

#### 3.1 DESCRIPTION

The system consists of the LSS Module, four Shear Beam Load Cells (sensors), Wire Harness, and various brackets and fasteners. The LSS Module is mounted in the platform on a bracket beneath the console box (above the rotator). The Shear Beam Load Cells mount between the platform and the support structure in such a way that all support force for the platform is applied through them (for measurement). The four Shear Beam Load Cells plug directly into the LSS Module. The Wire Harness connects the LSS Module to the Host Control System.

#### 3.2 INSTALLATION

 Loosen the Fasteners that secure the Platform to the Support Structure. Maneuver the platform above a pair of saw-horses or other adequate supporting device capable of supporting up to 350lbs.(160 kg). Position the platform to a comfortable height. Loosen but do not remove the four 1/2 inch Shank (3/4 inch Head) Hex Bolts that secure the platform to the support.



 Separate the Platform and Support Structure. Gently lower the platform onto the saw-horses or supporting device (from Ground Control). Remove the fasteners that secure the platform to the support structure and discard the fasteners (new fasteners must be used for installation since all are torqued to specification).



 Mount the Shear Beam Load Cells to the Support <u>Structure</u>. Carefully examine the detail on Figure 3-2., Load Sensing System Installation (Sheet 2 of 2) that shows how the components are placed onto the platform support structure. Place one of the Shear Beam Load Cells on top of the support structure with the Orientation Arrow pointing downward (groove near the single mounting hole upward).





Figure 3-1. Load Sensing System Installation (Sheet 1 of 2)



Figure 3-2. Load Sensing System Installation (Sheet 2 of 2)

Insert the two 1/2 inch Shank (3/4 inch Head) Hex Bolts from above.



Install the Load Cell Guard Bracket (2 Left and 2 Right) and Washers below the support structure and secure the Hex Lock Nuts but do not completely tighten (all fasteners will be fully tightened in a subsequent step after alignment to minimize off-axis stress on the sensors).



Install the remaining three Shear Beam Load Cells in the same fashion. Label each sensor's connector to avoid confusion in a subsequent step (Front-Left, Front-Right, Rear-Left, Rear-Right).



4. Install the Wire Channels to the Support Structure. The channels mount to the Load Cell Guard Brackets and provide protection for the wiring beneath the platform. Mount the channels as shown on Figure 3-1., Load Sensing System Installation (Sheet 1 of 2) and Figure 3-2., Load Sensing System Installation (Sheet 2 of 2). The large opening is positioned toward the rear of the platform and provides clearance for the sensor's cable exit. The open part of the channel faces inward (away from the sensor).



Route the rear sensor wiring through the large opening in the channel. An additional shield is supplied for the two Rear Shear Beam Load Cells (to cover the sensor's cable exit). Mount the cable clamps inside the channel (3 small clamps per side) to properly retain the wiring within the channel.



During this step, pull all four Shear Beam Load Cell wires through the channels toward the LSS Module mounting location. Excess wire length should not be allowed to hang below the platform (it will be bundled near the LSS Module).



5. Mount the Platform to the Shear Beam Load Cells. Carefully maneuver the platform support structure toward the platform (from Ground Control). Make final adjustments by sliding the platform on the sawhorses or barrels. Ensure that sensor wiring is not damaged during this step. Study the Installation Drawing's detail regarding how components are placed. From below, insert the 5/8 inch Shank bolts (15/16" Head) with washers that mount the Platform to the Shear Beam Load Cells. Place the spacer bushing on top of the Shear Beam Load Cells (between the platform and sensor), with the beveled feature toward the sensor. Secure the Hex Lock Nut on top of the platform but do not completely tighten.



- 6. Torque all Fasteners to Specification. First, ensure that the platform is resting completely on the platform support structure (adjust using the Ground Control). Torque the two 1/2 inch Shank (3/4 inch Head) bolts between the platform support structure and the Shear Beam Load Cell to 75ft-lbs (105 Nm) (do all four sensors), ensuring that the access holes in the Load Cell Guard Brackets for the 5/8 inch Shank bolts remain aligned. Next, torque the 5/8 inch Shank (15/16 inch Head) between the platform and Shear Beam Load Cell to 50 ft-lbs (68 Nm) (do all four sensors).
- Mount the LSS Module to the Platform. Secure the LSS Module to the bracket with the hardware described in the Installation Drawing. Next, mount the assembly to the platform mid-rail (drill mid-rail if necessary).



8. Install the Shear Beam Load Cell Connections. Locate the connector from the Rear-Right Shear Beam Load Cell (orientation from the normal operator's position while using platform control console). Install the Rear-Right connector into the LSS Module's J8 by carefully rotating the molded portion of the connector until the keys align, and then tightening the knurled barrel. Tighten it first by hand (avoid cross-threading), and then carefully secure it with a small pair of locking pliers. The connector must be secured in this fashion to compress its O-ring seal and assure moisture resistance, but must not be over-tightened such that it damages the LSS Module. Install the Rear-Left into J7, the Front-Right into J6, and the Front-Left into J5. Neatly bundle the excess wire using wire ties so it can be stowed in the region below the LSS Module mounting location. Ensure that the excess wire length stays within the platform envelope and does not interfere with hydraulic hose movement at the rotator.



