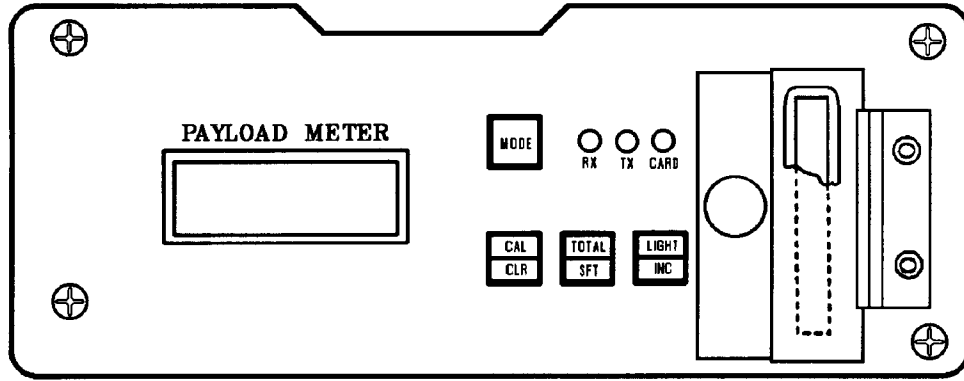


CEAM006301

Operation & Maintenance Manual



PAYLOAD METER II™



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PAYLOAD METER II™

ON BOARD WEIGHING SYSTEM (OBWS)

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PAYLOAD METER II™ ON BOARD WEIGHING SYSTEM (OBWS)

GENERAL INFORMATION

The Payload Meter II™ (PLM II™) On Board Weighing System displays and records the payload weight along with other operating information. The system consists of a payload meter, pressure sensors, deck mounted lights and an inclinometer.

The payload meter (Figure 20-1) uses the four suspension pressures and an inclinometer to determine the load in the truck. The payload weight can be displayed in short tons or metric tons.

Haul Cycles

The beginning of a new haul cycle starts at the dump, when the body comes down from dumping the last load.

At the loading site, the PLM II™ begins to calculate the size of each shovel pass (swingload) once the payload is greater than 10% of rated load for the truck. There are three external deck-mounted lights on each side of the truck. The lights indicate payload weight divided into three separate stages. A forecast feature will flash a deck mounted light predicting the payload weight if the next bucket of material is dropped into the body.

At the moment the wheels begin to turn after loading under the shovel, the PLM II™ takes one sample of

suspension and inclinometer data. After traveling 160 m (0.10 mi.) from the loading site, the PLM II™ uses the data sampled under the shovel to calculate final payload.

The PLM II™ displays payload on its display when the truck is stopped. For the first 160 m (0.10 mi.) after loading, the payload meter displays distance from the loading site. At all other times when the truck is moving, the display shows the time of day.

The payload meter stores in memory various operating data. This data includes:

- payload, time, distance, and travel speed for each cycle
- date and time that the engine was started and stopped
- date and time of each fault that occurred or was canceled
- total payload and the overall number of cycles for a specific time period

This data is retained even when the power is switched off. The stored data is backed up by an internal battery.

The data can be down loaded from the payload meter to a personal computer when a communication cable is connected to the port inside the cab.

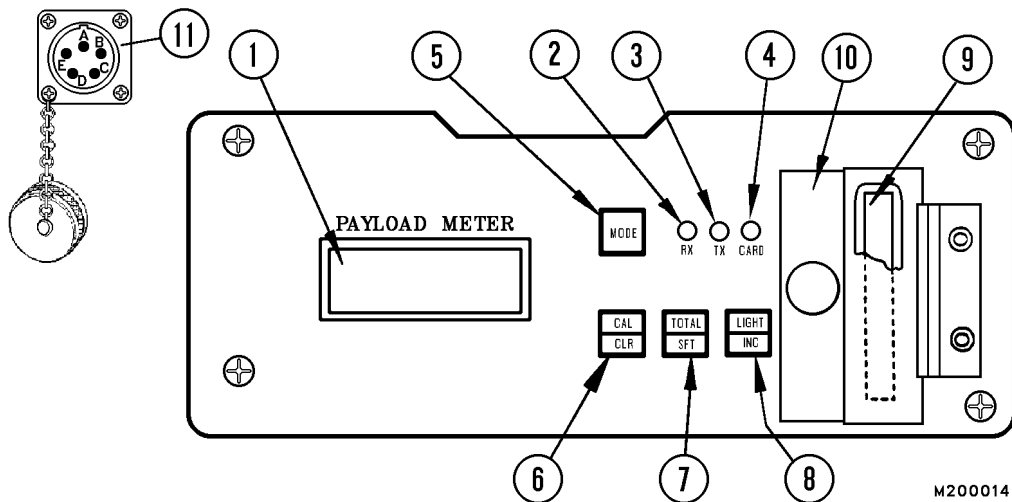


FIGURE 20-1. PAYLOAD METER II™

- | | |
|---|---|
| <p>1. Display panel
 2. Reception pilot lamp (Rx busy)
 3. Transmission pilot lamp (Tx busy)
 4. Memory card access lamp (CARD busy)
 5. Mode switch [MODE]</p> | <p>6. CAL CLR switch
 7. Total/shift switch [TOTAL] [SFT]
 8. Light/increment switch [LIGHT] [INC]
 9. Memory card
 10. Cover
 11. Diagnostic/Download Port</p> |
|---|---|

LIGHTS, SWITCHES, and COMPONENTS On The Face Of The Payload Meter (Refer to Figure 20-1)

1. Display Panel

Digital display area for the data being recorded in memory. This will include items such as:

Payload

Date & Time

Cycles

Travel Distance

Fault Codes and Warnings

2. Reception Pilot Lamp (Rx Busy)

This light will illuminate for 3 seconds when the system is powered up. It will then be lit whenever the computer is communicating.

3. Transmission Pilot Lamp (Tx Busy)

This light will illuminate for 3 seconds when the system is powered up. It will then be lit whenever the memory is being downloaded to a personal computer.

4. Memory Card Access Lamp (CARD Busy)

This light will illuminate for 3 seconds when the system is powered up. It will also be lit whenever the memory data is being downloaded to the memory card.

5. Mode Switch

This switch is used to select the mode or system that will allow a function to be performed. This may include:

Various settings or corrections to the display

Memory card downloading

Clearing data

Display of Abnormalities or Warnings

Setting the speed limit

Setting the date and time

6. Calibration/Clear Switch

Used to calibrate the machine when the conditions regulate this action.

Also used with the TOTAL/SFT switch to clear total payload and overall number of cycles.

7. Total/Shift Switch

Used to display payload and overall number of cycles each time the load is dumped. Will display the error codes. This switch is also used with the CALIBRATION/CLEAR switch to clear total payload and overall number of cycles.

8. Light/Increment Switch

Used to change the digital increments or units for the various displays. Also used to adjust the brightness of the lights on the monitor display.

9. Memory Card

Used to receive data from the payload meter memory to this card which can then be used to transfer the data into a personal computer. This enables the memory to be downloaded and saved when a personal computer is not available.

10. Cover

Protective cover for the Memory Card. Do not open or place foreign objects in slot.

11. Diagnostic/Download Port

Connector port that is used for downloading the memory data to a personal computer.

TIPS FOR OPERATION

To assure the On Board Weighing System records the most accurate and consistent data, these important steps should be followed:

- * Always keep suspension oil and nitrogen properly charged. The most common failure for causing inaccurate payload data is due to improperly charged suspensions. Always follow shop manual procedures when charging a suspension. Refer to Section "H". It is crucial to maintain the proper oil and nitrogen levels at all times.
- * For most Komatsu Trucks:
Use **only the brake lock** switch to hold the truck stationary at the loading and dumping area.
For Komatsu 330M/HD785 Trucks ONLY:
Use the **park brake switch** to hold the truck stationary at the loading and dumping area.
Any other method will not allow the payload system to register properly.
- * Do not activate the "Lamp Test" switch during loading. Inaccurate and inconsistent data may be stored.
- * At the loading area **do not release** the Brake Lock (or Park Brake switch) **until the loading is complete** and the load shock from the last load dumped has settled.
- * The loading area surface **must be** maintained as flat and level as possible. The On Board Weighing System can compensate for slight variations in grade and unevenness, but ruts, berms, rocks, etc. will cause the system to record inaccurate and inconsistent data.
- * Regularly remove "carryback" from the dump body.
- * Calibrate regularly. Refer to "Calibrating a Truck".
- * Do not focus on single payloads when viewing data from the payload meter. Use the average of several payloads to get a more accurate calculation of payload productivity.

EXTERNAL DISPLAY LIGHTS

The Payload Meter II™ controls three light relays. The relays operate three deck mounted lights on each side of the truck. There is one green light, one amber light, and one red light. (Figure 20-2)

While the truck is stopped being loaded and the hoist lever is in the float position, the appropriate lights will remain on according to the following schedule:

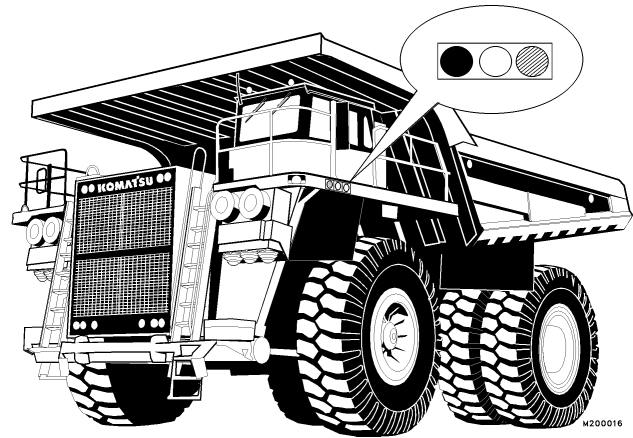


FIGURE 20-2. LOAD INDICATOR LIGHTS

INDICATOR LIGHTS			PAYLOAD WEIGHT
Off	Off	Green	50% and Greater
Off	Amber	Green	90% and Greater
RED	Amber	Green	105% and Greater

The shovel or loader operator can predict the payload weight by observing these lights. During the loading operation, a forecast feature flashes a deck mounted light predicting the payload weight after the next bucket of material is loaded into the body.

The logic is as follows:

1. If the measured payload is varying 3% or less of the rated load for more than 3 seconds, the current load is deemed a steady value.
2. If the difference between the previous steady value and the current steady value is greater than 15% of the rated load, the difference is taken to be the size of the current bucket.
3. The average size of previous buckets is added to the current load. One of the deck mounted lights will turn on, if another "average" size load is put in the body, and will blink at one second intervals.

THEORY OF OPERATION

Basic Description

The payload meter uses the four suspension pressures and the inclinometer to determine the load in the truck. These inputs are critical to the calculation of the load. The other inputs to the payload meter (Body Up, Speed, Brake Lock, Alternator R Terminal, and Engine Oil Pressure) are used to indicate where the truck is in the haul cycle. These inputs enable the payload meter to make time and distance measurements for the haul cycle.

The suspension pressures are the key ingredients in determining the sprung weight of the truck. These pressures are converted into forces using the formulas shown below.

$$\text{Sprung Weight} = \frac{\pi}{4} \text{ Suspension Diameter}^2 (\text{Psi Left} + \text{Psi Right})$$

$$\text{Sprung Weight} = \text{Axle Weight}(\text{lbs})/2000$$

These forces are combined with the geometry of the truck to produce the load calculation. It is critical that the suspensions are charged according to shop manual specifications and the pressure sensors are functioning properly.

Inclinometer

The inclinometer gives the payload meter information regarding the pitch angle of the truck. The front and rear incline factors are determined by the pitch angle. These two factors account for the load transfer that occurs when the truck is inclined nose up or nose down.

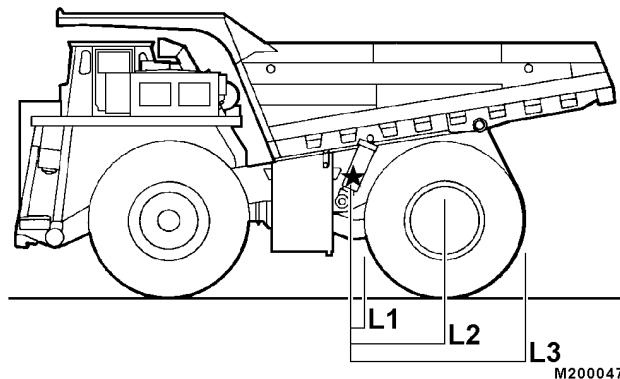


FIGURE 20-3

Linkage Factor

The linkage factor is part of the complex calculations performed by the payload meter to determine the load in the truck. The linkage factor is dependent on the load on the rear suspensions.

Figure 20-3 shows the side view of a truck. The nose pin is marked with a star and there are three arrows pointing to different spots of the rear tire. This figure shows how the support under the rear tire can affect the calculation of the load. The payload meter does not directly measure the load transferred to the frame through the nose pin. To account for portion of the load carried by the nose pin, the linkage factor is multiplied by the rear suspension force. It is assumed that the truck is supported under the center of the tire. In this case the payload meter uses L2 to help compute the linkage factor. If, however, the truck is backed into a berm and the rear tire is supported towards the back of the tire, the actual linkage factor calculation should use L3. Since the payload meter assumes L2 it will overestimate the load in the truck. The opposite is true in the case where the rear tires are supported toward the front of the tire. The linkage factor should use L1 but the payload meter assumes L2. This change in leverage will cause the payload meter to underestimate the load.

Gain Factor

Gain factor is part of the formula the payload meter uses to calculate the payload. The gain factor is a tool that compensates for variations between actual weight of the payload and the calculated weight from the payload meter. The gain factor should only be adjusted after several payloads have been weighed on a scale. The gain should never be adjusted based only on one payload. It takes at least 10 scale weigh-ins to determine an average variation. A worksheet is located at the end of this chapter to assist in calculating the necessary gain adjustment.

There are two types of gain adjustments, G_t gain and UP factor. It is recommended that only the G_t gain be adjusted. This adjustment is made using the potentiometer on the side of the payload meter. Refer to "Adjusting the Gain".

Brake Lock

The Brake Lock only applies the rear brakes. This allows the front wheels to rotate slightly as the truck is being loaded. This is important because the payload meter assumes that the front wheels can rotate freely. As the truck is being loaded, it will begin to squat down on the suspensions. This will change the wheel base dimension of the truck. This freedom of movement prevents additional binding and friction in the front suspensions.

The incline of the grade on which the truck is loading is measured by the inclinometer. This helps determine the incline factors that are applied to the front and rear sprung weights. The tire forces on the road surface that hold the truck on grade affect the suspension pressures. If the front and rear brakes are locked, the effect on the suspension pressures cannot be determined. If only the rear brakes are applied the effect is predictable and the incline factors accurately account for the forces on the tires.

If the service brake or park brake is used and depending on the incline and other factors, the payload meter can overestimate or underestimate the load. **It is important that only the brake lock be used while loading the truck. (Parking brake on 330M/HD785).**

Sources of Error

Poorly charged suspensions can lead to systematic error in the calculation of payload. The error is most obvious when the oil level is low. When there is too little oil in the suspensions, the cylinder may compress completely under a load. The weight of the truck will be carried by the metal to metal contact within the suspension. Not only will the ride of the truck and the life of the tires, and other components be affected, but the pressure in the cylinder will not truly represent the load on the truck. Under-charged suspensions typically cause the payload calculations from the payload meter to be lower than the actual payload.

Typical Data From Service Check Mode

A sample data set is shown in Figure 20-4. This data was taken in the laboratory and is used in Figure 20-5 to calculate the final load. Note that the front suspension pressures were converted into the front sprung weight using the formulas above Figure 20-5. The front sprung weight is then multiplied by the front incline factor and the front linkage factor. The same is done with the rear sprung weight. The front and rear sprung weights are then summed. This number is multiplied by the G_t gain potentiometer value. The calibration load is subtracted from the total to produce the final load. The load displayed on the meter is this final load (item #15) multiplied by the UP gain factor.

Number	Data	Description
1	13:09	Current Time
2	749.4	Front Left Pressure (Psi)
3	848.9	Front Right Pressure (Psi)
4	863.2	Rear Left Pressure (Psi)
5	1049.0	Rear Right Pressure (Psi)
6	106.0	Front Weight (Tons)
7	75.1	Rear Weight (Tons)
8	-1.85	Inclinometer (Degrees)
9	0.95	Incline Factor - Front Wheels
10	0.984	Incline Factor - Rear Wheels
11	1	Link Factor - Front Wheels
12	1.539	Link Factor - Rear Wheels
13	70.6	Calibration Sprung Weight (Tons)
14	1.000	Gain Adjustment
15	143.8	Current Load (Tons)
16	3.9	Battery Backup Voltage (Volts)

Figure 20-4.

NOTE: This screen is the only place that the value of the G_t gain potentiometer can be checked.

There are two gain factors that can be applied to the payload measurement. The first is the G_t gain factor and the other is the UP gain factor. They are not applied uniformly to all payload calculations.

Example Calculation of Payload

These calculations used a 13" front suspension diameter and 10" rear suspension diameter.

$$\text{Sprung Weight} = \frac{\pi}{4} \text{ Suspension Diameter}^2 (\text{Psi Left} + \text{Psi Right})$$

$$\text{Sprung Weight} = \text{Axle Weight}(\text{lbs})/2000$$


Front Weight (6)	106.00	Rear Weight (7)	75.10
x Incline Factor (9)	0.95	x Incline Factor (10)	0.98
	100.70		73.90
x Link Factor (11)	1.00	x Link Factor (12)	1.53
Front Weight	100.70	Rear Weight	113.70
Front Weight	100.70		
Rear Weight	113.70		
Total Weight	214.40		
XGain Factor (14)	1.00		
	214.40		
- Calibration (13)	-70.60		


Figure 20-5.