9. Wire the Load Sensing System to the Host Control System. Ensure that the Host Control System is powered-down by depressing the EMS at the Ground Control station. From the wire harness provided, insert the Black 12-position Deutsch connector into J2 on the LSS Module (System Interface – Communication) to install the JLG Analyzer connection. Plug the Deutsch connector into J1 on the LSS Module (System Interface – Power & Digital). Install a strain relief connector into the platform box and route the harness from the Grey 12-position Deutsch connector into the Platform Console Box.



Route the wires under the module. Terminate the three harness wires inside the Platform Console Box according to the Wiring Diagram for the Load Sensing System. Match the wire colors and numbers from the LSS harness to those of the Host Control System.



 Setup the Host Control System to enable the Load Sensing System. Power-up the Host Control System by resetting the EMS at the Ground Control station. Plug the JLG Analyzer into the Host Control System's Analyzer Connection at the Ground or Plat-



form (do not confuse the Host Control System and LSS Module's Analyzer Connections).

Enter the Access Level 1 Password (33271). Next, proceed to the MACHINE SETUP, LOAD sub-menu and select "2=CUTOUT PLT". Press the RIGHT ARROW to view the MACHINE SETUP, LOAD TYPE sub-menu. Set it to "1=4 UNDER BASKET" to select the Load Sensing System with four Shear Beam Load Cells beneath the platform. At this point, it is likely that the Host Control System's Visual and Audible Warnings for the Load Sensing System will be active (since the LSS Module is un-calibrated).

11. <u>Perform a Calibration of the Load Sensing System.</u> Refer to the Calibration procedure in this manual to prepare the Load Sensing System for use.

#### 3.3 CALIBRATION

#### Procedure

- 1. <u>Plug the JLG Analyzer into the LSS Module and enter the Access Level 1 Password.</u> Do not confuse the Host Control System and LSS Module's Analyzer Connections. The Host Control System's connection is mounted beneath the Platform Console Box, and the LSS Module's connection hangs from a short harness near the module. Proceed to the ACCESS LEVEL menu and enter the Access Level 1 Password (33271).
- Level the Platform. The platform should be approximately level for calibration. Level the platform from Ground Control (if necessary) to within <u>+</u>5 degrees.
- Configure the LSS Module for Boom Lift mode and <u>Desired Units.</u> Proceed to the LSS Module's MACHINE SETUP, MODEL sub-menu and select "MODEL=BOOM LIFT". Press the RIGHT ARROW to view the Units Selection. Select "UNITS=LBS" for platform load measurement in Pounds, and "UNITS=KG" for measurement in Kilograms.
- 4. <u>Remove everything except JLG Accessories from</u> <u>the Platform.</u> Empty the platform to allow the Load Sensing System to record its weight during calibration. All tools, debris, and customer-installed devices shall be removed. Permanently-fixed JLG Accessories shall remain and their contribution toward Rated Load will be accounted for in the next step.
- 5. <u>Configure the LSS Module for JLG Accessories</u>. The contribution of each permanently-fixed JLG Accessory toward Rated Load must be determined. JLG Accessories are decaled with their effective contribution toward Rated Load. If this decal is missing, reference the appropriate manual for the JLG Accessory or consult the table within this manual. Once determined, the contributions of all permanently-fixed JLG Accessories mounted in the platform of the vehicle shall be **added together** and entered in the Analyzer's PERSONALITIES, ACC'Y display (using the proper units).
- Execute a Calibration via the JLG Analyzer. Proceed to the Analyzer's CALIBRATION top level menu and press ENTER. Press ESC to abort a calibration or ENTER to calibrate (tare). If successful, the Analyzer will display "COMPLETE". If unsuccessful, a message will be displayed that will help lead to a resolution (reference the Troubleshooting section of this manual). Press ESC to return to the top level menu.

#### **Testing & Evaluation**

Refer to the Troubleshooting section of this manual if the Load Sensing System fails to meet these guidelines.

- <u>Plug the JLG Analyzer into the LSS Module.</u> Do not confuse the Host Control System and LSS Module's Analyzer Connections. The Host Control System's connection is mounted beneath the Platform Console Box, and the LSS Module's connection hangs from a short harness near the module.
- Level the Platform. The platform should be approximately level for analysis, or the guidelines below will not be applicable. Level the platform from Ground Control (if necessary) to within <u>+</u>5 degrees.
- Observe the Empty Platform Weight. Proceed to the DIAGNOSTICS, PLTLOAD sub-menu and observe the measured platform load. All tools, debris, and customer-installed devices shall be removed during evaluation. Ideally, the PLTLOAD should be zero but can vary ±15lbs (± 7kg). Further, the reading should be stable and should not vary by more than ±2lbs (±1kg) (unless there is heavy influence from wind or vibration).
- 4. Use the Technician's Weight to Evaluate. The technician should enter the platform and record the PLT-LOAD reading while standing in the center of the platform, and then each corner. The average of the readings should be the estimated weight of the technician. The range of the readings should be no more than 20lbs (9kg) (max PLTLOAD reading min PLT-LOAD reading).
- 5. Confirm Host Control System Warnings and Interlocks. Using the vehicle's keyswitch, select Platform Mode and power-up. Ensure that all controls are functional and the Load Sensing System's Overload Visual and Audible Warnings are not active. Simulate an Overload by unplugging the Shear Beam Load Cell connected to J5 on the LSS Module (the most easily accessed). The Overload Visual Warning in the platform should flash, and the Audible Warning (at Platform and Ground) should sound for 5 seconds On, and 2 seconds Off. All controls should be prevented. Install the disconnected Shear Beam Load Cell back in J5 on the LSS Module. The Overload Visual and Audible Warnings should cease and normal control function should return. Switch the vehicle's keyswitch to Ground Mode and repeat the above procedure. The Overload Visual Warning at the Ground Controls should flash, and the Audible Warning (at Platform and Ground) should sound for 5 seconds On, 2 seconds Off. However, the controls should remain functional (if the Host Controls System's MACHINE SETUP, LOAD is set to "2=CUTOUT PLT". If set to "3=CUTOUT ALL", then Ground Controls will be prevented as in the platform). Re-fit the Shear Beam Load Cell to J5 on the LSS Module and carefully tighten by hand, and then with a small pair of locking pliers to seat the O-ring seal.
- <u>Confirm Load Sensing System Performance with</u> <u>Calibrated Weights.</u> Operate the vehicle from Ground Control and place the boom in the transport position (fully stowed) for safety. Plug the JLG Analyzer into the LSS Module's connection and proceed to the DIAGNOSTICS, PLTLOAD display. Place 500lbs (230kg) in the platform and ensure that PLT-LOAD is with <u>+</u>5% of the actual weight.

#### 3.4 TROUBLESHOOTING

The following tables are furnished to provide possible resolutions for common difficulties. Difficulties are classified as General, Calibration, Measurement Performance, and Host System Functionality.

Table 3-1. LSS Troubleshooting Chart - General	

Difficulty	Possible Resolution		
JLG Analyzer does not display "HELP: PRESS ENTER" when connected to LSS Module's	The JI power power	LG Analyzer is failing to communicate with the LSS Module, but the LSS Module is ed (indicated by module's LED). Investigate JLG Analyzer serial communication and supply connections.	
connection, but the module's LED is lit or flashing.	1.	If the Analyzer displays "CONNECTING" or "CONNECTION ERROR" after a short interval, examine the Analyzer harness on J2. J2-2 should connect to Pin 3 on the Analyzer, and J2-11 should connect to Pin 2.	
	2.	If the Analyzer does not display anything (and there is no backlighting), examine the Analyzer's power supply. Remove the harness connection from J2 and ensure that J2-1 has approximately 12V, and J2-12 is 0V. The harness should connect J2-1 to Pin 1 on the Analyzer, and J2-12 to Pin 4 on the Analyzer.	
	3.	The JLG Analyzer is suspect. Substitute to determine cause of failure.	
	4.	The LSS Module is suspect. Substitute to determine cause of failure.	
LED on LSS Module does not	The LS	SS Module is un-powered, a short exists, or the device is damaged.	
light.	1.	LSS Module's power supply is improper. Check for the presence of approximately 12V on J1-1, and 0V on J1-2. The module's power supply comes from the Platform Console Box. Use to the Wiring Diagram to trace the conductors to their source.	
	2.	There is a short circuit on the reference voltage present on J5-J8. Unplug the con- nectors one at a time and observe if the module begins to function after a particular connection is removed. If so, carefully inspect the wiring between the module and that sensor.	
	3.	There is a short circuit on the pre-regulated supply for the JLG Analyzer present on J2-1. Unplug J2's connector and observe whether the module begins to function. If so, examine the Analyzer harness for defect.	
	4.	The LSS Module is suspect. Substitute to determine cause of failure.	

Difficulty	Possible Resolution		
JLG Analyzer displays	The LSS Module expected the empty platform to weight more for calibration.		
" <min after="" attempt="" cal"="" calibrate.<="" is="" made="" td="" to=""><td><ol> <li>The platform is resting on the ground or another obstruction during calibration. The platform's weight must be transferred through the Shear Beam Load Cells and into the support structure for an accurate calibration.</li> </ol></td></min>	<ol> <li>The platform is resting on the ground or another obstruction during calibration. The platform's weight must be transferred through the Shear Beam Load Cells and into the support structure for an accurate calibration.</li> </ol>		
	<ol> <li>The wrong Model Selection was made under the LSS Module's MACHINE SETUP, MODEL. This should be set to "MODEL=BOOM LIFT". Improper selection may lead the LSS Module to expect different empty platform weights.</li> </ol>		
	<ol> <li>One or more shear beams are improperly mounted (there is interference between the platform and support structure) or upside down. Refer to the Installation portion of this manual to resolve the issue.</li> </ol>		
	4. The calibration difficulty may be a result of a Measurement Performance issue. Review the Possible Resolutions under that category.		
JLG Analyzer displays ">MAX	The LSS Module expects the empty platform to weigh less for calibration.		
CAL" after attempt is made to Calibrate.	<ol> <li>Tools, debris, or customer-installed accessories have not been removed before cal- ibration. The LSS Module must tare an empty platform and its optional JLG Acces- sories.</li> </ol>		
	<ol> <li>The wrong Model Selection was made under the LSS Module's MACHINE SETUP, MODEL. This should be set to "MODEL=BOOM LIFT". Improper selection may lead the LSS Module to expect different empty platform weights.</li> </ol>		
	<ol> <li>One or more shear beams are improperly mounted (there is interference between the platform and support structure) or upside down. Refer to the Installation portion of this manual to resolve the issue.</li> </ol>		
	4. The calibration difficulty may be a result of a Measurement Performance issue. Review the Possible Resolutions under that category.		