Viewing Payload Calculation Inputs

The PLM II™ estimates payload by monitoring suspension pressures when the truck is loaded and compares them to truck empty pressure values. The PLM II™ uses one empty truck weight for all payload calculations. This empty truck weight is called the 'tare weight'. It is not the empty vehicle weight (EVW). It is an estimate of the empty weight of all the truck components suspended above the suspensions. The process of making the PLM II™ calculate the tare weight is called the calibration procedure.


This calibration weight is used as item #13 from the manual calculation procedure in Figure 20-4.

1. Press and hold the LIGHT/INC and MODE switches until "CHEC" is flashing on the display. 

2. Press and hold the CAL/CLR switch until "CALLO" is flashing on the display. 



3. Press the CAL/CLR switch to cycle through the following data. The sequence repeats.

Item and Description	Units
1. Year of Calibration	Last 2 digits of year
2. Month:Day of Calibration	XX:XX
3. Hour:Minute of Calibration	XX:XX
4. Truck Model Setting	
5. Pressure Front Left	Psi
6. Pressure Front Right	Psi
7. Pressure Rear Left	Psi
8. Pressure Rear Right	Psi
9. Front Sprung Weight	Tons
10. Rear Sprung Weight	Tons
11. Degree of Incline	±° Nose Up Positive
12. Incline Factor - Front Axle	
13. Incline Factor - Rear Axle	
14. Link Factor Front Axle	
15. Link Factor Rear Axle	
16. Calibration Weight	Tons

4. Press MODE once and "CHEC" will flash on the display. 

5. Press MODE once and the meter will return to normal operation.

Checking the Gain




1. Press and hold the LIGHT/INC and MODE switches until "CHEC" is flashing on the meter. 
2. Press and hold the LIGHT/INC switch until "ALLO" is flashing on the display. "A.FUL" may also be displayed. 
3. Press the LIGHT/INC switch 14 times. The number displayed will be the current G_t gain. Press MODE twice to return to normal operation.

Adjusting the Gain

Before adjusting the gain perform the following steps:

1. Confirm the suspension oil and nitrogen charges are at the levels specified in the shop manual.
2. Weigh the empty truck and then calibrate the payload meter. Do both in succession to ensure the weights are nearly identical.
3. Weigh at least 10 different loads to get an accurate deviation from actual scale weight and the payload calculation from the payload meter. Complete the gain adjustment worksheet at the end of this module. The worksheet is an accurate way to calculate the necessary gain adjustment.

Adjustment Procedure:

1. Ensure the PLM II™ is in normal operating mode.
2. Adjust the gain potentiometer on the side of the meter. Right to decrease, left to increase.
3. Press and hold the LIGHT/INC and MODE switches until "CHEC" is flashing on the meter. 
4. Press and hold the LIGHT/INC switch until "ALLO" is flashing on the display. "A.FUL" may also be displayed. 
5. Press the LIGHT/INC switch 14 times. The number displayed will be the current G_t gain. This is not a "live" reading. Any time the gain is changed, this cycle must be repeated to view the new change.
6. Press MODE once and "CHEC" will flash on the display. 
7. Press MODE once and the meter will return to normal operation.

TYPES OF DATA STORED

Cycle Data

One cycle is considered to be from the point where a load is dumped to the point where the next load is dumped. Data between these two points is recorded in memory. Examples of the data are shown below. The maximum number of cycles that can be stored in memory is 2900 cycles.

ITEM	UNIT	RANGE	REMARKS
Engine Operation Number	Number	1 - 65535	Advances by one each time the engine is started.
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	These values are stored when the load is dumped.
Time Minute	Minute	1 - 59	
Payload	Metric tons Short tons	0 - 6553.5	
Travel Time When Empty	Minute	0 - 6553.5	
Travel Distance When Empty	Miles/Km	0 - 25.5	
Maximum Travel Speed When Empty	Mph/Kmh	0 - 99	
Average Travel Speed When Empty	Mph/Kmh	0 - 99	
Time Stopped When Empty	Minute	0 - 6553.5	
Time Stopped During Loading	Minute	0 - 6553.5	
Travel Time When Loaded	Minute	0 - 6553.5	
Travel Distance When Loaded	Miles/Km	0 - 25.5	
Maximum Travel Speed When Loaded	Mph/Kmh	0 - 99	
Average Travel Speed When Loaded	Mph/Kmh	0 - 99	
Time Stopped When Loaded	Minute	0 - 6553.5	
Dumping Time	Minute	0 - 6553.5	
Speed Limit	Mph/Kmh	0 - 99	
Warnings For Each Cycle	The fault codes that occur during each cycle		

Engine ON/OFF Data

When the engine is started or stopped, the following data is recorded.

ITEM	UNIT	RANGE	REMARKS
Engine Operation Number	Number	1 - 65535	Advances by one each time the engine is started.
Last Two Digits Of The Year	Year	0 - 99	Indicates when the engine was started.
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	
Last Two Digits Of The Year	Year	0 - 99	Indicates when the engine was shut off.
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	
Total Payload	Metric tons Short tons	0 - 999900.0	Total payload from the time when the engine was started until the time the engine was shut off.
Total Number Of Cycles	Number	0 - 9999	Totals for the time that the engine was running.

Fault Codes and Warning Data

ITEM	UNIT	RANGE	REMARKS
Error Code	Displayed by a combination of letters and numbers representing a specific error code.		
Engine Operation Number At Time Of Occurrence	Number	1 - 65535	Every time the engine is started the number advances by one.
Number Of Times Of Occurrence Since The Engine Was Switched ON	Number	1 - 255	
Last Two Digits Of Year	Year	0 - 99	
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	

Engine Operation

ITEM	UNIT	RANGE	REMARKS
Number when Canceled	Number	1 - 65535	Every time the engine is started the number advances by one.
Last Two Digits Of Year	Year	0 - 99	
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	
NOTE: If the engine operation number is a 0, this indicates that the problem occurred or was canceled (depends on the operation that was performed) when the key switch was in the ON position and the engine was not running.			

Total Payload and Total Number of Cycles

The total payload and overall number of cycles can be displayed using the forced display operation. Both values start from a zero point whenever the memory has been cleared. The payload total is automatically displayed when the load is dumped.

ITEM	UNIT	RANGE	REMARKS
Total Payload	Metric Tons Short Tons	0 - 999900.0	The total payload since the unit was cleared.
Total Number Of Cycles	Digital Number	0 - 9999	The number of cycles since the unit was cleared.
Last Two Digits Of Year	Year	0 - 99	Date and time the unit was cleared.
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	

Other Data

CONTENT	ITEM	UNIT	RANGE	REMARKS
Set Up Data That The Operator Can Check	Speed Limit	Km/MPH	0 - 99	
	Option Code	Digital Number	0 - 13	Communication Mode
Calibration Data	Year	Year	0 - 99	Date and time when calibrated.
	Month	Month	1 - 12	
	Day	Day	1 - 31	
	Hour	Hour	24 Hour Clock	
	Minute	Minute	0 - 59	

OPERATOR FUNCTIONS

Using the Operator Load Counter

Description

The payload meter makes available to the operator a total load counter and haul cycle counter. This allows each operator to track the tons hauled during their shift. The total is displayed in hundreds of tons. For example, if 223 is displayed, this means that 22,300 tons have been hauled since the last time the cycle counter was cleared.

This memory location is separate from the main payload data storage. This memory is not cleared when the Data All Clear Operation is performed. Clearing this memory does not affect the main payload data storage.

Viewing the Operator Load Counter

1. Press the TOTAL/SFT switch once.

If there is a fault code present at this time:

2. The error code for that problem will be displayed. This will be a flashing display.
3. Press the TOTAL/SFT switch again. If additional faults or warnings exist, that fault code will be displayed as a flashing code.
4. Repeat step #3 until no fault codes are displayed. ":" will show when no additional faults exist. The display will then show total tons hauled since the last time the counter was cleared. The total is displayed in hundreds of tons.
5. Press the TOTAL/SFT switch again. The number displayed is the number of haul cycles since the last time the cycle counter was cleared.
6. Press the TOTAL/SFT switch again. ":" is displayed for 2 seconds before the display returns to normal operations.

Clearing the Operator Load Counter

1. Press the TOTAL/SFT switch once. The number displayed is the total tons hauled since the last time the counter was cleared. The total is displayed in hundreds of tons.
2. Press and hold the CAL/CLR switch until the display flashes.
3. Press the CAL/CLR switch until "0000" is displayed. After 2 seconds the meter will return to normal operation.

Clearing this memory **does not** affect the main payload data storage.

Dimming the Lights on the Display

There are a total of 10 brightness levels on the PLM display.

From the normal operation display:

1. Press the LIGHT/INC switch. The lighting will become one level dimmer. This will continue until the lighting has reached its lowest level.
2. After reaching the lowest level, the display will return to the brightest setting.

If the switch is held in the depressed position, the brightness will change continuously.

INITIAL SETUP OF PAYLOAD METER

There are several things that must be checked and programmed when a payload meter is first installed.

1. Check the switch settings on the side of the meter.
2. Check the Operator Check Mode settings
3. Check the Service Check Mode settings
4. Calibrate the clean truck.

The next few pages show the steps required to perform these checks. Only after all of these steps have been performed can the payload meter be released for service.

Switch Settings

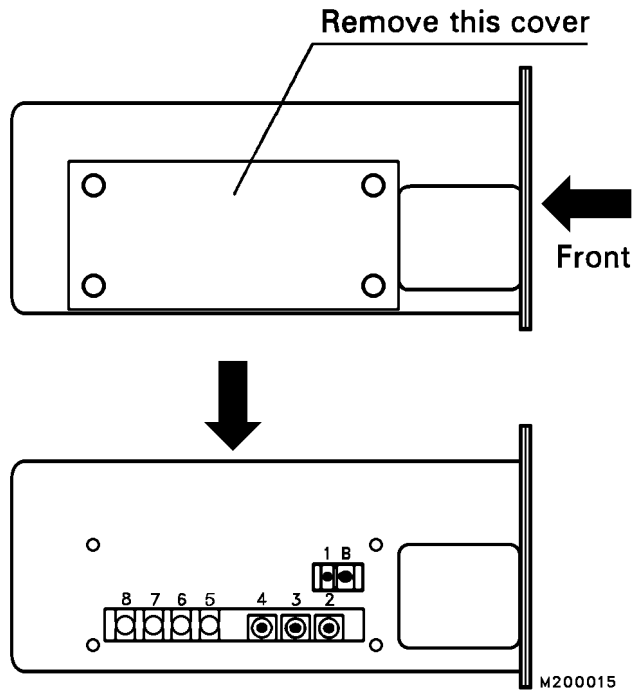


Figure 20-6.

There are nine switches located behind the panel on the left side of the payload meter. Figure 20-6 shows the switch numbers. The following switch positions should be confirmed before the meter is installed.

* Set switch 4 for the appropriate model.

Switch	Position
1	Initial Setup should be set to 1.00 - Gain Clockwise(-20%) CCW (+20%) Refer to "Gain Factor" for adjust guidelines
B	Do not Adjust - Buzzer Volume
2	7 - Speed Regulation 0=107%, 7=100%, F=92% The 930-2 should be set to '6'.
3	7 - Distance Regulation 0=107%, 7=100%, F=92% The 930-2 should be set to '6'.
4*	4 - 685E
	5 - 630E
	B - 730E
	C - 930E
	D - 530M
	E - 330M
	F - 830E
5	DOWN - Memory function (DOWN = Enable UP=Disable)
6	DOWN - Inclinator Use (DOWN = Enable UP=Disable)
7	DOWN = Short Tons, UP = Metric Tons
8	UP




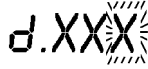




⚠ IMPORTANT ⚠

930E-2 trucks are equipped with 53/80R63 series tires and require small changes to the switch settings of the PLM II™. The tires have a larger rolling radius than the PLM II™ assumes. This causes the PLM II™ to underestimate distances by 1%. The Speed Regulation and Distance Regulation switches should be switched to position 6. This is contrary to what the label may say.

Additionally, the payload gain on 930E-II™ trucks also needs to be adjusted. The front suspensions are larger than the original 930E suspension, and therefore, data programmed into the payload meter is not completely accurate. The gain must be increased by 1%. There are two methods for changing this gain; changing the UP factor using the buttons on the front panel, or using the gain adjustment potentiometer on the side of the meter. The preferred method is using the potentiometer. Refer to "Adjusting the Gain".

Checking the Operator Check Mode

The Operator Check Mode is used to check and change several settings. These should be checked before the payload meter is put into service.

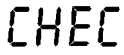
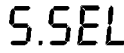
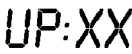

1. Press and hold the MODE switch. The display will show: 
2. Press the MODE switch once. The display will show:  Refer to "Data All Clear" to clear the haul cycle data.
3. Press the MODE switch once. The display will show:  Refer to "Display of Fault Codes" for viewing fault codes.
4. Press the MODE switch once. The display will show:  This is the truck ID number. Refer to "Setting The Machine ID" to change Machine ID.
5. Press the MODE switch once. The display will show:  Refer to "Setting The Operator ID" to change operator.
6. Press the MODE switch once. The display will show "SP:62" should be displayed. The speed limit should be set to 62 to avoid unnecessary faults and warnings. Refer to "Setting The Speed Limit" to make adjustments. 
7. Press the MODE switch once. The display will show:  Refer to "Setting The Option Code" to change the option.
8. Press the MODE switch once. The current time should be displayed with the minutes flashing.  Refer to "Setting The Time And Date" to change the time and date.
9. Push the MODE switch to return to normal operation.

Checking the Service Check Mode



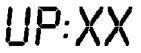
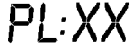




Refer to UP Factor and PL Mode for additional information prior to setting these values.

Setting "UP:XX"

1. Press and hold the LIGHT/INC and MODE switches. The display will show: 
2. Press and hold the LIGHT/INC and TOTAL/SFT switches. The display will show: 
3. Press the CAL/CLR switch once. The display will show: 
4. Press the LIGHT/INC switch until "XX" is set to the desired gain ($\pm 9\%$).
5. Press MODE. The display will show: 
6. Press MODE and the meter will return to normal operation.

Setting "PL:00"

1. Press and hold the LIGHT/INC and MODE switches. The display will show: 
2. Press and hold the LIGHT/INC and TOTAL/SFT switches. The display will show: 
3. Press the CAL/CLR switch once. The display will show: 
4. Press the CAL/CLR switch once. The display will show: 
5. Press the LIGHT/INC switch until "PL:00" is displayed. **ONLY "PL:00" IS RECOMMENDED.** 
6. Press the MODE switch. The display will show: 
7. Press MODE and the meter will return to normal operation.

Checking the G_t setting:

Refer to "Checking the Gain" and "Adjusting the Gain" for display and adjustment information.

Checking the Inclinometer Settings

Refer to "Viewing Payload Calculation Inputs" for instructions on displaying truck pitch angle. With an empty truck on level ground and suspensions properly charged, the display should indicate 0.0 ± 1.0 . Remember, this is not a live display. After adjustment, Service Check Mode must be entered again to obtain a new reading.

An alternative method is to use a personal computer running the Komatsu Payload Download Program for Microsoft Windows. The "Monitor Pressures" section of the program displays live inclinometer data. The inclinometer can be loosened and adjusted until the live display shows 0.0 ± 1.0 degrees with an empty truck on level ground, and the suspensions properly charged.

Another method is to use a voltmeter to read the voltage output of the inclinometer. With an empty truck on level ground, and the suspensions properly charged, the output voltage should be $2.6 \pm .1$ volts.

Calibrating a Truck

This procedure causes the PLM II™ to calculate a new empty 'tare' (calibration) weight (refer to "Viewing Payload Calculation Inputs") for use with all subsequent payload estimates. Before calibrating, confirm the truck nose up produces a positive incline.

The payload meter should be calibrated whenever one of the following occurs:

1. When a new payload meter is installed.
2. When a suspension sensor has been changed.
3. Whenever the suspensions have been serviced or the Nitrogen levels have changed.
4. Whenever any major change to the truck has been performed that would change the empty vehicle weight.
5. Once a month thereafter.

To calibrate the payload meter:

1. With the engine running and the truck stopped, press and hold the CAL/CLR switch until "CAL" is flashing on the display.
2. Drive the truck until the speed is approximately 20-10 MPH (10-15 Km/H)
3. Press the CAL/CLR switch once.
4. Drive until the display switches back to the time of day. This will take up to 30 seconds.



Carry out this operation on flat level ground.

Travel in a straight line.

Maintain a steady speed, 20-10 MPH (10-15 Km/H)

5. The payload meter is now calibrated and ready for normal operation.

DISPLAYS AT START-UP

POWER ON:

All external display lamps (Figure 20-2) will come on and stay on for approximately 27 seconds during the "Power-up Process".

The "Power-up Process" will display the PLM settings. Each display will occur for approximately 3 seconds:

1. The display will show: **88:88**
In addition, a buzzer will sound and the following lamps will light for 3 seconds:
 - Reception Pilot Lamp (2, Figure 20-1)
 - Transmission Pilot Lamp (3, Figure 20-1)
 - Memory Card Pilot Lamp (4, Figure 20-1)
2. The display will show: **CO:XX**
The "xx" indicates the Truck Model. Refer to "Initial Setup of Payload Meter" for code definitions.
3. The display will show: **Cd:--**
This display indicates the status of the Memory Card where: **Cd:00**
"Cd : - -" indicates Card Not Used, and
"Cd : 00" indicates Card Is Used.
4. The display will show: **CL:--**
This display indicates the status of the Inclinometer for the PLM, where **CL:00**
"CL : - -" indicates Inclinometer Not Used, and
"CL : 00" indicates Inclinometer Is Used.
5. The display will show: **US:--**
This display indicates method of measurement where: **US:00**
"US : - -" indicates METRIC Tons.
"US : 00" indicates U.S. Tons.
6. The display will show: **SU:--**
This function is not used. **SU:00**
"SU : - -" indicates Switch 8 is up.
"SU : 00" indicates Switch 8 is down.