Table 3-2.	LSS Troubleshooting	Chart - Calibration
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Difficulty	Possible Resolution		
Empty Platform Weight (DIAG- NOSTICS, PLTLOAD) is not within ±15lbs (±7kg) of zero. <b>or</b> Platform Load readings (DIAG- NOTICS, PLTLOAD) are unsta- ble by more than ±2lbs (±1kg) (without the influence of vibra- tion or wind).	<ol> <li>The LSS Module is unable to properly measure the platform weight.</li> <li>One of the Shear Beam Load Cells is not properly plugged into the LSS Module. Since the connectors seal with an O-ring and are located in a crowded area, it is possible that the connectors are threaded together, but poor electrical contact is made. Attempt to wiggle the molded portion of each connector on J5-J8. If properly tight- ened, the molded portion should not move. Also, examined each Shear Beam Load Cell's readings via the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL 1-4, LOAD displays and determine if the readings are reasonable. Note that it is possible to have only two sensors carrying all of the platform load due to fit between the platform and support structure (this is normal).</li> </ol>		
or There are large variations in Platform Load (DIAGNOS- TICS, PLTLOAD) based on the location of the load. Tolerance to variations is 20lbs for an evaluation using the techni- cian's weight, and <u>+</u> 5% of Rated Load when using cali-	2. Wiring leading to one of the Shear Beam Load Cells is damaged. Examine each sensor's reading using the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL 1-4, LOAD displays and determine if the readings are reasonable and responsive to slight downward pressure above the sensor being viewed. Carefully inspect sensor wiring where it passes through cable clamps for signs of damage. Inspect wiring where damage to the channel is apparent. If damage to the sensor's cordset is found, replace the appropriate Shear Beam Load Cell since the cordset is not serviceable (connector is molded for moisture resistance; cordset is soldered into sensor beneath welded stainless steel cover).		
(continued)	3. One of the Shear Beam Load Cells was not assembled properly during installation. Examine each sensor's reading using the JLG Analyzer. Proceed to the DIAGNOS-TICS, CELL 1-4, LOAD displays and determine if the readings are reasonable. It is often helpful to apply slight downward pressure above the sensor being examined and observe that its output increases (increasing force measurement; decreasing means the sensor is mounted upside-down). Compare the order of assembly to the detail on the Installation Drawing and ensure that the only contact between the platform and the support is through the sensor bodies (nothing else touches except wires). Re-assemble according to print if necessary. (continued)		

Table 3-3. LSS	Troubleshooting	<b>Chart - Measurem</b>	ent Performance
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Difficulty	Possible Resolution
Empty Platform Weight (DIAG- NOSTICS, PLTLOAD) is not within <u>+</u> 15lbs (±7kg) of zero. <b>or</b> Platform Load readings (DIAG-	4. Improper procedure was used when tightening the fasteners for the Shear Beam Load Cells. Failure to regard the notes in the Installation guide can result in large off-axis forces on the sensors (which disturb the primary measurement axis readings). Loosen all fasteners and sequentially torque them as recommended in the Installation guide (new fasteners are recommended to achieve proper torque).
NOTICS, PLTLOAD) are unsta- ble by more than <u>+</u> 2lbs (±1kg) (without the influence of vibra- tion or wind). <b>or</b> There are large variations in Platform Load (DLCNOC	5. Damage to the platform or support structure has occurred or one of the components is out-of-tolerance (not planar). When the fasteners are torqued to specification, the sensors are disturbed by large off-axis forces (which disturb the primary measurement axis readings). Loosen all fasteners and observe whether the platform or support were drawn-up by the fasteners (they should both be planar and match up accurately). Resolution is to replace the damaged or faulty component. Watch for Shear Beam Load Cell damage (yield) as a result of this difficulty.
Platform Load (DIAGNOS- TICS, PLTLOAD) based on the location of the load. Tolerance to variations is 20lbs for an evaluation using the techni- cian's weight, and <u>+</u> 5% of Rated Load when using cali- brated weights.	6. One of the Shear Beam Load Cells is contaminated by debris or moisture. Examine each sensor's reading using the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL 1-4, LOAD displays and determine if the readings are reasonable and stable (not changing by more than ±2lbs (±1kg) (without the influence of vibration or wind). Lack of measurement stability is a key indication of contamination. Unplug the appropriate connector (J5 is CELL 1, J6 is CELL 2, J7 is CELL 3, and J8 is CELL 4) and inspect for dirt or moisture. Look carefully into the female connector on the sensor's cordset for evidence of contamination. Debris should be brushed away with a soft bristle brush (do not introduce any cleaners as they will leave conductive residue). Moisture should be allowed to evaporate or accelerated with a heat-gun (use low heat and be carefully to not melt connector materials). Moisture intrusion into the molded portion of the connector (capillary action into the wire bundle) or the Shear Beam Load Cell itself will require replacement of the sensor.
	7. One of the Shear Beam Load Cells has been mechanically damaged (yielded). Any Shear Beam Load Cell that is physically deformed or has damage to one of the stainless steel covers should be replaced immediately. It is also possible to have invisible mechanical damage resulting from an extreme overload (>6000lbs [>2722kg]). This can be detected by removing all fasteners that mount the platform and supporting the platform on two saw-horses or barrels (no weight resting on the Shear Beam Load Cells). Examine each sensor's reading using the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL 1-4, LOAD displays and observe whether the unloaded sensors read with ±15lbs (±7kg) of zero (individually). Replace sensors that read excessive force when physically unloaded.
	8. The LSS Module is suspect. Interchange the Shear Beam Load Cell connections (J5- J8) and observe the results via the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL 1-4, LOAD displays and observe the readings. If the problem seems to remain with a particular sensor, carefully re-examine the issues above. If the problems seems to remain with a particular LSS Module channel, substitute another module.