7. The display will show: **d.XXX**
This display indicates the Machine ID code where "xxx" indicates a value between 0 and 200.
8. The display will show: **o.XXX**
This display indicates the Operator ID code where "xxx" indicates a value between 0 and 200.
9. The display will show: **SP:XX**
This display indicates the Speed Limit setting where "xx" indicates a value between 0 and 99 km/h.
10. The display will show: **OP:XX**
This display indicates the Option code setting.
Refer to "Operator Check Mode, Setting the Option Code" and to "Method of Operation" for more information on this function.

NORMAL OPERATION

If the truck engine is started before the preceding "Power-up Process" is completed, the display will shift to normal operation.

If the engine is running when the payload meter starts up, only "o:XXX" and "d:XXX" will display before switching to normal operations.






SETUP AND MAINTENANCE

Speed Limit






A warning can be displayed if the machine exceeds a preset speed.

The available range is: 10 - 99 km/h (6 - 62 mph). It is recommended to set the speed limit to 99 km/h (62 mph).

Setting The Speed Limit

1. Press and hold the MODE switch until "Cd:dP" is flashing. 
2. Press the MODE switch once. The display will show: 
3. Press the MODE switch once. The display will show: 
4. Press the MODE switch repeatedly until "SP:XX" is displayed. 
5. Press the LIGHT/INC switch to change the "unit digit" to the desired number.
6. Press the TOTAL/SFT switch and the display will then indicate: 
7. Press the LIGHT/INC switch to change the "tens digit" to the desired number.
8. Press MODE switch to return to normal operation.

Setting the Option Code




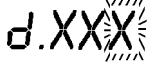


1. Press and hold the MODE switch until "Cd:dP" is displayed. 
2. Press the MODE switch once. The display will show: 
3. Press the MODE switch once. The display will show: 
4. Press the MODE switch repeatedly until "OP:XX" is displayed. 
5. Press the LIGHT/INC switch to change the "unit digit" to the desired number.
6. Press the TOTAL/SFT switch and the display will then indicate: 
7. Press the LIGHT/INC switch to change the "tens digit" to the desired number.
8. Press the MODE switch to return to normal operation.
9. The Option Code selects the PLM communication mode as follows:

Option Code	COMMUNICATION MODE
0	Stand Alone
10	PMC Mode (530M/HD1500 only)
12	Modular Mining Mode, Scoreboard and User Data Communication Mode




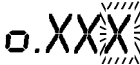


NOTES:

1. The Option Code is set to "0" for trucks not equipped with Modular Mining System (MMS) (Except 530M/HD1500).
2. The 530M/HD1500 with Powertrain Management Control (PMC) system uses "10" as the setting for the Option Code.
3. For trucks with Modular Mining System (MMS) or Scoreboard, the Option Code is "12".

Setting The Machine I.D. Code









1. Press and hold the MODE switch until "Cd:dP" is displayed. 
2. Press the MODE switch once. The display will show: 
3. Press the MODE switch once. The display will show: 
4. Press the MODE switch once. "d.XXX" is displayed. 
5. Press the LIGHT/INC switch to change the last digit to the desired number.
6. Press the TOTAL/SFT switch and the display will show: 
7. Press the LIGHT/INC switch to change the middle digit to the desired number.
8. Press the TOTAL/SFT switch and the display will show: 
9. Press the LIGHT/INC switch to change the first digit to the desired number.
10. Press the MODE switch to return to normal operation.

Setting The Operator I.D. Code

1. Press and hold the MODE switch until "Cd:dP" is displayed. 
2. Press the MODE switch once. The display will show: 
3. Press the MODE switch once. The display will show: 
4. Press the MODE switch repeatedly until "o.XXX" is displayed. 
5. Press the LIGHT/INC switch to change the last digit to the desired number.
6. Press the TOTAL/SFT switch and the display will then indicate: 
7. Press the LIGHT/INC switch to change the middle digit to the desired number.
8. Press the TOTAL/SFT switch and the display will show: 

9. Press the LIGHT/INC switch to change the first digit to the desired number.
10. Press the MODE switch to return to normal operation.

Setting The Time and Date

1. Press and hold the MODE switch until "Cd:dP" is displayed. 
2. Press the MODE switch once. The display will show: 
3. Press the MODE switch once. The display will show: 
4. Press the MODE switch repeatedly until "XX:XX" is displayed. 
5. Press the LIGHT/INC switch to change the minutes.
6. Press the TOTAL/SFT switch and the display will then indicate: 
7. Press the LIGHT/INC switch to change the hours. The clock is a 24 hour clock.
8. Press the TOTAL/SFT switch and the display will then indicate: 
9. Press the LIGHT/INC switch to change the day.
10. Press the TOTAL/SFT switch and the display will then indicate: 
11. Press the LIGHT/INC switch to change the month.
12. Press the TOTAL/SFT switch and the display will then indicate: 
13. Press the LIGHT/INC switch to change the year.
14. Press MODE switch to return to normal operation.

DOWNLOAD OF INFORMATION




Payload information and fault codes recorded should be downloaded to a personal computer on a regular basis. The software required is available under part number AK4635. Detailed instructions for installing the software and downloading the data is provided with AK4635 PLM II™ download software.

Data All Clear

This function will erase all of the cycle data, engine ON/OFF data, and fault/warning data. Total payload and the overall number of cycles will not be cleared.






IMPORTANT - Before clearing the data, download the data to a personal computer.

To begin, the shift lever should be in the "N" position, the brake lock set, the hoist control lever should be in the "FLOAT" position and the body in the down position.

1. Press and hold the MODE switch until "Cd:dP" is displayed. 
2. Press the MODE switch once. The display will show: 
3. Press and hold the CAL/CLR switch until "A.CLE" is flashing. 
4. Press the CAL/CLR switch again and the memory will be cleared. The meter will then return to normal operation.

This does not clear the Operator Load Counter.

DISPLAY OF FAULT CODES

1. Press and hold the MODE switch until "Cd:dP" is displayed. 
2. Press the MODE switch once. The display will show: 
3. Press the MODE switch once. The display will show: 
4. Press the TOTAL/SFT switch.
If there are no faults or warnings, the display will show for 6 seconds. 
If there are current faults or warnings, the codes will be displayed in order of their priority, the highest priority first. Each code will flash for **6 seconds**.
5. After the current codes have been displayed, past history codes that have been reset will be displayed. Each code will flash for **3 seconds**.
If there are no history codes or after all history codes have been shown, the display will show for 3 seconds: 

The system will then proceed to the following displays: Refer to Page 22 for details.

- Condition of the shift selector on mechanical trucks or brake lock on electric trucks.

The panel will display: "C1:XX" for 3 seconds, then indicate:

Mechanical trucks

"C1:00" Shift selector is in "N".

"C1:- —" Shift selector is not in "N".

Electric trucks

"C1:00" Brake lock is on.

"C1:- —" Brake lock is off.

- Condition of the Body Up Switch signal.

The panel will display: "C2:XX" for 3 seconds, then indicate:

"C2:00" Body up switch is in up position.

"C2:- —" Body up switch is in down position.

- Condition of the Engine Oil Pressure signal.

The panel will display “:C3:XX” for 3 seconds, then indicate:

“C3:00” Engine is running.

“C3:— —” Engine is not running.

- Condition of Alternator 'R' terminal signal.

The panel will display “C4:XX” for 3 seconds, then indicate:

“C4:00” Engine is running.

“C4:— —” Engine is not running.

- Condition of the Spare Analog Input 1 signal.

The panel will display “C5:XX” for 3 seconds with XX: as an input signal (V).

- Condition of the Spare Analog Input 2 signal.

The panel will display “C6:XX” for 3 seconds with XX: as an input signal (V).

- Condition of the Spare Digital Input 1 signal.

The panel will display “C7:XX” for 3 seconds, then:

“C7:00” High.

“C7:— —” Low.

- Condition of the Spare Digital Input 2 signal.

The panel will display “C8:XX” for 3 seconds, then:

“C8:00” High.

“C8:— —” Low.

4. Press the TOTAL/SFT switch to view faults again or press the MODE switch to return to normal operation.

FAULT CODES				
FAULT	CAUSE	CORRECTIVE ACTION	DECK LIGHTS	PRIORITY
b-FL Steady	Brake Lock On and Body is UP and not dumping.		Flash	1
b-FL Flashing	Brake Lock Off and Body is UP.			1
Cd Flashing	Remove memory card during download.			2
F-09	Internal battery voltage below 2.7 volts.	Open controller check internal battery and connections. Check voltage using Service Check Mode.		3
L-FUL Flashing	Less than 300 haul cycle data sets memory capacity remain.			4
L-FUL Steady	2900 Haul cycles have been stored and the oldest data is being overwritten.			4
E-FUL Flashing	Less than 10 engine start data sets memory capacity remain.			4
E-FUL Steady	115 engine start data sets have been stored and the oldest data is being overwritten.	Down load data to PC and clear memory. See Operator Check Mode; Clearing the haul cycle data memory.		4
F-FUL Flashing	Less than 10 fault data sets memory capacity remain.			4
F-FUL Steady	230 fault data sets have been stored and the oldest date is being overwritten.			4
H-FUL Flashing	Haul cycle counter or payload totalizer are near capacity.			4
H-FUL Steady	Haul cycle counter exceeded 9999 or payload totalizer exceeded 999900.	Press TOTAL/SFT to display totals, then press CAL/CLR for at least 2 seconds, then press CAL/CLR again for at least 2 seconds.		4
F-18	Battery alternator R terminal is shorted or disconnected. The input to the PLM is less than 2V.	Trouble shoot wiring. Pin CN1-9, circuit # 21D.		5
F-20 Flashing	Sensor power is less than 15V or over 20V (18V normal).	Trouble shoot wiring, possible short.	Flash	6
F-21 Flashing	Left front pressure signal is less than 1V (1 - 5V normal).		Flash	7
F-22 Flashing	Right front pressure signal is less than 1V (1 - 5V normal).	Trouble shoot wiring, likely an open circuit.	Flash	8
F-23 Flashing	Left rear pressure signal is less than 1V (1 - 5V normal).		Flash	9
F-24 Flashing	Right rear pressure signal is less than 1V (1 - 5V normal).		Flash	10

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FAULT CODES			
FAULT	CAUSE	CORRECTIVE ACTION	DECK LIGHTS
F-25 Flashing	Left front pressure signal is greater than 5V (1 - 5V normal).	Trouble shoot wiring, likely sensor wires are shorted together.	Flash
F-26 Flashing	Right front pressure signal is greater than 5V (1 - 5V normal).		Flash
F-27 Flashing	Left rear pressure signal is greater than 5V (1 - 5V normal).		Flash
F-28 Flashing	Right rear pressure signal is greater than 5V (1 - 5V normal).		Flash
F-31 Flashing	Inclinometer input less than 1.57V (more than + 10 degrees, nose up).	Trouble shoot wiring, likely an open circuit (Inclinometer output is 2.6V when horizontal, calibration: -103mV/degree)	Flash
F-32 Flashing	Inclinometer input greater than 3.63V (more than - 10 degrees, nose down).	Trouble shoot wiring, likely sensor wires are shorted together.	Flash
F.CAL	No calibration has been performed or cal data has been cleared.	Perform calibration.	Flash
F-41 Flashing	Light relay #1 driver short circuit.	Trouble shoot wiring, relay coil likely shorted.	
F-42 Flashing	Light relay #2 driver short circuit.		
F-43 Flashing	Light relay #3 driver short circuit.		
F-44 Flashing	Light relay #4 driver short circuit.		
F-45 Flashing	Light relay #5 driver short circuit.		
L.bad Flashing	Payload measured while chassis is pitching.	Data ignored, error will clear for next load.	
SP:SP Flashing	Speed limit setting is being exceeded.	Set the speed limit, using Operator Check Mode, to 62 mph or 99Km/h depending on the position of the unit selection switch (switch #7 behind the left side panel).	
F-71 F-73 F-80 F-81 F-91 F-92 F-93 F-94 F-95 F-96 F-97 F-98 All Flashing	Communications port error.	Check communication wiring (RS-232) to Modular Mining Hub or to Scoreboard. Check OP setting.	

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Monitoring Input Signals

This procedure can be used to monitor the current input signals to the payload meter.

1. Press and hold the LIGHT/INC and MODE switches until "CHEC" is flashing.
2. Press and hold the CAL/CLR and TOTAL/SFT switches until "S.CHE" is flashing.
3. Press the CAL/CLR switch to cycle through the following information :

C1	Mechanical Trucks	C1:00 - Shift Selector in "N" C1:-- - Shift Selector not in "N"
C1	Electric Trucks	C1:00 - Brake Lock On C1:-- - Brake Lock Off
C2	Body Up	C2:00 - Body Down C2:-- - Body Up
C3	Engine Oil Pressure	C3:00 - Engine Run C3:-- - Engine Stopped
C4	Alternator R Terminal	C4:00 -Alternator Charging C4:-- - Alternator Stopped
C5	Analog 1 - Not Used	
C6	Analog 2 - Not Used	
C7	Digital 1 - Not Used	
C8	Digital 2 - Not Used	
C9	Speed	Vehicle Speed
C10	Travel Distance - under the current loaded or empty state	xx.xx Miles
C11	<u>Current Status</u> Note: Sample values are shown.	03:01 - Empty Stopped 01:02 - Empty Traveling 06:03 - Loading 02:04 - Loaded Traveling 04:05 - Loaded Stopped 05:06 - Dumping
C12(a)*	Time Empty Travel	S1:xx - Minutes*10
C12(b)	Time Empty Stopped	S2:xx - Minutes*10
C12(c)	Time Loaded Travel	S3:xx - Minutes*10
C12(d)	Time Loaded Stop	S4:xx - Minutes*10

4. Press the MODE switch once and "CHEC" will flash.
5. Press the MODE switch once and the meter will return to normal operation.

Service Check Mode

1. Press and hold the LIGHT/INC and MODE switches until "CHEC" is flashing.
2. Press and hold the LIGHT/INC switch until "ALLO" is flashing. "A.FUL" may also be displayed.
3. Press the LIGHT/INC switch to cycle through the following data. The sequence repeats.

Item and Description	Units
1. Current Time	Hours:Minutes
2. Pressure Front Left	Psi
3. Pressure Front Right	Psi
4. Pressure Rear Left	Psi
5. Pressure Rear Right	Psi
6. Front Weight	Tons
7. Rear Weight	Tons
8. Degree of Incline	±° Nose Up Positive
9. Incline Factor - Front Axle	
10. Incline Factor - Rear Axle	
11. Link Factor - Front Axle	
12. Link Factor - Rear Axle	
13. Calibration Weight	Tons
14. G _t Gain	
15. Current Load	Tons
16. Backup Battery Voltage	Volts

4. Press MODE once and "CHEC" will flash on the display.
5. Press MODE once and the meter will return to normal operation.

UP Factor - Payload Calculation Gain

Description of UP Factor

The payload calculation gain, or UP factor is multiplied to the actual calculated load. From the example shown in Figure 20-4, the calculated load is 143.8 tons. If the UP factor is set to +5% the displayed load will be $143.8 \times 1.05 = 151$ tons. This factor can be used to minimize the effects of systematic error for a particular truck. The UP factor is not applied uniformly to all load calculations. There are three operating modes for the payload meter and the UP factor is applied differently to each mode. Therefore, it is recommended that this percentage be set to 0. There are significant differences in final calculated load that can be introduced by adjusting this gain.



Payload meters sent from the factory are typically set to "UP: 5" indicating a +5% gain in final load. This should be checked on all new meters and changed to "UP: 0".

PL Mode - Load Calculation Timing

Load Calculation Timing

The PL mode controls when the payload meter takes a sample of the data and calculates the load. There are three modes available. There are two sets of data that are affected by the PL mode setting.

- Modular Mining Transmission
- Memory Storage

The PL mode setting can have a significant impact on the perceived accuracy of the payload meter.

PL:00 is the only recommended setting.



Use of settings other than PL:00 is NOT recommended.

Careful consideration must be given to the use of PL:01 and PL:10. These modes divide the data transmitted by Modular Mining and the data stored in the payload meter's memory. Additionally, each mode handles the UP factor differently and can calculate different loads for the same haul cycle. For these reasons **it is recommended that the payload meter be set to use PL:00 in all cases.**

PL:00

Modular Mining Transmission - The data is captured at the last transition from 0 to 1 MPH prior to traveling 160 meters from the shovel. The captured data is transmitted when the truck travels 160m from the shovel. This load calculation **will use** the UP factor percentage.

Memory Storage - Same as above, the data is captured at the last transition from 0 to 1 MPH prior to traveling 160 meters from the shovel. The captured data is stored into memory when the body rises at the dump. This load calculation **will use** the UP factor percentage.

PL:01

Modular Mining Transmission - The data is captured at the last transition from 0 to 1 MPH prior to traveling 160 meters from the shovel. The captured data is transmitted when the truck travels 160m from the shovel. This load calculation **will use** the UP factor percentage.

Memory Storage - The data is captured and stored when the body rises from the frame. This calculation **will not use** the UP factor percentage.

PL:10

Modular Mining Transmission - The data is captured and transmitted when the truck travels 160 meters from the shovel. This calculation **will not use** the UP factor percentage.

Memory Storage - The data is captured and stored when the body rises from the frame. This calculation **will not use** the UP factor percentage.

FINAL GEAR RATIO SELECTION

For an 830E truck, the proper gear ratio has to be selected.

1. Press and hold the MODE and LIGHT/INC switches until "CHEC" is displayed. **CHEC**

2. Press and hold the TOTAL/SFT and LIGHT/INC switches until "S.SEL" is displayed. **S.SEL**

3. Press the CAL/CLR switch repeatedly until "A.XX" is displayed, where "XX" is one of the following: **A.XX**

"XX"	Gear Ratio	Remarks
00	31.875	Original
01	36.400	High Traction
02	28.125	Standard
03	26.625	High Speed

NOTE: The Payload Meter is originally set to "00".

4. Press the TOTAL/SFT switch and "XX" will flash.
5. Press the LIGHT/INC switch to select the desired gear ratio.
6. Press the MODE switch and "CHEC" will be displayed. **CHEC**
7. Press the MODE switch and the meter will return to normal operation.

BATTERY REPLACEMENT PROCEDURE ERROR CODE, F-09, DISPLAYED

Replacing the Battery

The payload meter has an internal battery used to protect the memory from being erased when the key switch is turned to the OFF position. Battery life is approximately 2 years. The capacity of the battery is monitored by the payload meter. When the voltage of the memory battery drops, error code, F-09, will be displayed.

When the F-09 error code appears, download the data within 48 hours; otherwise, the data may be lost. The haul cycle data may not be recorded properly while F-09 is displayed.

At this time it will be necessary to replace the battery. This should be performed when the truck is in an unloaded condition. The data stored in the payload meter should be downloaded to a personal computer or carry out the memory card dump operation. If this is not done, when the battery is disconnected all data will be lost.

All that is required is a phillips-head screwdriver and a new battery (P/N 581-820-55710)

1. With the keyswitch in the ON position, download the data stored in the payload memory, or perform the memory card dump operation.
2. Turn the keyswitch to the OFF position.
3. Remove the four mounting screws holding the payload meter in position and then pull the payload meter out, away from the instrument panel (Figure 20-7).

NOTICE - Use care not to let dirt, metal or spare parts to drop inside the controller at any time.

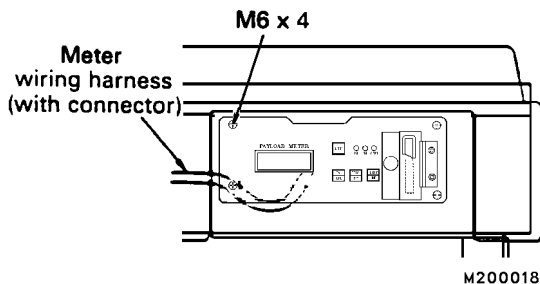


FIGURE 20-7. REMOVING PAYLOAD METER

4. Remove the electrical connector. Remove the screws on the top surface and the rear face. Remove the cover (Figure 20-8). This will expose the battery, its wires, and the connector.

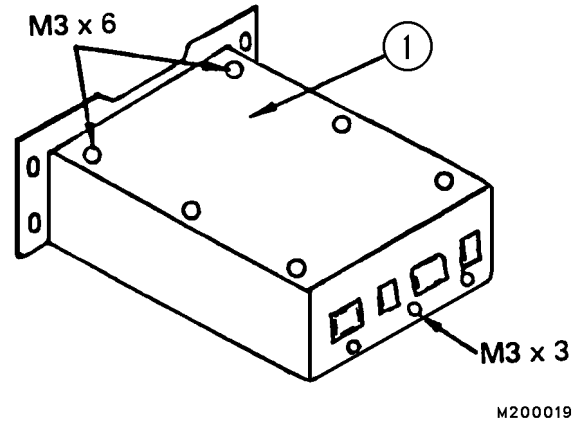


FIGURE 20-8. ACCESS TO BATTERY

5. Grasp the wires coming from the battery and pull outward. By pulling perpendicular from the board, it will disconnect the connector from the board and pull the battery out of its holder simultaneously (Figure 20-9).

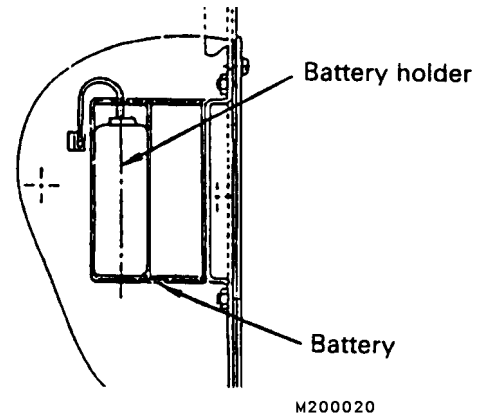


FIGURE 20-9. BATTERY INSTALLATION

6. Insert the connector of the new battery directly into the connector on the board (Figure 20-10). Place the battery in the battery holder, and pass the wiring through the notch. When doing this, insert the wiring into the bottom of the holder and pass it through the notch.
7. Install the controller cover, replace the electrical connector, and install the payload meter controller back into the instrument panel.

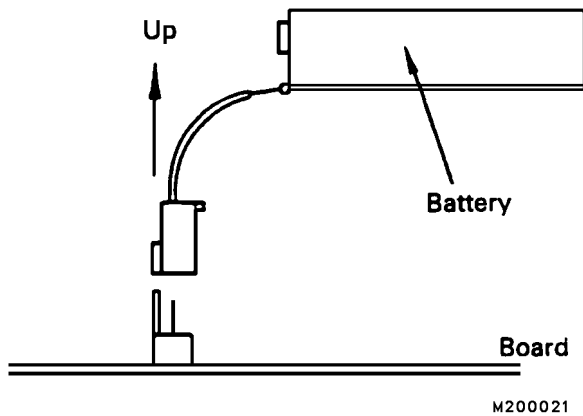


FIGURE 20-11. BATTERY CONNECTION

After Replacing the Battery

While replacing the battery, the backup power source for the memory inside the payload meter is momentarily disconnected.

This can allow unwanted data (garbage) to enter the memory and affect the meter's recognition procedures. The following will remove this unwanted data.

1. Turn the keyswitch to the ON position.

F-CAL may flash.

2. Using the Operator Check Mode, set the speed limit option code, time and date. (These were erased from memory when the battery was disconnected).
3. Without turning the keyswitch to the OFF position advance to the start position. With the engine running, the display: **F-CAL** may flash.
4. Perform the calibration procedure. Refer to "Calibrating a Truck".
5. Load the truck to the rated payload, or close to it. Dump the load.
6. Move the truck to a safe area, wait at least 5 seconds after dumping the load, then shut the truck down.
7. Turn the keyswitch back to the ON position but do not start the engine.
8. Perform the Data All Clear in the Operator Check mode.

9. Forcibly clear the data for the total payload and overall number of cycles.

With this operation performed, all the unwanted data inside the payload meter is cleared. Except for the calibration data, all the data recorded in the previous steps is also erased.

10. After this procedure has been performed the system is ready for normal function.

SUSPENSION PRESSURE SENSOR

The pressure sensors are mounted on top of each suspension cylinder. The sensors produce a voltage signal from 1 – 5 volts output.

The pressure sensor is mounted to the suspension cylinder using a Schrader Valve assembly, adapter and sensor. The sensor can be replaced without releasing the pressure in the suspension by removing the sensor with the adapter.

Removal



Ensure the adapter and sensor are removed together from the valve assembly. Removing the complete valve assembly or just the sensor may result in the component being forced out of the suspension by the gas pressure inside.

1. Disconnect sensor from truck wiring harness.

*Note: The Schrader valve in the valve assembly will prevent gas from escaping **when adapter and sensor are removed together**. If entire valve assembly is turned allowing nitrogen gas to escape, recharging of the suspension will be required.*

2. Hold valve (2, Figure 20-11) with wrench while removing the adapter/sensor assembly (3 & 4).
3. Remove sensor (4) from adapter (3).

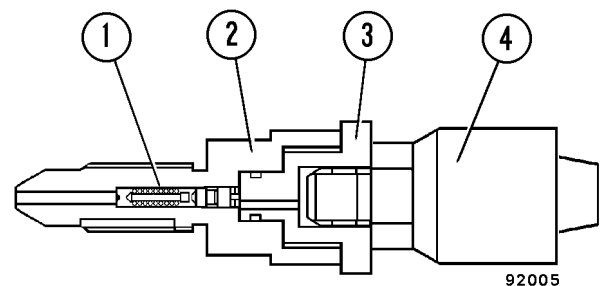


FIGURE 20-10. PRESSURE SENSOR.

- | | |
|-------------------|------------|
| 1. Schrader Valve | 3. Adapter |
| 2. Valve Assembly | 4. Sensor |

Installation

1. Install a new O-ring onto sensor (4, Figure 20-11) and install sensor onto adapter (3). Tighten the sensor to **22–29 ft.lbs. (30–39 N.m) torque**.
2. Install a new O-ring onto adapter (3) and install complete adapter/sensor assembly onto valve (2). Hold the valve body and tighten adapter/sensor assembly to **103 ft.lbs. (176 N.m) torque**.
3. Connect the sensor wiring to the truck wiring harness. The sensors have three wires. Be sure that wires are connected correctly. (Figure 20-12)

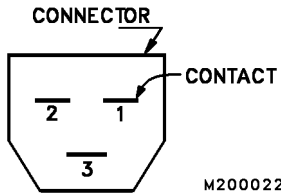


FIGURE 20-12. SENSOR SIDE CONNECTOR VIEW

Pin Number	Wire Color	Wire Function
1	Black	Ground (GND)
2	Red	+ Power
3	White	Signal

INCLINOMETER

As the truck is tilted fore or aft, the weight distribution between the front and rear axles changes. To compensate for this, the inclinometer measures the ground angle at which the truck rests. This data is then sent to the payload meter so it can calculate the correct payload weight. The inclinometer is located below the operator's center console (passenger seat structure).

Removal

1. Disconnect inclinometer wire lead from harness.
2. Remove the three capscrews, nuts and lockwashers (4, Figure 20-13) and inclinometer (3).

Installation

1. Install inclinometer (3, Figure 20-13) with cap-screws, nuts and lockwashers (4).

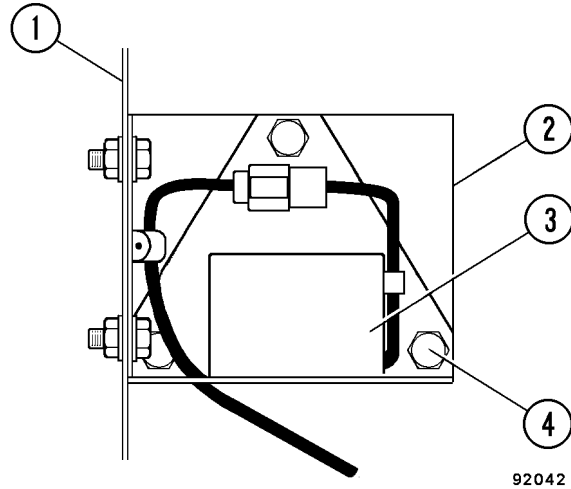


FIGURE 20-13. INCLINOMETER

- | | |
|------------------------------------|---------------------------------|
| 1. Operator's Center Console Frame | 3. Inclinometer |
| 2. Bracket | 4. Capscrew, Nut and Lockwasher |

2. Connect inclinometer wiring to the truck wiring harness. (Figure 20-14) Be sure that wires are connected correctly.

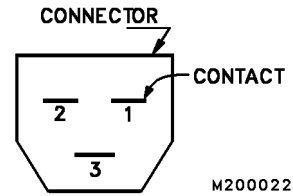


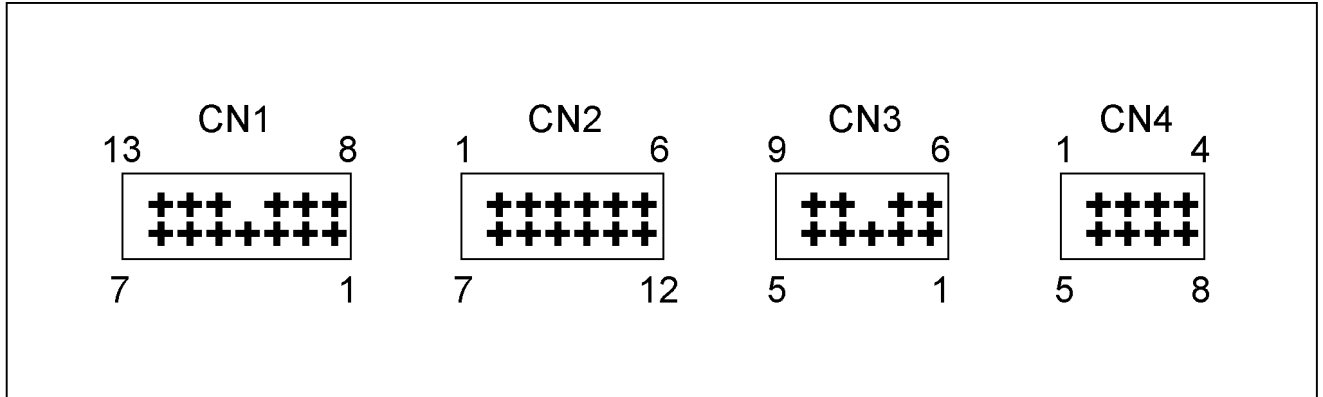
FIGURE 20-14. INCLINOMETER SIDE CONNECTOR VIEW

Pin Number	Wire Color	Wire Function
1	Black	Ground (GND)
2	White	Signal
3	Red	+ Power

Adjustment

1. Park the truck on a 0% grade.
2. Loosen the three inclinometer mounting cap-screws (4, Figure 20-13) and rotate the inclinometer until a voltage range of 2.6 ± 0.1 volts can be measured (using a volt-meter) at pins 1 and 2 of the inclinometer electrical harness connector.
3. Tighten all cap-screws (4, Figure 20-13) to standard torque, after the adjustment.

PAYLOAD METER BACK PANEL



M200050

CONNECTIONS

CN1 - AMP MIC-MKII 13 Pins White Connector		
No.	Description	Comments
1	Power +24V (Battery)	
2	Lamp Relay 1	
3	Lamp Relay 2	
4	Lamp Relay 3	
5	Lamp Relay 4	
6	Lamp Relay 5	
7	Speed Sensor (Signal)	
8	Speed Sensor (GND)	
9	Alternator R Terminal (Charge Signal)	Running - 28VDC Off - 0VDC
10	Key Switch ACC Terminal (ACC Signal)	
11		
12		
13	GND (Power GND)	

CN3 - AMP MIC-MKII 9 Pins White (RS-232C Port)	
No.	Description
1	RTS
2	SG
3	RD
4	TX
5	CTS
6	DTR
7	DSR
8	

CN2 - AMP 040 12 Pins Black Connector		
No.	Description	Comments
1	Engine Oil Pressure Switch	Running Open Off - Closed
2	Sensor Power Out	+18V
3	Sensor GND	
4	Left Front Suspension Pressure Sensor	1-5VDC Normal
5	Right Front Suspension Pressure Sensor	1-5VDC Normal
6	Left Rear Suspension Pressure Sensor	1-5VDC Normal
7	Right Rear Suspension Pressure Sensor	1-5VDC Normal
8	Inclinometer	
9	Body Rise Signal	Body Down - Open Body Up - Gnd
10	Brake Lock Signal/Neutral Signal	Lock Off - Open Lock On - Gnd
11		
12		

CN4 - AMP 040 8 Pins Black (Optional Input, Reserved)	
No.	Description
1	Optional Input GND
2	Analog Input 1
3	Analog Input 2
4	Digital Input 1
5	Digital Input 2
6	
7	

PAYLOAD CIRCUIT NUMBERS

Circuit Designation	Circuit Description
39F, 39F1...39F5	+18 volt sensor power supply
39FA	Pressure signal Right Rear
39FB	Pressure signal Left Rear
39FC	Pressure signal Right Front
39FD	Pressure signal Left Front
39FE	Inclinometer signal
39FG	Sensor ground
39A	PLM lamp output - green
39B	PLM lamp output - amber
39C	PLM lamp output - red
39D	PLM lamp output - unused
39E	PLM lamp output - unused
39G	+24 volt PLM power
39AA	Load light - green
39BA	Load light - amber
39CA	Load light - red
73FSL	TCI 100% load signal - 930E only
73MSL	TCI 70% load signal - 930E only
714A	Speed signal
714AT	Speed signal
63L	Body up (gnd = up, open = down)
39H	Brake lock (gnd = release, open = lock)
35L1	PLM RS232 RTS (request to send)
35L2	PLM RS232 signal ground
35L3	PLM RS232 receive
35L4	PLM RS232 transmit
35L5	PLM RS232 CTS (clear to send)
35L6	
35L7/35L4	Scoreboard 1 to scoreboard 2
35L8	PLM chan 2 TxD
35L9	PLM chan 2 RxD
21C	Engine oil pressure (gnd = off, open = run)
21D	Alternator R-Terminal (open = off, +24V = run)

PAYLOAD METER II™ RE-INITIALIZATION PROCEDURE

This procedure is designed to reset the Payload Meter II™ to clear repeated F.CAL errors.

This procedure is necessary to fix a rare condition in the operation of the meter. Indication for this procedure is a repeated display of F.CAL on the meter despite repeated calibration. If possible, download the payload meter before performing this procedure. This procedure will erase all memory and user settings.

NOTE:

This procedure should be performed before any payload meter is returned for warranty or repair.

Before performing this procedure, be sure that the engine inputs into the payload meter can be manipulated to indicate engine running and engine stopped. Some payload meter installations have hard-wired these inputs. These inputs must be accessible and able to produce the following input conditions:

Condition	21C Engine Oil Pressure	21D Alternator "R" Terminal
Engine Running	Open	24VDC
Engine Stopped	Ground	Open

1. Turn off all systems.
2. Turn on the Payload Meter but leave the engine off.
3. Hold MODE and LIGHT until "CHEC" flashes.
4. Hold the CAL, TOTAL and LIGHT buttons until "00:00" is displayed.
5. Press CAL for 2 seconds." 00 00" will flash and the meter will erase its memory and reset to its factory settings. This includes OP, UP, PL, P.SEL, and E.SEL settings.
The meter will restart and display "F.CAL".
6. Start the engine.