#### Table 3-3. LSS Troubleshooting Chart - Measurement Performance

Difficulty	Possible Resolution		
The Visual and Audible Over-	The Host Control System is failing to regard the overload signal from the LSS Module, or		
load Warnings fail to sound when platform is loaded beyond Rated Load, or when simulated by unplugging a Shear Beam Load Cell from the LSS Module. Controls remain functional at Platform and Ground Control positions.	<ol> <li>the signal is shorted.</li> <li>The Load Sensing System must be enabled within the Host Control System. Plug the JLG Analyzer into the Host Control System, enter the Access Level 1 password (33271), and examine the MACHINE SETUP, LOAD sub-menu. The selection "2=CUTOUT PLT" should be displayed for European Community compliance (plat- form controls prevented during overload, ground controls remain operational). In country- or customer-specific circumstance, the selection "3=CUTOUT ALL" is used (platform and ground controls prevented during overload).</li> </ol>		
	2. The signal between the LSS Module and the Host Control System is shorted. The Platform Module's J8-6 is an input, and it connected to the J1-5 output on the LSS Module To examine the status of this signal, plug the JLG Analyzer into the Host Control System, enter the Access Level 1 password (33271), and examine the DIAGNOSTICS, LOAD display. The display will indicate "OK" when the Platform Module's input is energized (approximately 12V), and "OVERLOADED" when it is de-energized (0V). Refer to the Wiring Diagram for Load Sensing System for details		
	3. Observe the LSS Module's assessment of overload using the JLG Analyzer plugged into the LSS Module's connection. Proceed to the DIAGNOSTICS, OVERLOADED? display. The display should indicate "OVERLOADED? N" when the platform is empty, and "OVERLOADED? Y" when the platform is overloaded. If the assessment is improper, the difficulty may be a result of a General or Measurement Performance issue. Review the Possible Resolutions under those categories.		
	<ol> <li>If the LSS Module's J1-5 Output does not appears to coincide with the DIAGNOS- TICS, OVERLOADED? display, then the LSS Module is suspect. Substitute to deter- mine cause of failure.</li> </ol>		
The Visual and Audible Over- load Warnings sound even when the platform is empty.	The LSS Module is un-powered, un-calibrated, or is experiencing a Measurement Perfor- mance difficulty. Alternately, the Host Control System is not receiving the proper signal from the LSS Module.		
Controls are prevented in the same manner as when over- loaded.	<ol> <li>Ensure that the LSS Module is powered. The LSS Module's LED will be lit or flash if the module is powered. If not, ensure that approximately 12V is present between J1- 1 and J1-2 on the LSS Module (J1-1 is positive). Trace the Ignition and Ground sup- ply wires into the Platform Console Box's Wiring Harness using the Wiring Diagram to locate the difficulty.</li> </ol>		
	2. Plug a JLG Analyzer into the LSS Module's connection and ensure that the Host Control System is powered-up. When HELP:PRESS ENTER is displayed, press the ENTER key on the Analyzer. If "EVERYTHING OK" is displayed, it is probable that the Overload Signal from the LSS Module is not reaching the Host Control System. This signal is present on LSS Module's J1-5 and is approximately 12V normally, and OV during an overload. This signal eventually reaches the Platform Module's J8-6. Refer to the Wiring Diagram for wire color, number, and terminal information.		
	<ol> <li>If the Analyzer displayed "OVERLOADED" in the previous step, press the ENTER key again. If "NO CAL" is displayed, the Load Sensing System has not been prop- erly calibrated. Refer to the Calibration portion of this manual.</li> </ol>		
	<ol> <li>If another fault is displayed, refer to the portion of this manual that describes Fault Messages and their causes.</li> </ol>		
	<ol><li>The difficulty may be a result of a Measurement Performance issue. Review the Pos- sible Resolutions under those categories.</li></ol>		

Table 3-4.	LSS Troubleshooting	Chart - Host S	ystem Functionality
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Difficulty	Possible Resolution
The Ground Audible Warning fails to sound, but the Platform Audible Warning sounds properly.	The Host Control System's Ground Alarm is missing or improperly installed. Verify that the device is mounted. Verify wiring from the Main Terminal Box and Ground Module according to the proper Host Control System documentation. The Ground Alarm is energized from J11-1 on the Ground Module (approximately 12V). Ensure that the ground termination is proper (0V).
Controls remain functional at the Ground Control position during an overload, or when simulated by unplugging a	The Host Control System is configured to prevent platform controls only in the event of overload (as required for EN280 compliance). Alternately, the Host Control System can be configured to prevent ground and platform controls for country- or customer-specific circumstances.
Shear Beam from the LSS Module. The Control at the Platform Control position are prevented when using the engine, but not when using the Auxiliary Power Unit.	Plug the JLG Analyzer into the LSS Module's connection and enter the Access Level 1 password (33271). Proceed to the MACHINE SETUP, LOAD sub-menu. Set this parameter to "2=CUTOUT PLT" to prevent platform controls in the event of overload. Set this parameter to "3=CUTOUT ALL" to prevent platform and ground controls in the event of overload.