7. Set the time, date, OP, PL, and UP settings. All other user settings should updated at this time.
8. Calibrate the payload meter by holding the CAL button until CAL flashes.
9. Release the brake lock (park brake for 330M/HD785), begin driving 5-8 MPH on level ground, and press CAL.
CAL should display until the meter finishes its calibration.
10. Load the truck to rated load and drive through one haul cycle.
11. After dumping the load, wait at least 15 seconds and drive the truck to a safe location.
12. Stop the truck and shut down the engine.
13. Turn on the payload meter but leave the engine off.
14. Hold MODE and LIGHT until "CHEC" flashes.
15. Hold LIGHT and CAL until "A:CLE" flashes.
16. Press CAL to clear the service memory.
17. When "CHEC" is displayed, press MODE to return to normal operation.
18. Clear the haul cycle memory by holding MODE until "Cd:dP" is displayed.
19. Press MODE and "A.CLE" will be displayed.
20. Hold CAL until "A.CLE" flashed.
21. Press CAL once more to clear the haul cycle memory.
22. Clear the operator load counter by pressing the TOTAL button until ":" is displayed.
23. Hold the CAL button until the display flashes.
24. Hold the CAL button until "0000" is displayed to clear the memory.
25. The payload meter should now function normally.

TROUBLESHOOTING

COMMON PROBLEMS

Suspension Charging

The Payload Meter II™ is a reliable controller and is rarely the source of failure in calculating payloads. The single most common cause for an inaccurate payload estimate is improper suspension charging. Often maintenance personnel will not take the time to properly drain a suspension and carefully recharge it with oil and nitrogen. Most often technicians will simply 'gas up' the suspensions with more nitrogen and send a truck back into service. Komatsu engineers have conducted tests at customer sites to monitor suspension charging on trucks and found many trucks to be improperly charged. Trucks with poorly charged suspensions were sent to service bays for maintenance by mine personnel. In some cases these trucks were returned to operation in worse condition than when they were first checked because service personnel did not take the time to carefully charge the suspensions.

The payload meter uses the pressures from the suspensions to calculate payload. As the truck is loaded, a flat suspension will completely collapse. The top suspension cap will make metal-to-metal contact with the bottom. This often occurs in the rear suspensions. The pressure in the suspension will not accurately reflect the force applied to the suspension by the weight of the material in the body and inaccurate payload calculations will result.

In addition to inaccurate payload calculations, improperly charged suspensions increase wear-and-tear on truck frames and tires, increasing maintenance costs over the life of the truck. Each over-loaded haul cycle with under-charged suspensions leads to premature failure. Consistently low payload estimates are the first sign that the suspensions are not being properly maintained and the truck is on a path toward increased operating costs and system failures. Thankfully, the effects of improper suspension charging can be postponed with proper service and care.

Specific suspension charging procedures for each truck model can be found in the shop manual. In general, the following items are very important for proper charging:

- Completely discharge the suspension. This may take more than an hour for the nitrogen and oil to completely discharge. However, to ensure that the proper volume of fresh oil is added, it's necessary to remove as much of the oil/nitrogen mixture as possible.
- Fill the suspension to the proper height with fresh oil, this is critical to keeping the suspensions from bottoming out.
- Charge the suspension to the proper height with nitrogen.

Refer to Section "H" for the proper charging procedures.

This module contains an example of how to use the Scope program from Komatsu to monitor suspension pressure data.

Symptom Table

PROBLEM	PROBABLE CAUSE
Payload meter is not recording haul cycles.	Broken or missing body-up signal. The body up signal triggers the PLM II™ to start a new haul cycle. Check using the "Monitoring Input Signals" procedure.
Only one haul cycle in memory.	
Display shows payload all the time.	Broken or missing speed signal. Check using the "Monitoring Input Signals" procedure.
Display does not show time when the truck is traveling.	
No distance or speed information is recorded in the haul cycle data.	
Payload meter does not 'count up' while driving away from the shovel.	
Payload meter will not calibrate.	
F-18 fault	Missing alternator R-terminal signal. Troubleshoot signal or make modification to eliminate signal. Refer to the "F-18: R-Terminal, Oil Pressure Signals" on the following page.
F20 - F28 faults flashing	Shorted sensor power or ground. Troubleshoot wiring. Refer to the "Shorted 18v Sensor Power Supply" fault tree in this section.
Pressure sensor value drifts up or down erratically.	

Missing Body-Up Signal

The payload meter starts a new haul cycle after the body comes down from dumping the last haul cycle. Each new haul cycle starts at the dump. Without a body-up signal, the payload meter does not know that a new haul cycle has started. The payload meter will not record new haul cycles without the body-up signal. This is the most common sign that the signal is missing.

The body-up input signal is received from a magnetic switch located on the inside of the truck frame forward the pivot pin of the truck body. This is the same switch typically used for input to the drive system. When the body is down, the switch closes and completes the circuit to 71-Control Power. 24vdc indicates the body is down. Open circuit indicates that the body is up. This input can be checked using the "Monitoring Input Signals" procedure.

Missing Speed Signal

The payload meter uses the speed signal to measure distances and speeds. It is the speed signal that causes the payload meter to sample pressure data to estimate payload just after loading. After the truck travels 160 m (0.10 mi.) the payload meter records the payload estimated using the data captured just after loading. During the 160 m, the payload meter displays a count. When the payload meter is set to display metric units, it counts up to 160 m. When English units is selected, it counts up to 0.10 mi. This 160 m (0.10 mi) is designed to allow the truck to reposition around the shovel during loading.

If the speed signal is missing, the payload meter captures suspension data when the body rises at the dump. Without the speed signal, the payload meter cannot determine that the truck has begun moving after loading. In addition, it cannot measure the 160 m from the loading site. While the truck is loaded, the payload meter will display live payload estimates. When the truck is empty, the payload meter will display 0. The haul cycle data stored in memory will have 0 recorded to max speed and haul cycle distance.

F-18: Alternator R-Terminal, Oil Pressure Signals

The PLM II™ monitors engine hours using the alternator R-terminal and oil pressure signals. The payload meter will register a fault if both signals are not present.

For the R-terminal input to the payload meter, 24v=engine running and 0v=engine stopped.

For the oil pressure input to the payload meter, open=engine running and ground=engine stopped.

It is recommended that these inputs be modified to indicate that the engine is running at all times. Connect the R-terminal input to payload meter to the keyswitch (712) signal. Disconnect and tape back the oil pressure signal to the payload meter. These changes will cause the payload meter to always consider the engine to be ON.

There are 2 effects from this change.

- On power-up, the payload meter will not show the normal sequence of displays. This is not usually a problem.
- The payload meter cannot be re-initialized. This extremely rare procedure is used to reboot the payload meter.

Shorted 18v Sensor Power Supply (930E)

The 18v sensor power supply, circuit 39F, comes from the payload meter and branches out to the inclinometer and pressure sensors. The connection for this is made approximately 30.5 cm (12 in.) from the connection at the back of the cab, just above the wheel. This can be a common point of failure and should be the first place to check when the pressure sensor values drift erratically while the truck is sitting still or the payload meter indicates shorts on all the pressure sensors.

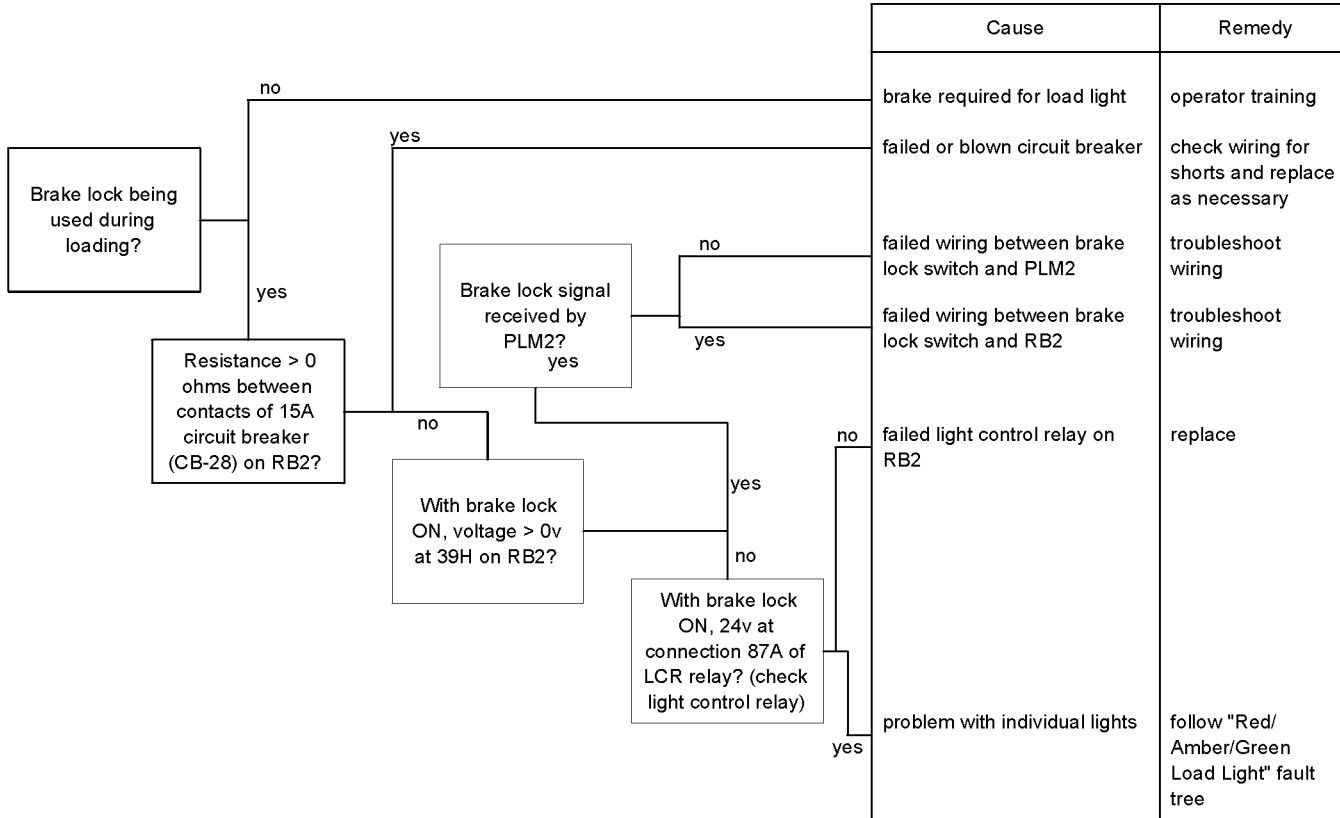
The harness may be repaired with a butt splice, or a new harness can be purchased and installed.

FAULT TREE DIAGNOSIS

Payload Lights Won't Illuminate

The load lights are illuminated for 5 seconds after the keyswitch is turned ON. The load lights are powered through a 15A breaker on relay board 2 (RB2). The Light Control Relay (LCR) is activated by a ground signal through the brake lock switch. The brake lock switch must be closed to complete the circuit through the LCR relay and power the load lights. Each light color is controlled by a relay on RB2. Each load light relay coil is grounded through the payload meter to activate the light. There is one relay for each color light.

If the load lights do not illuminate during loading, verify the brake lock is being used at the loading site. Verify that the lights illuminate when the keyswitch is turned ON. If not, check the 15A circuit breaker and the LCR relay, first. Then, check the brake lock signal to the relay board. Ensure that the connections to the relay board are solid.

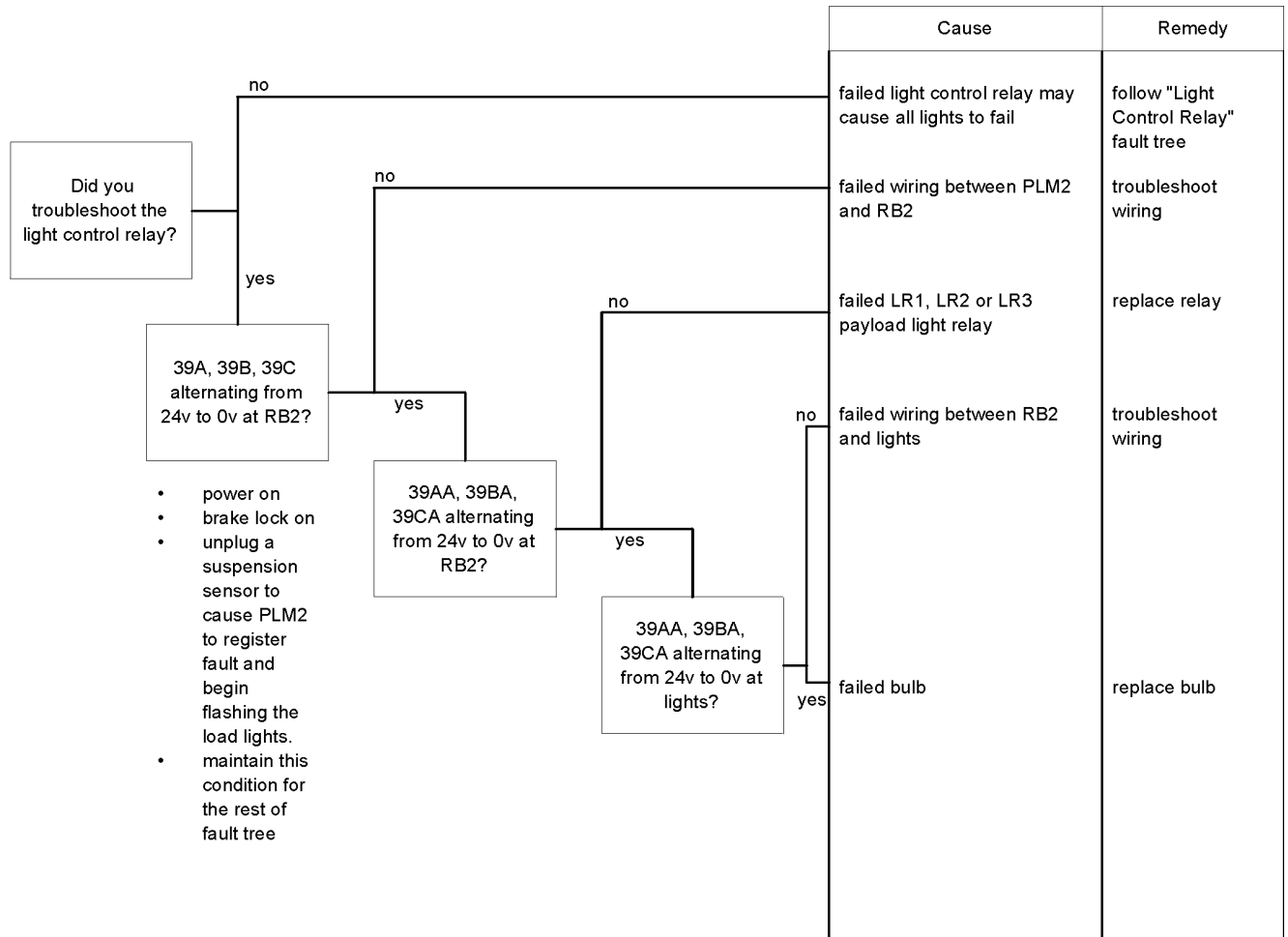


M200056

Red, Amber or Green Payload Light Does Not Illuminate

The payload lights only illuminate when the brake lock is applied. If all the load lights are not working, be sure to troubleshoot the light control relay, refer to "Payload Lights Won't Illuminate".

The most common reason for a payload light not working is a burned out bulb. Replace burned out bulbs with Komatsu's high durability replacement lights. Komatsu is also currently working on Light Emitting Diode (LED) replacement lights with significantly longer life. Check with your distributor for availability.



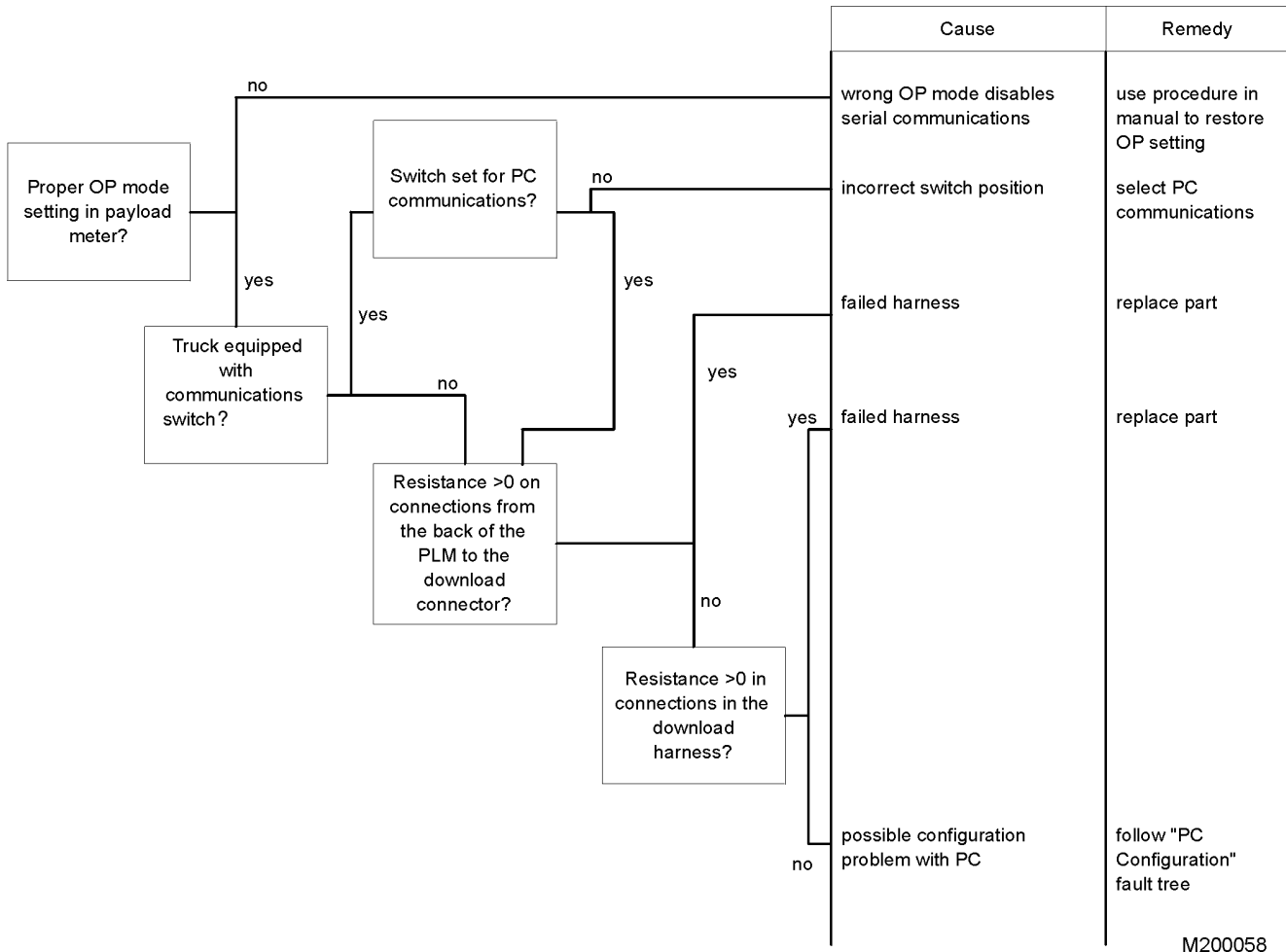
M200057

Cannot Download - PC Communications

The most common problem with PC communications to the payload meter is configuration of the PC. Be sure the correct serial port is selected for your laptop. In addition, be sure you have the latest PC software by checking with your distributor.

Verify the payload meter is using the proper OP setting. Refer to "Setting the Option Code" for information on OP settings.

No body-up input signal can be perceived as a communication problem with the payload meter. Without the body-up signal, the payload meter never starts a new haul cycle. When the payload meter is downloaded, and no haul cycles have been stored in memory, a technician may assume that the laptop did not communicate with the payload meter.

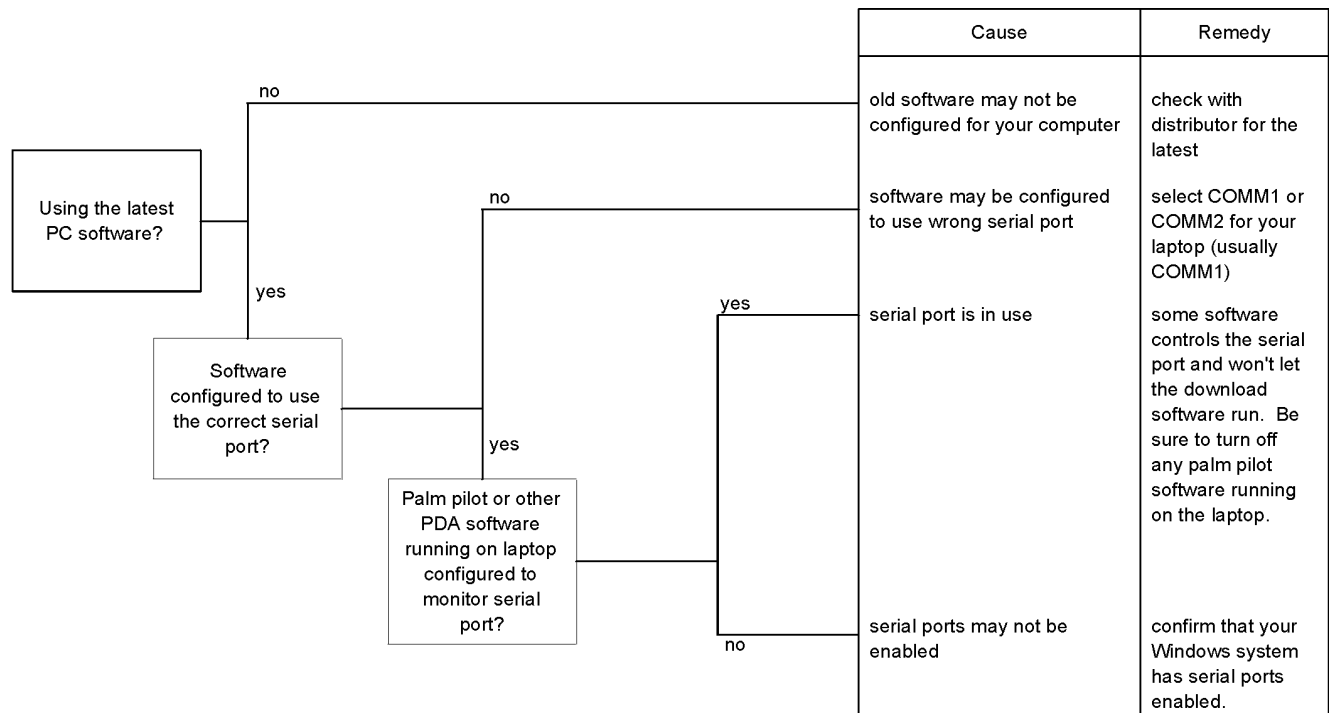


PC Communications Configuration

Laptop computers must be properly configured to communicate with the payload meter. Often times the wrong serial port is set, or old software is being used that is not compatible with newer computers.

Verify the correct serial port is set for your laptop. The most common port available on a laptop is serial port 1. It is sometimes labeled as COMM1.

Occasionally, installed software on the laptop will take command of the serial port and not let the download software have access to the port. Software used by Palm Pilots, Handspring Visors, Pocket PCs, and other Personal Digital Assistant (PDA) devices monitors the serial port for connections. When this software is active, the download software cannot use the serial port and cannot download the payload meter. Ensure this software is not running when attempting to download data from the payload meter.

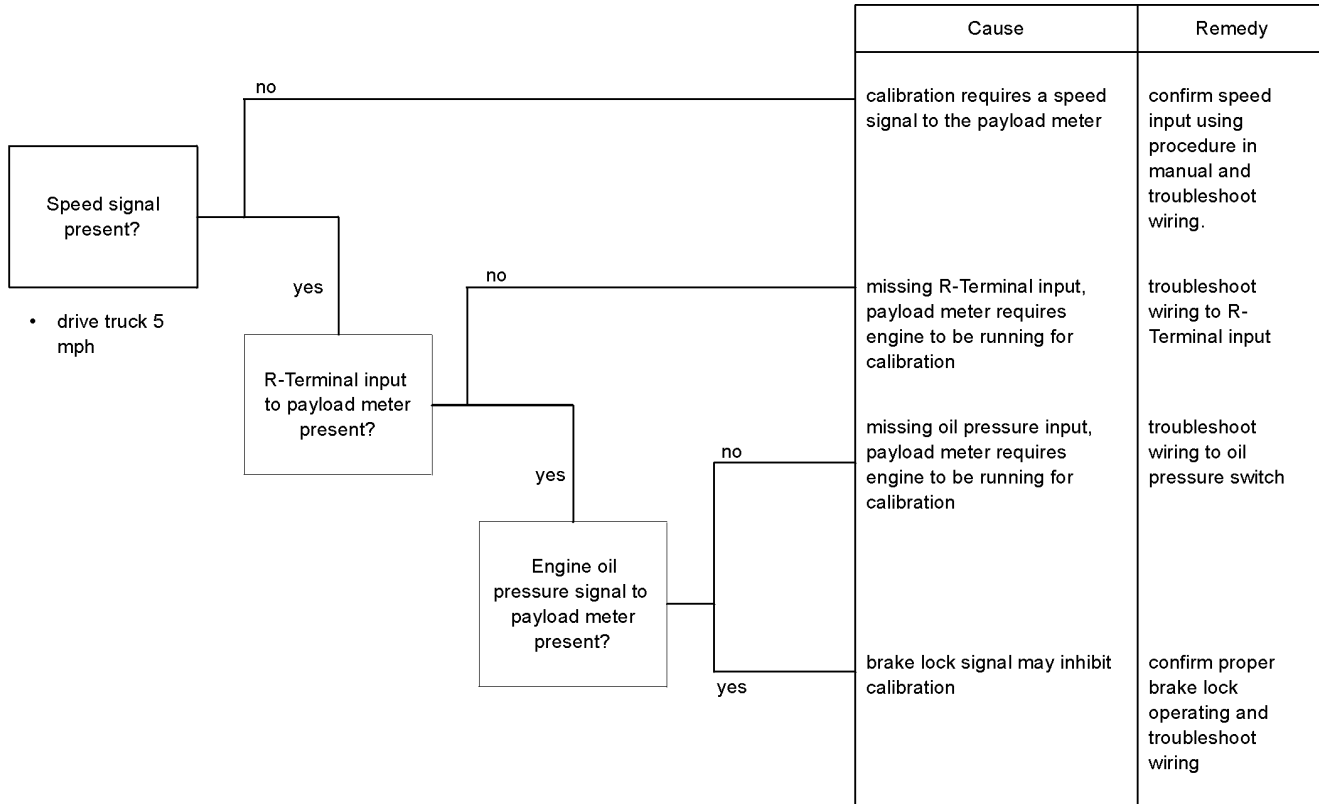


M200059

F.CAL: Payload Meter Won't Calibrate

The most common cause for failure to calibrate is a missing speed signal to the payload meter. Check the inputs to the payload meter to confirm that the speed signal is being received. Refer to "Monitoring Input Signals".

The payload meter also uses the R-terminal and oil pressure signals for calibration. These signals indicate that the engine is running. Verify these signals are being properly received.



M200060

F-20: Sensor Power Fault

A common failure point can be the connector on the suspension pressure sensors. These connectors take a lot of abuse from pressure washing and occasionally short circuit or develop floating voltages from water and dirt intrusion. The quickest way to fix these problems is to disconnect the two halves and blow out any debris and clean the contacts. The process of disconnecting and re-inserting a connector often clears up many problems. If a problem persists, check the crimps on the terminals for intermittent connection due to vibration and wear.

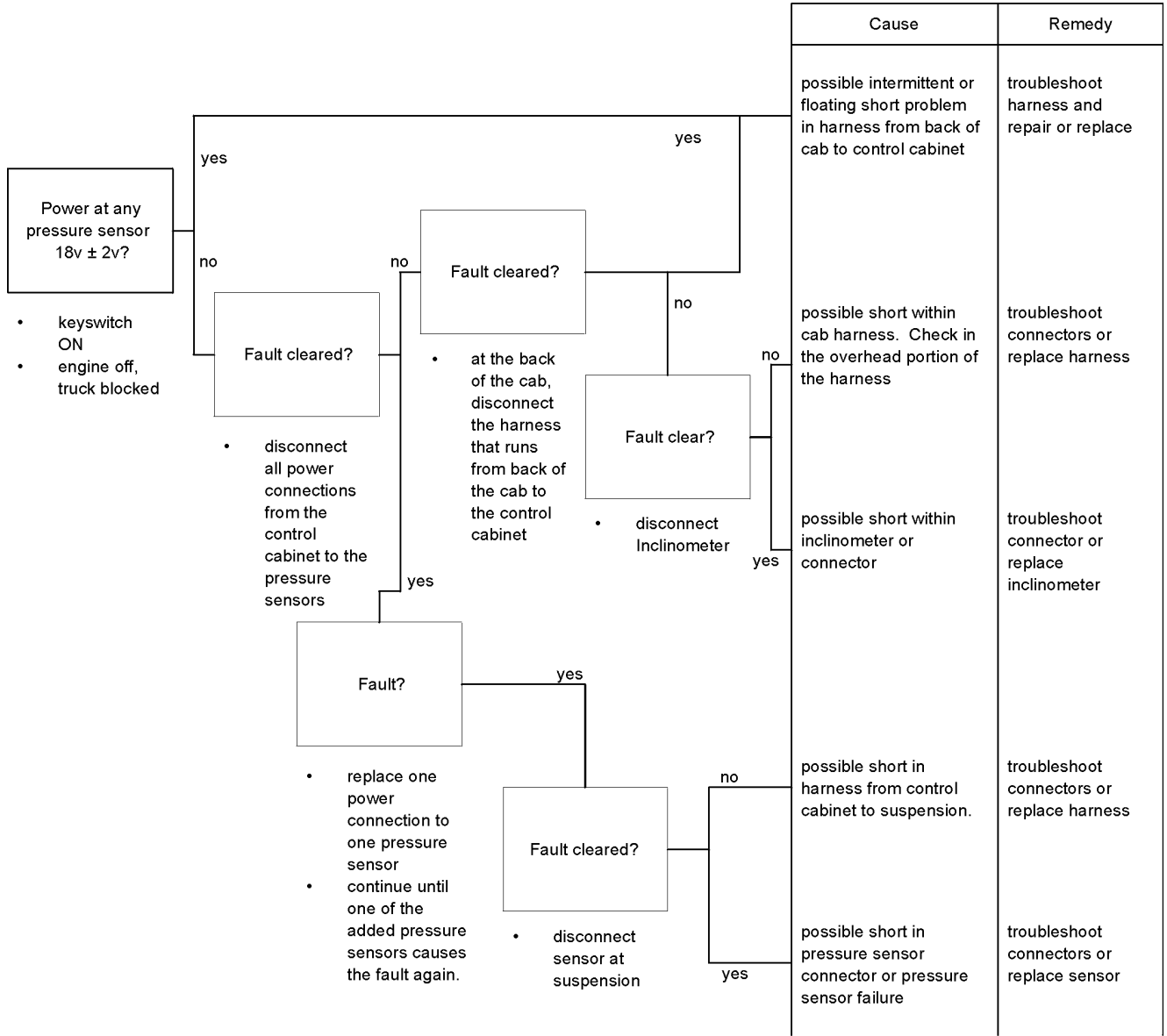
On the 930E's, the most common cause for sensor power faults is a short in the harness coming from the back of the cab to the Aux/Junction box. This harness contains a splice for sensor power. This splice is approximately 305 mm (12 in.) from the connector and is exposed to vibration and dirt from the left tire. It may be possible to locate this splice and repair it. A single wire for circuit 39F carries 18v from the payload meter to the splice, where it branches out for each sensor.

The 39F circuit from PLM II™ is over-current protected. If this circuit is shorted to ground, the payload meter will automatically shut off the 18v supply. This will cause the payload meter to register faults for all the sensors.

In general, check the voltages at the sensors. It may be possible to disconnect each sensor in the junction box to see where the short may be. If disconnecting all the sensors does not clear the fault, it is likely that the problem lies within the harness from the back of the cab to the control cabinet.

Refer to the following page for the fault tree diagram.

Sensor Power Fault Fault Tree



M200061

F-21, F-25: Left Front Pressure Sensor**F-22, F-26: Right Front Pressure Sensor****F-23, F-27: Left Rear Pressure Sensor****F-24, F-28: Right Rear Pressure Sensor**

A common problem with sensors is connector failure. Often the connectors to the suspension pressure sensor are not secured to the truck and become caked with mud and debris. They become targets for the power washers used to clean the trucks at maintenance. Many problems with the pressure sensors can be relieved by disconnecting the connector, cleaning the terminals, reconnecting the connector halves, and securing the connector. Over time, the terminal crimps may fail and need to be replaced.

Check power supply voltage to the sensor between circuits 39F (red, 18vdc) and circuit 39FG (black, ground). Check the sensor output between circuits 39FA, 39FB, 39FC or 39FD (white, 1-5vdc) and circuit 39FG (black, ground). It may be helpful to check these voltages on the sensor side of the connector and on the harness side of the connector. Corrosion in the connector can affect voltages through the connection.

Compare output voltage from the pressure sensor to the pressure inside the suspension. Use a pressure gauge to measure the pressure in the suspension. The output voltage from the pressure sensor is a 1-5vdc signal. This 4-volt span linearly represents 0 to 2845 psi. For example, if the pressure in the suspension is 410 psi, the output voltage should be:

$$V_{output} = 1 + 4 \times \left(\frac{410}{2845} \right) = 1.576vdc$$

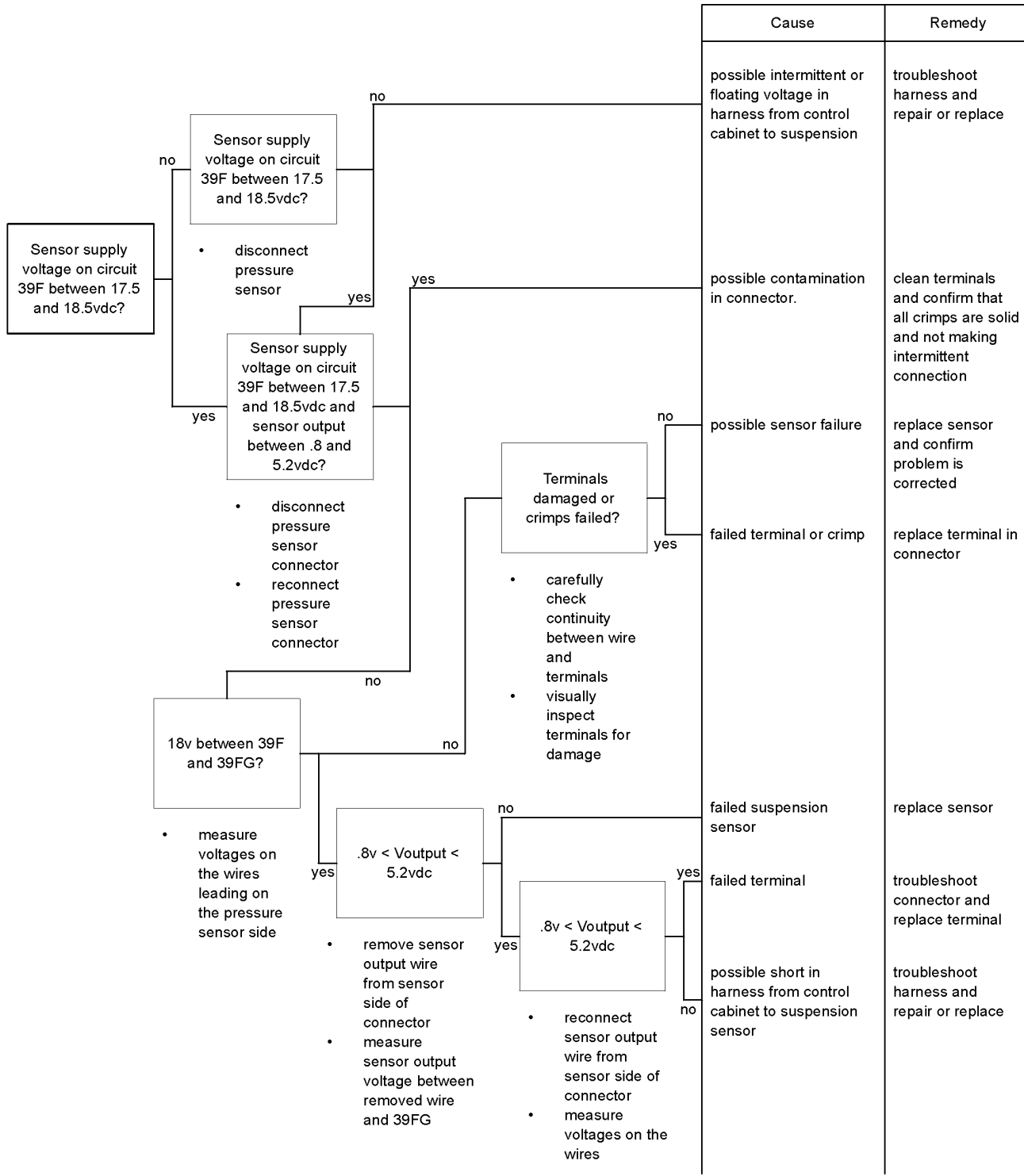
Don't forget to add the 1v since the output of the pressure sensor at 0 psi is 1 volt

The generic version is:

$$V_{output} = 1 + 4 \times \left(\frac{Suspension \ pressure}{2845} \right)$$

Pressure Sensor Fault Tree

NOTE: Confirm the sensor voltages using the Sensor Power Fault tree to confirm that the problem is not a failure in the harnesses coming from the cab to the control cabinet. If all the pressure sensor faults are active, check the power supply first.