#### Table 3-4. LSS Troubleshooting Chart - Host System Functionality

Pin	Signal	Description
1	VBAT	Positive Power Supply from Host Control System (12-24V)
2	GND	Negative Power Supply from Host Control System (0V)
3	GND-2	Connects to GND
4	N/C	Unused
5	DO1	Overload Indicator Output (Normal=VBAT / Over- load=0V)
6	DO2	Warning Indicator Output (Normal=0V / Over- loaded=VBAT for 5 Sec, 0V for 2 Sec)
7	DI3	Unused
8	DI2	Select OVERLD3 Personality Rating (No=0V/ Yes=VBAT)
9	DI1	Select OVERLD2 Personality Rating (No=0V / Yes=VBAT)
10	GND-2	Connects to GND
11	VBAT-2	Connects to VBAT
12	VBAT-2	Connects to VBAT

## Table 3-5. LSS Module System Interface Connector -Power & Digital (J1 - Grey)

## Table 3-6. LSS Module System Interface Connector – Communication (J1 - Black)

Pin	Signal	Description
1	APWR	Pre-Regulated Supply for JLG Analyzer (Analyzer Pin 1; approx. 12V)
2	ТХ	RS-232 for JLG Analyzer (Analyzer Pin 3)
3	TRP1	120 Ohm CANbus Terminator
4	CANH-1	CANbus Interface High
5	CANS-1	CANbus Shield Termination (Not same as GND)
6	CANH-2	Connects to CANH-1
7	CANL-2	Connects to CANL-1
8	CANS-2	Connects to CANS-1
9	CANL-1	CANbus Interface Low
10	TRP2	120 Ohm CANbus Terminator
11	RX	RS-232 for JLG Analyzer (Analyzer Pin 2)
12	GND	Ground for JLG Analyzer (Analyzer Pin 4)

## Table 3-7. LSS Module Load Cell Connector Pinout (J5,<br/>J6, J7, J8)

Pin	Signal	Description
1	+ Signal	Positive Sensor Output (approx. 2.5V)
2	Cal Clock	Serial Clock to Sensor's Integrated Memory
3	- Excitation	Negative Sensor Supply Voltage (approx. 0V)
4	+Excitation	Positive Sensor Supply Voltage (approx. 5V)
5	- Signal	Negative Sensor Output (approx. 2.5V)
6	Cal Data	Serial Data from Sensor's Integral Memory



**NOTE:** Physical connector as viewed looking into the cable end

#### Figure 3-3. LSS Module Load Cell Connector Pinout (J5, J6, J7, J8)



Figure 3-4. Wiring Diagram

### **SECTION 4. PARTS**

	TABLE OF CONTENTS				
Flgure	Description	Page			
4-1	PLATFORM SUPPORT AND LOAD SENSING INSTALLATION	4-2			



Figure 4-1. Platform Support & Load Sensing Installation

FIG & ITEM #	PART NUMBER	DESCRIPTION	QTY.	REV.
		SUPPORT & LOAD SENSING SYSTEM INSTALLATION	Ref.	
	0272704	E300A/AJ/AJP, E/M400AJP and E/M450AJ	Ref.	к
	1001108604	E/M400A/AJ and E/M450A	Ref.	В
	0273125	E/M600/A/AJ	Ref.	J
	1001118888	340AJ	Ref.	С
	1001146158	18RS/24RS	Ref.	D
	0272703	400S, 460SJ, 450A/AJ Series II, 510AJ, 600SC/SJC,	Ref.	Ν
		660SJC, 601S, 740A/AJ, 800A/AJ, 800S, 860SJ, 1100SB, 1200SJP, 1250AJP & 1350SJP		
	0272703	600A/AJ, 600S/SJ, 660SJ (USA Built Machines)	Ref.	Ν
	1001115099	600A/AJ, 600S/SJ, 660SJ (China Built Machines)	Ref.	А
	0275574	680S	Ref.	В
	1001120607	1500SJ	Ref.	А
	0272384	Machines with SkyGlazier Option except 1500SJ (< 2007)	Ref.	Н
	0272703	Machines with SkyGlazier Option except 1500SJ (2008 >)	Ref.	Ν
	1001120607	1500SJ with SkyGlazier Option	Ref.	Α
101	Not Used			
102	0100048	Grease, Dielectric (Not Shown)	A/R	
103		Bolt Options:	6	
	0630407	Capscrew 1/4"-20NC x 5/8"		
	0641405	Bolt 1/4"-20NC x 5/8"		
	0760608	Bolt M6 x 16mm		
104		Bolt Options:	3	
	0641406	Bolt 1/4"-20NC x 3/4"		
	0641416	Bolt 1/4"-20NC x 2"		
	0760618	Bolt M6 x 50mm		
105		Bolt Options:	1	
	0641405	Bolt 1/4"-20NC x 5/8"		
	0641407	Bolt 1/4"-20NC x 7/8"		
	3941406	Screw 1/4" x 3/4"	7	
	0760610	Bolt M6 x 20mm		
106	0641516	Bolt 5/16"-18NC x 1"	3	
107		Bolt Options:	_	
	0641822	All Except 18RS, 24RS, 680S & 340AJ (Bolt 1/2-13NC x	8	
		2 3/4 )		
	06/1900	Event (Bolt 1/2 12NC x 2 $2/4^{2}$ )	4	
	06/1920	$\frac{1}{2} = \frac{1}{2} = \frac{1}$	4	
	0701222	$18BS_{24}RS_{34}RA \mid (Bolt M12 \times 70 mm)$	8	
108	0701222	Bolt Ontions:	4	
100	0642024	Bolt 5/8-11NC x 3"		
	0642034	Bolt 5/8"-11NC x 4 1/4"		
	0701624	Bolt M16 x 80mm	8	
109	0.01021	Bolt Options:	8	
	0681608	Bolt 3/8"-16NC x 1" (Grade 8)		
	0771012	Bolt M10 x 25mm (Grade 10.9)		
110		Flatwasher Options:	8	
	4891600	Flatwasher 3/8" Hardened	_	
	5241000	Flatwasher M10 Hardened		

FIG & ITEM #	PART NUMBER	DESCRIPTION	QTY.	REV.
111		Guard, Load Cell (Right) Options:		
	0902920	All Except 680S & 340AJ	2	
		680S		
	3576904	Front	1	
	3577017	Rear	1	
	1001118910	340AJ	2	
	1001146213	18RS & 24RS	2	
112		Guard, Load Cell (Left) Options:		
	0902919	All Except 680S & 340AJ	2	
		680S		
	3576903	Front	1	
	3576931	Rear	1	
	1001118909	340AJ	2	
	1001146214	18RS & 24RS	2	
113		Bracket, Module Mounting Options:	1	
113A	0902894	Design A		
113B	1001113483	Design B		
114	0962450	Bushing, Spacer	4	
	4812300	Flatwasher M16 (18RS, 24RS & 340AJ Only)		
115		Channel, Wire Options:	2	
	1271538	All Except 680S		
	1271651	680S		
116	1320136	Clamp	A/R	
117	1320224	Clamp	A/R	
118		Electronic Interface Module Options	1	
		(Note: Machine must be recalibrated when replaced):		
	1600350	USA Built Machines Prior to S/N 0300076525		
	1600387	USA Built Machines S/N 0300076525 to Present		
	1600387	Belgium, China & Romanian Built Machines		
119	2420202	Load Cell Assembly (See Figure 4-2 for Breakdown)	4	
120	Not Used			
121		Locknut Options:	A/R	
	3311405	Locknut 1/4"-20NC		
	3290605	Locknut M6		
122	3311508	Nut, Flanged 5/16"-18NC	3	
123		Locknut Options:	8	
	3311805	Locknut 1/2"-13NC		
	3291205	Locknut M12		
124		Locknut Options:	4	
	3312005	Locknut 5/8"-11NC		
	3291605	Locknut M16		
125		Hardware Options:	A/R	
	3900283	Screw, Button Head 3/8"-16NC x 3/4"		
	8310643	Screw, Button Head M8 x 25mm (Grade 10.9)		
	0760808	Bolt M8 x 16mm		
	1001118274	Nut, Retainer M8	_	
126	4061054	Shield	2	
127	4240033	Tie-Strap (Not Shown)	A/R	

FIG & ITEM #	PART NUMBER	DESCRIPTION	QTY.	REV.
128		Flatwasher Options:	A/R	
	4711400	Flatwasher 1/4" Thin		
	4811700	Flatwasher M6		
129		Flatwasher Options:	4	
	4711600	Flatwasher 3/8" Thin		
	4811900	Flatwasher M8		
130		Flatwasher Options:	A/R	
	4751400	Flatwasher 1/4" Thick		
	4811700	Flatwasher M6		
	4811702	Flatwasher M6 (18RS & 24RS Only)		
131	4751500	Flatwasher 5/16" Thick	3	
132		Platform Support Weldment Options:	1	
		Machines without Glazier Option:		
	4846608	E300A/AJ/AJP, 340AJ, E/M400A/AJ/AJP & E/M450A/AJ		
	4846573	400S, 460SJ, 450A/AJ Series II, 510AJ, 600SC/SJC, 660SJC, 601S, 740A/AJ, 800A/AJ, 800S, 860SJ, 1100SB, 1200SJP, 1250AJP, 1350SJP & 1500SJ		
	4846573	600A/AJ, 600S/SJ, 660SJ (USA Built Machines) (Note: S/N starts with 03xxxxxxxx)		
	1001113465	600A/AJ, 600S/SJ, 660SJ (China Built Machines) (Note: S/N starts with B3xxxxxxxx)		
	4341327	680S		
	1001149734	18RS & 24RS		
		Machines with Glazier Option:		
	4846651	Machines with SkyGlazier Option (< 2007)		
	4846573	Machines with SkyGlazier Option (2008 >)		
133	Not Used			
134		Flatwasher Options:	8	
	4891800	Flatwasher 1/2" Hardened		
	5241200	Flatwasher M12 Hardened		
135		Flatwasher Options:	A/R	
	4892000	Flatwasher 5/8" Hardened		
	5241600	Flatwasher M16 Hardened		
136		Harness Options (See Figure 4-2 for Breakdown)	1	
	4922916	EIM Power Harness (E300A/AJ/AJP, E/M400A/AJ/AJP, E/M450A/AJ & E/M600/A/AJ)		
	4922917	Platform Analyzer Harness (E300A/AJ/AJP, E/M400A/AJ/ AJP, E/M450A/AJ & E/M600/A/AJ)		
	1001120371	EIM Power Harness (E340AJ)		
	4922869	EIM Power Harness (400S, 460SJ, 450A/AJ Series II, 510AJ, 600A/AJ, 600S/SJ, 600SC/SCJ, 601S, 660SJ, 660SCJ, 680S, 740A, 800A/AJ, 800S, 860SJ, 1100SB, 1200SJP, 1250AJP, 1350SJP & SkyGlazier)		
	1001120608	EIM Power Harness (1500SJ)		
	1001150197	EIM Power Harness (18RS & 24RS)		
	1001150159	Platform Box Connector Harness (18RS & 24RS) (Not Shown)		
137	1061020	Cable, Load Cell Harness Extension (680S Only - Not Shown)	2	
138	4460225	Terminal Plug - 6 Position (400A & 450A Only - Not Shown - Located Inside Platform Control Console on J8)	1	