F-31, F-32: Inclinometer

There are very few problems with the inclinometer in general. The inclinometer allows the payload meter to compensate for front-to-rear weight transfer on a grade.

Verify that when the truck nose is pointed uphill, the inclinometer reads positive. It is possible that the inclinometer is installed backwards. This could significantly reduce the accuracy of payload calculations.

The inclinometer output is voltage that linearly represents the angle of the truck with nose up producing a positive incline. $0^\circ = 2.6\text{vdc}$ and the voltage output decreases with positive incline. For example, with the truck parked 5° nose up:

Using the formula:

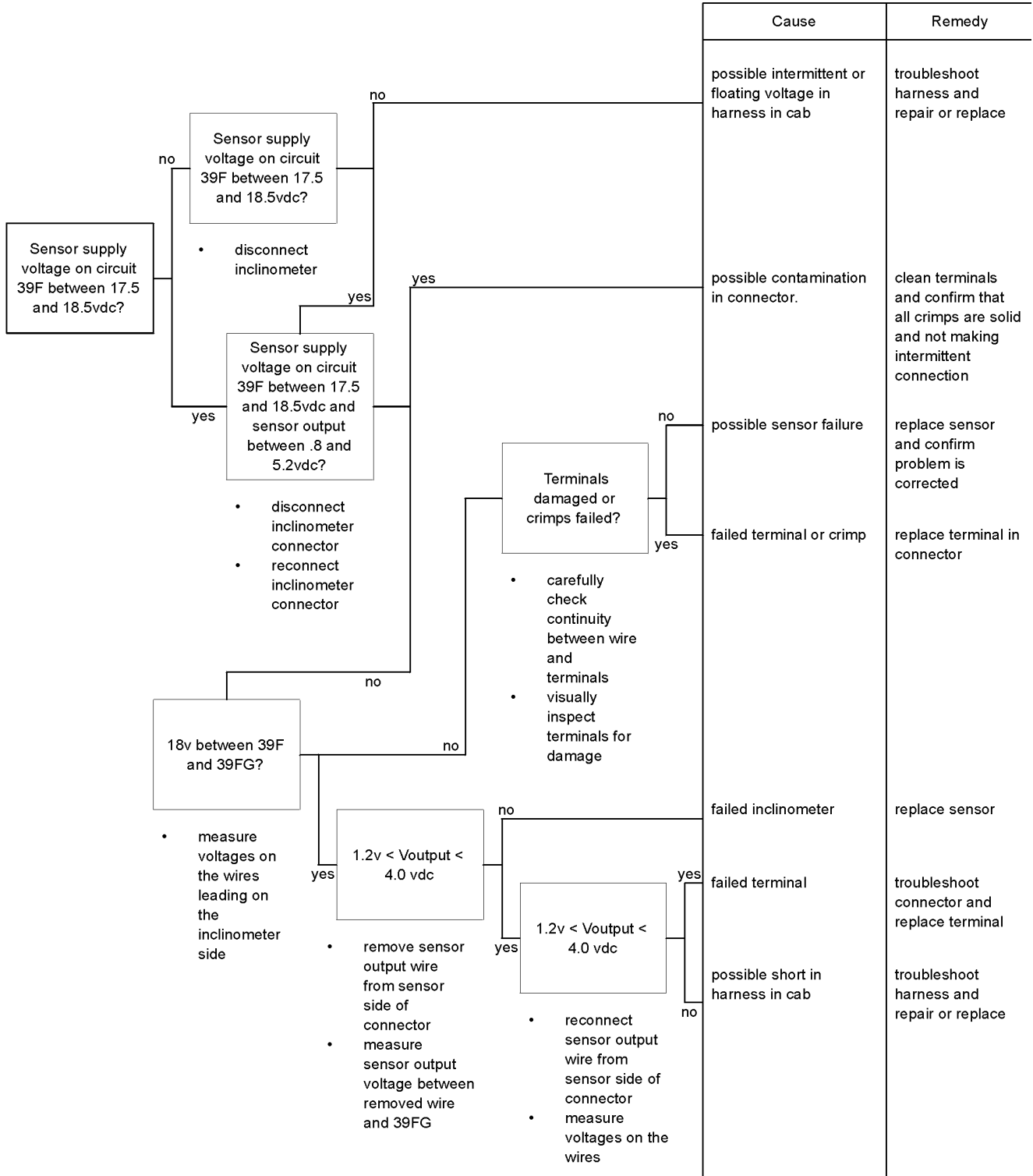
$$V_{output} = 2.6_{volts} - 0.103 \frac{volts}{degree} \times \textit{incline}_{degrees}$$

The inclinometer output should be:

$$V_{output} = 2.6_{volts} - 0.103 \frac{volts}{degree} \times 5^\circ = 2.085_{volts}$$

Refer to the following page for the Inclinometer Fault Tree.

INCLINOMETER FAULT TREE



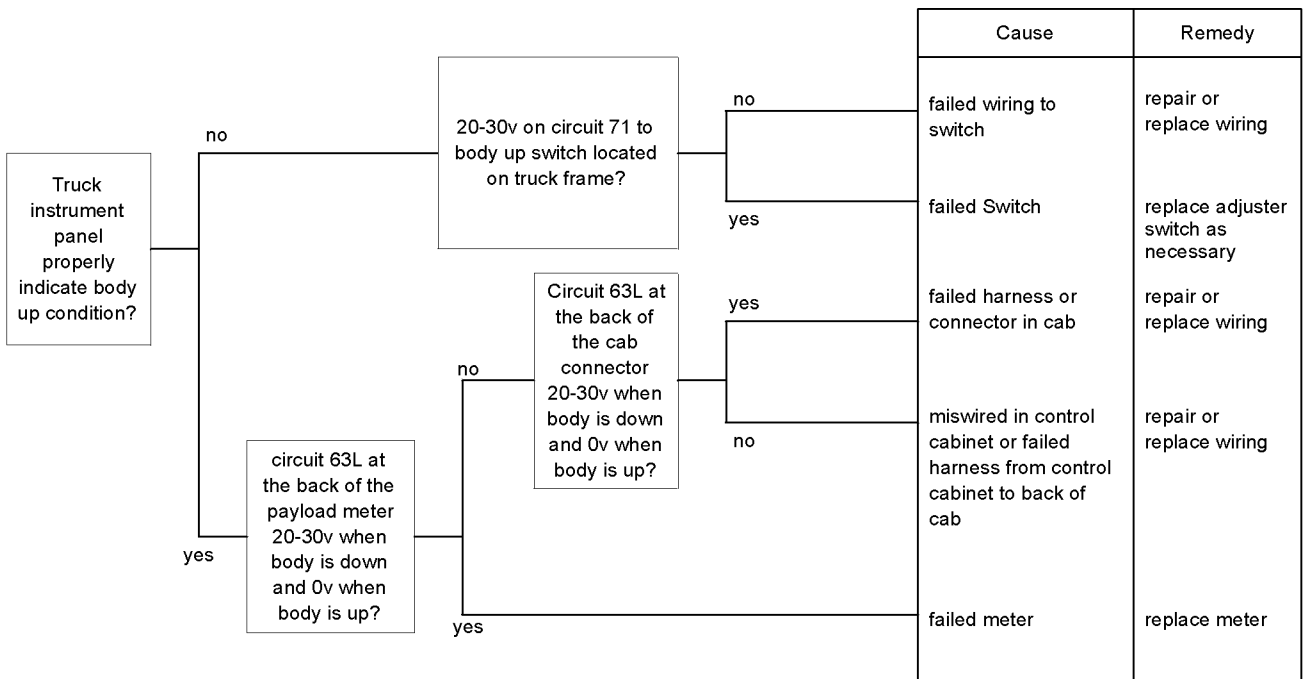
M200063

Body Up Input

The body up signal is critical to proper payload meter operation. The payload meter starts a new haul cycle when the body comes down from dumping the last load. If the payload meter cannot sense the body up and down, it will not begin recording haul cycles.

Confirm that the dashboard indicator for body-up is working properly. If not, check the connections at the body up switch. This switch is a magnetic reed switch. The switch may fail or the plate that triggers the switch may be misaligned. Refer to the appropriate shop manual for the proper procedure for adjusting the switches.

NOTE: The input to the payload meter is 'live' and can be checked by raising and lowering the body or using a large washer to trigger the switch.



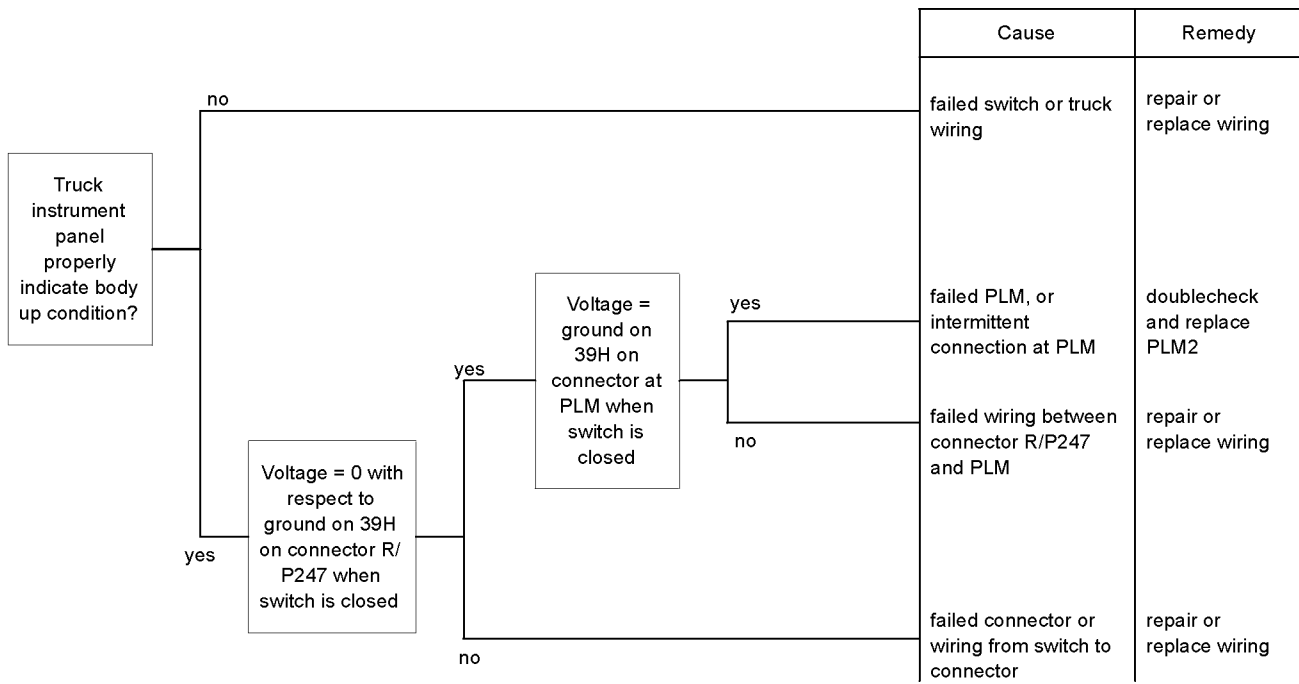
M200064

Brake Lock Input

The brake lock is used to lock only the rear wheels during loading. This allows the front wheels to rotate slightly and allows the payload meter to more accurately estimate payload. It is very important that only the brake lock be used during loading. Using the service brakes will significantly decrease payload meter accuracy.

The brake lock connects circuit 39H to ground. The circuit is wired through a small black connector behind the dash panel.

Confirm that the warning light panel indicates that the brake lock is recognized by the other truck systems. If so, follow the signal from the switch to the payload meter. It may also be that the connector on the back of the payload meter needs to be disconnected and re-inserted to clean the contacts.



M200065

Speed Signal

The speed signal triggers the payload meter to display the time of day when the truck begins moving. If this does not happen or the payload meter does not count up the distance from the shovel after loading, the speed signal may be missing. This can be confirmed by checking the inputs to the payload meter. Refer to “Monitoring Input Signals”. Verify the payload meter is not receiving a speed signal before following the troubleshooting fault tree.

NOTE: The payload meter will ignore speed signal input if the brake lock appears to be on. Confirm the payload meter correctly reads the brake lock input.

930E Speed Signal

On the 930E, the speed signal comes from a speed sensor mounted on the left-front wheel. Occasionally, this sensor is damaged by debris, impact during tire mounting, or misalignment during repair of the spindle. The wheel must be removed to replace the sensor. Since the sensor is an active device, it requires an 18v power supply to power the electronics that convert the electromagnetic pulses into signals for the payload meter. In addition, because the sensor is active and not just a simple coil, it is not possible to measure the resistance across the contacts of the harness to determine if the sensor has failed.

To troubleshoot, confirm that the 18v power supply is reaching the sensor. The speed signal can be monitored in the control cabinet to confirm the wiring from the sensor to the cabinet. Checking the signal at the back of the payload meter will confirm the wiring from the control cabinet. It is also possible to check the speed signal at the back of the payload meter to confirm the entire wiring route. A signal generator may be used at the wheel to generate a signal back to the payload meter. The speed signal input can be monitored from the payload meter using the procedure outlined in “Monitoring Input Signals”.

Adjusting the Speed Sensor:

1. Align a tooth on the speed sensor gear with the tip of the speed sensor.
2. Check the distance between the speed sensor and gear tooth with a feeler gauge.
3. Adjust the gap to 0.060 in. (1.5 mm) and lock the sensor in place.
4. Rotate the wheel hub 180° and verify that the gap has remained within specifications.

730E/830E Speed Signal

The speed signal for the 730E/830E model trucks comes from a passive speed sensor mounted on the left wheel motor. This signal travels on the 714/714A circuits to an isolation transformer in the control cabinet. From the transformer, the signal travels through the connector at the back of the cab up to the payload meter.

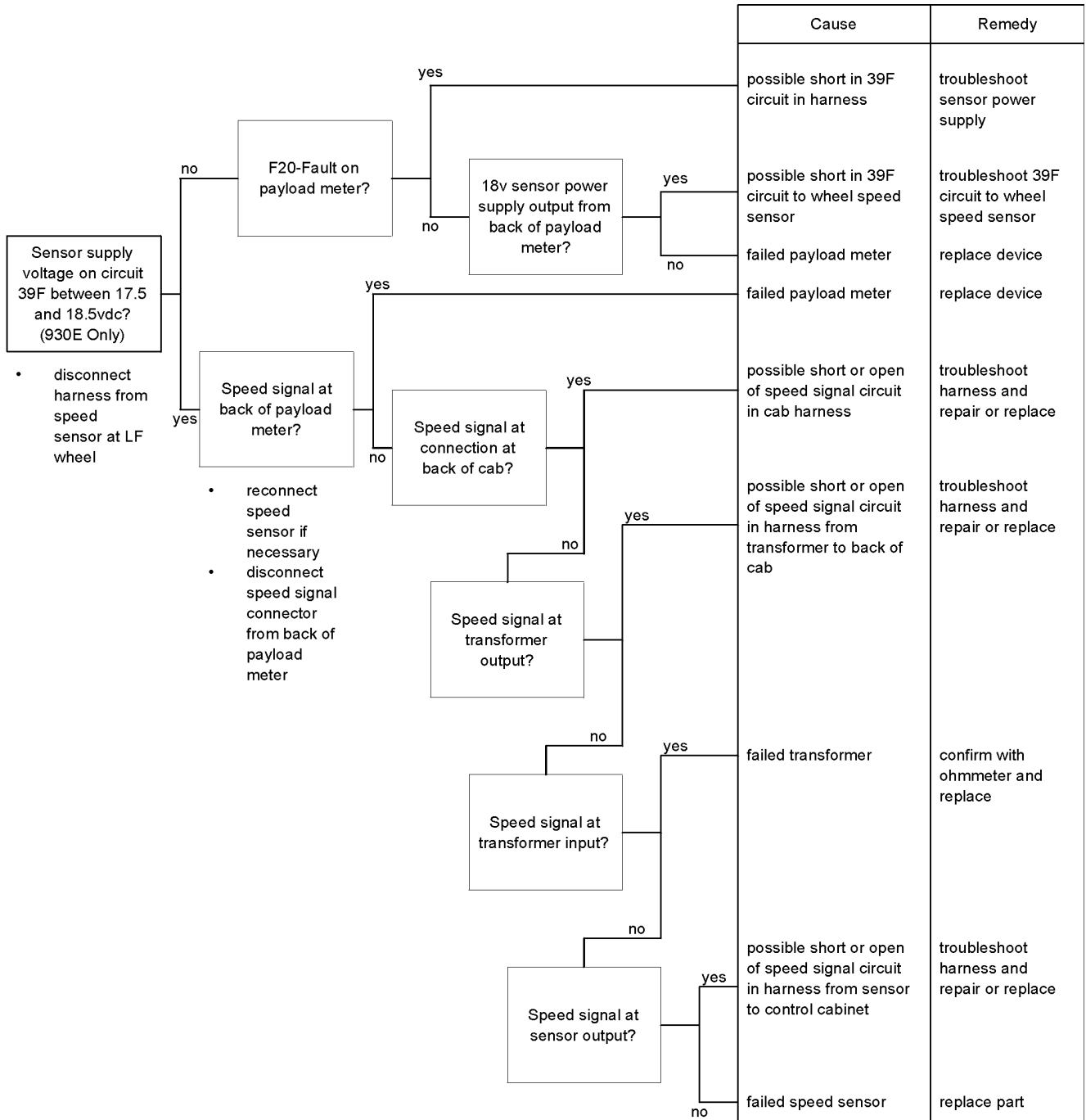
Confirm that the sensor at the wheel motor is working properly. This is a passive, coil-type speed sensor and its electrical integrity can be checked using an ohmmeter. Confirm the speed signal in the control cabinet at the transformer. A signal generator may be used at the wheel motor to generate a signal back to the payload meter. The speed signal input can be monitored from the payload meter using the procedure outlined in “Monitoring Input Signals”.