FIG & ITEM #	PART NUMBER	DESCRIPTION	QTY.	REV.
139	Not Used			
140	2540038	Grommet (All Models Except E300A/AJ/AJP, E/M400A/AJ/	1	
		AJP and E/M450A/AJ)		

FIG & ITEM #	PART NUMBER	DESCRIPTION	QTY.	REV.





FIG & ITEM #	PART NUMBER	DESCRIPTION	QTY.	REV.
		LOAD SENSING ELECTRICAL COMPONENTS	Ref.	
	0100048	Grease, Dielectric (Not Shown)	A/R	
1	2420202	Cell Load & Harness Assembly	4	А
2	Not Available	Harness, Load Cell (1 per Assembly)	4	
3	Not Available	Connector, Strain Relief (1 per Assembly)	4	
4	Not Available	Receptacle, Female (1 per Assembly)	4	
5		EIM Power Harness Options:	A/R	
	4922916	EIM Power Harness (E300A/AJ/AJP, E/M400A/AJ/AJP, E/M450A/AJ and E/M600/A/AJ)		2/B
		(Note: Analyzer Harness must be ordered separately.)		_
	4922869	EIM Power Harness (400S, 460SJ, 450A/AJ Series II, 510AJ, 600A/AJ, 600S/SJ, 600SC/SCJ, 601S, 660SJ, 660SCJ, 680S, 740A, 800A/AJ, 800S, 860SJ, 1100SB, 1200SJP, 1250AJP, 1350SJP & SkyGlazier) (Note: Analyzer Harness included in EIM Harness.)		E
	1001120371	EIM Power Harness (E340AJ)		В
	1001120608	EIM Power Harness (1500SJ)		А
	1001150197	EIM Power Harness (18RS & 24RS)		А
6	4460933	Plug, Male - 12 Position (Gray) (J1)	1	
	0840055	Boot	1	
	4460465	Socket, Female	A/R	
	4460466	Plug, Hole	A/R	
7	4460836	Plug, Male - 12 Position (Black) (J2)	1	
	0840055	Boot	1	
	4460465	Socket, Female	A/R	
	4460944	Socket, Female (18RS & 24RS Only)	A/R	
	4460466	Plug, Hole	A/R	
8	4460226	Pin, Male (All Machines except 1500SJ)	2	
9	1001120631	Connector M12 Male (1500SJ Only)	1	
	4460944	Socket, Female (1500SJ Only)	4	
10		Platform Analyzer Harness Options:		
	4922917	Platform Analyzer Harness (E300A/AJ/AJP, E/M400A/AJ/ AJP, E/M450A/AJ and E/M600/A/AJ) (Note: NOT part of p/n 4922916. Order separately.)	1	2/A
	4922705	Platform Analyzer Harness (400S, 460SJ, 450A/AJ Series II, 510AJ, 600A/AJ, 600S/SJ, 600SC/SCJ, 601S, 660SJ, 660SCJ, 740A, 800A/AJ, 800S, 860SJ, 1100SB, 1200SJP, 1250AJP & 1350SJP) (Note: Included with p/n 4922869)	1	1/A
	Not Available	Platform Analyzer Harness (340AJ & 1500SJ) (Note: See Model Specific Parts Manual)	1	
11	4460465	Socket, Female	4	
	4460761	Housing, 4 Position	1	
12	4460227	Pin, Male	4	
13		Connector, Strain Relief Options:	4	А
	4460428	Connector (All Machines except 1500SJ)		
	1001108122	Connector, Tee (1500SJ Only)		

FIG & ITEM #	PART NUMBER	DESCRIPTION	QTY.	REV.
14		Harness, Platform Box Connector (18RS & 24RS Only)	1	А
14A	1001119020	Connector, Buss Bar	1	
	4460933	Plug, Male - 12 Position (Gray)	1	
	4460944	Socket, Female	A/R	
	4460466	Plug, Hole	A/R	
14B	4460539	Plug, Male - 3 Position	1	
	4460944	Socket, Female	3	
14C	4460536	Receptacle, Female - 3 Position	1	
	4460943	Pin, Male	3	
	4933289	EIM LOAD CELL TO PLATFORM CONTROL BOX WIRING DIAGRAM COMPONENTS (E300A/AJ/AJP, E/M400A/AJ/AJP, E/M450A/AJ & E/M600/A/AJ ONLY)	Ref.	1/A
101	4460007	Strip, Terminal (Not Shown - Located in Platform Console Box) (Electric Machines Only - Not Shown)	1	
102 to 105	Not Used		-	- <del>-</del>
106	4922930	EIM Load Cell To Platform Control Box Terminal Strip Harness (Not Shown)	1	2/B
	4460326	Plug, Male - 3 Position (To J2 on Platform Power Module)	1	
	4460226	Socket, Female	2	
	4460227	Pin, Male	1	
	4460464	Pin, Male	1	



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