HD1500/530M Speed Signal

The speed signal runs from a speed sensor on the transmission output shaft to the PMC and to the payload meter. You can confirm the speed sensor by checking the speed input to the PMC. Confirm the speed signal wiring from the PMC to the payload meter. The speed signal input can be monitored from the payload meter using the procedure outlined in “Monitoring Input Signals”.

Refer to the following page for the fault tree diagram.

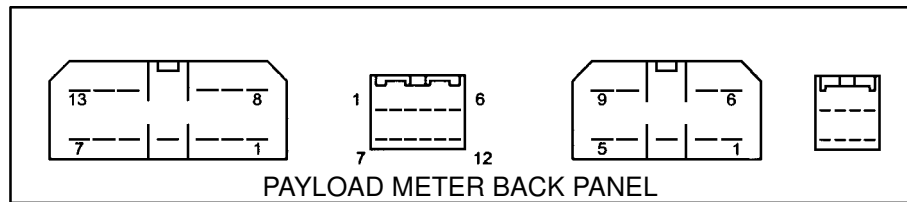
SPEED SIGNAL FAULT TREE



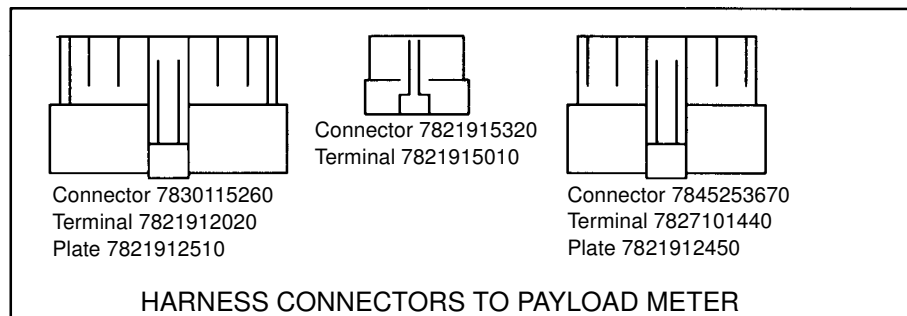
Cause	Remedy
possible short in 39F circuit in harness	troubleshoot sensor power supply
possible short in 39F circuit to wheel speed sensor	troubleshoot 39F circuit to wheel speed sensor
failed payload meter	replace device
failed payload meter	replace device
possible short or open of speed signal circuit in cab harness	troubleshoot harness and repair or replace
possible short or open of speed signal circuit in harness from transformer to back of cab	troubleshoot harness and repair or replace
failed transformer	confirm with ohmmeter and replace
possible short or open of speed signal circuit in harness from sensor to control cabinet	troubleshoot harness and repair or replace
failed speed sensor	replace part

M200066

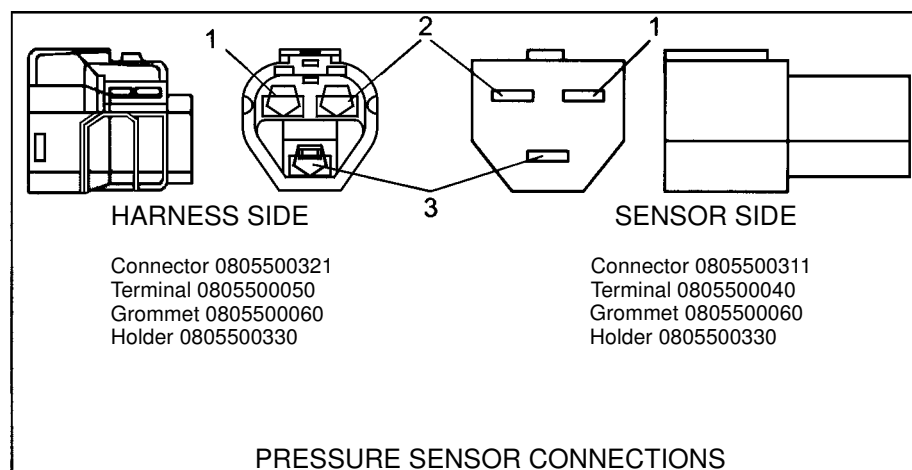
CONNECTORS AND PRESSURE SENSORS



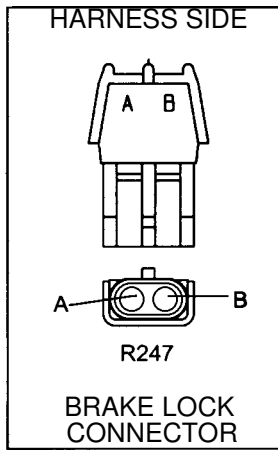
M200067



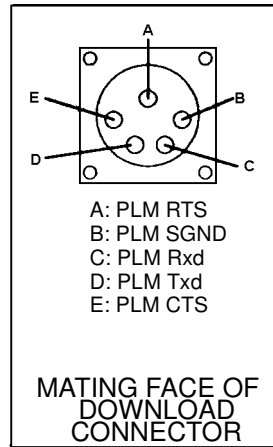
M200068



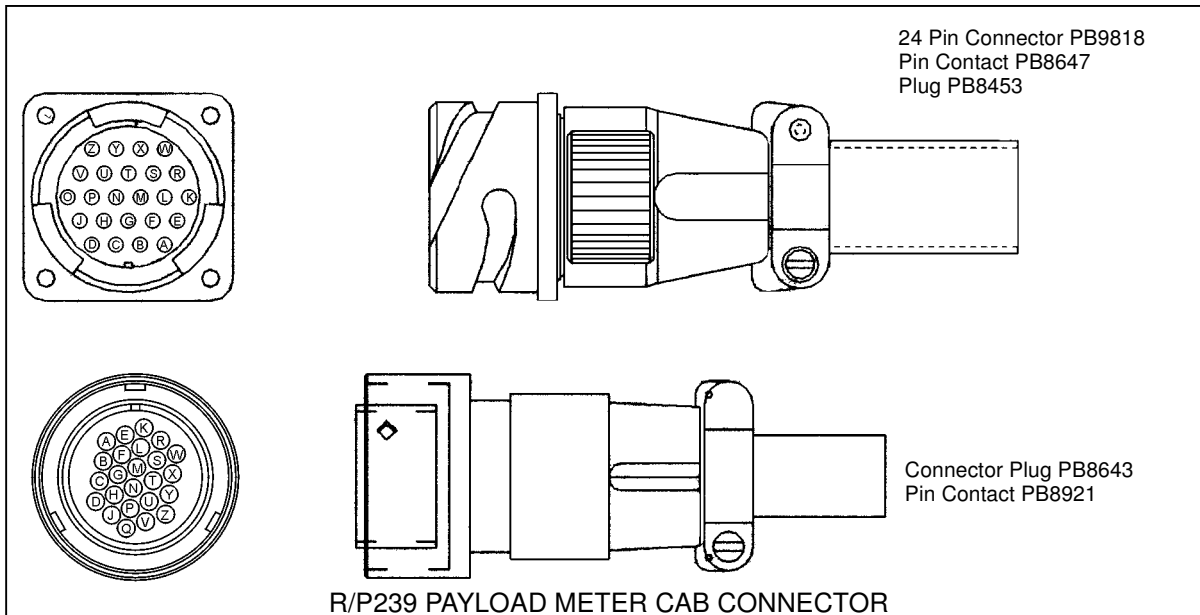
M200069



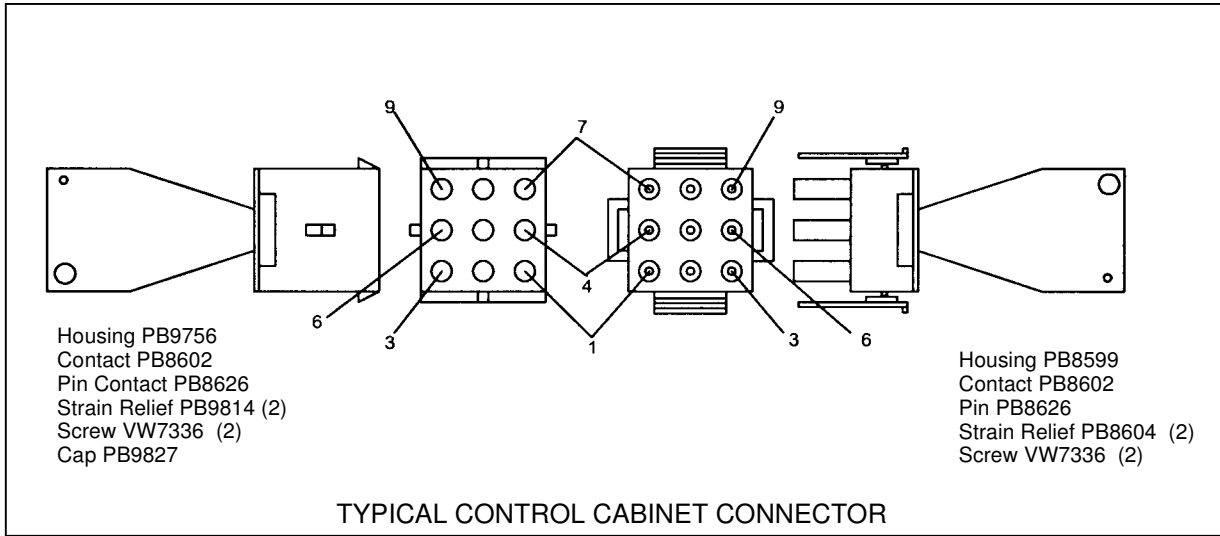
M200070



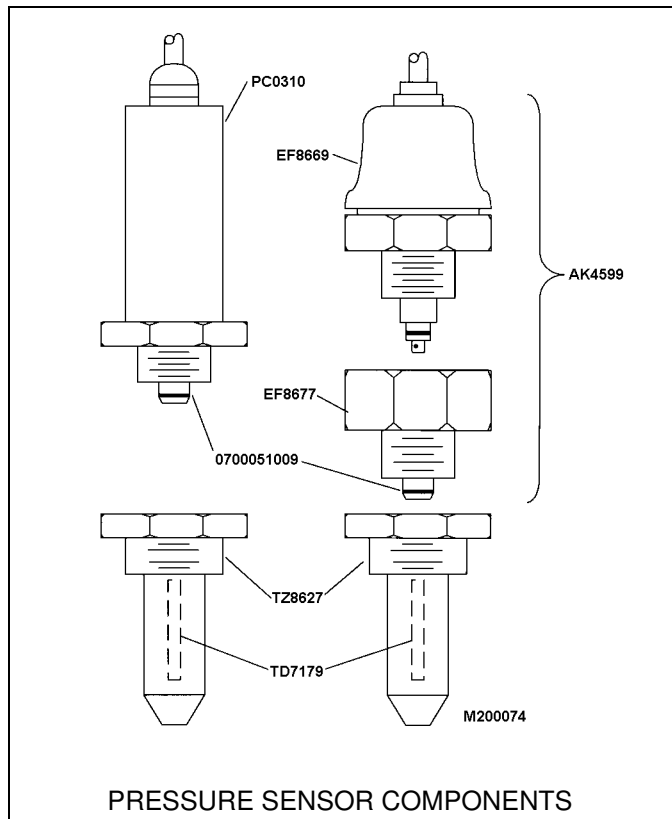
M200071



M200072



M200073



Real-Time Payload Meter II™ Monitor Program

Originally, this program was designed for engineering testing purposes only. It was not designed for general distribution or use. This program sets the Komatsu Mining Systems Payload Meter II™ into real-time data transfer mode. This allows the technician to monitor all inputs into the system. Scope also allows for the logging of this real-time data. These files can be used to analyze the inputs over a period of time.

Scope is used to record suspension pressures during a haul cycle. These pressures can be imported into Microsoft Excel or other spreadsheet programs to graph each suspension. Visually, a service technician can look for flat or undercharged suspensions. In addition, all the input to the payload meter can be checked using the PC instead of the switches on the front panel of the payload meter

System Requirements - Microsoft Windows 95, access to serial communications port 1, EF9159 & EF9160 harnesses to connect the Payload Meter II™ to the serial port of the PC. Payload Meter II™ must also be set up to use MMS Communications Mode. This is indicated on power up of the Payload Meter by OP12. Changing this setting is described in "Setting the Option Code".

Downloading Scope – Scope is available on the internet. It can be found at the following address:

<http://www.kms-peoria.com/payload>

The program, *Scopezipped.exe*, is a self-extracting executable. Save it into its own directory on your hard drive and run it. The program will unzip and be ready to run.

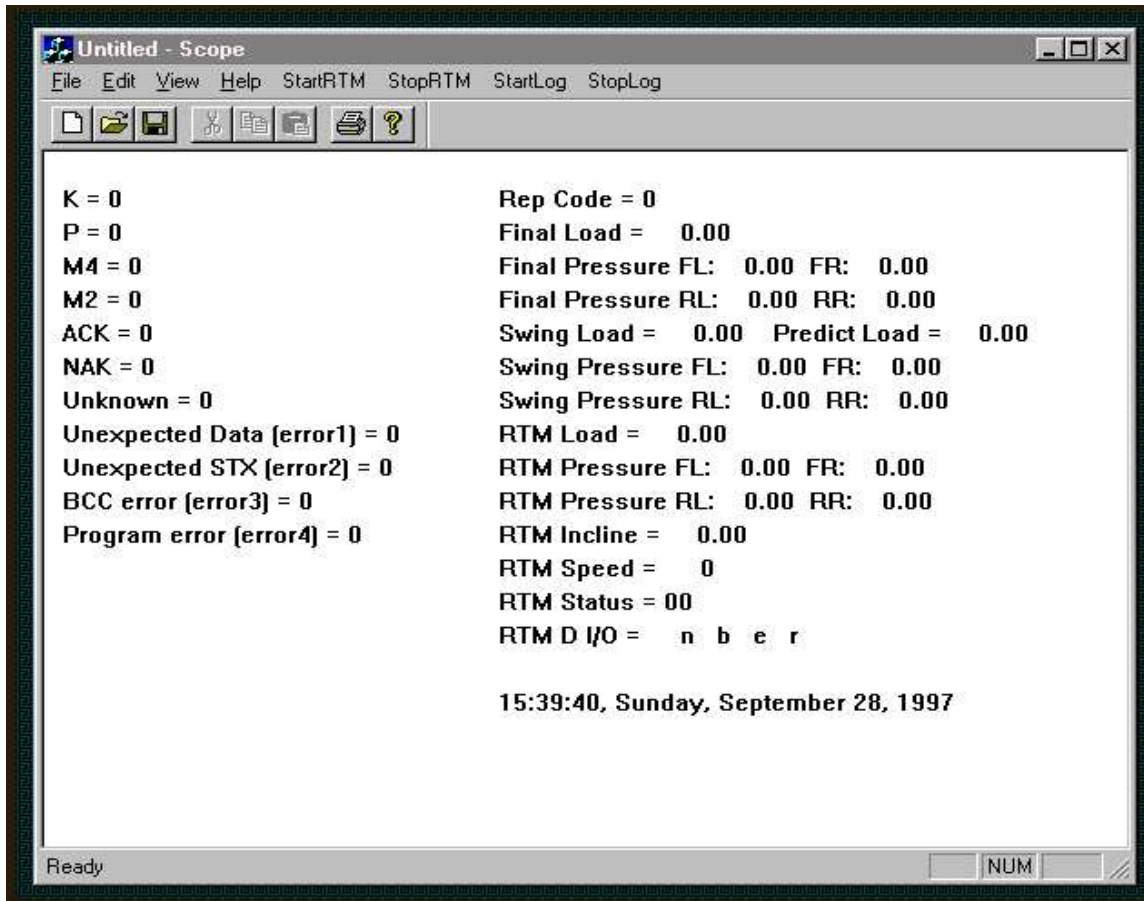
NOTE: This program has not been tested on all versions of Windows and may not work on all operating systems.

Use the following two tables in conjunction with the screen shot on the following page for a description of typical Scope information.

TABLE 1. DATA DEFINITIONS & COMMENTS		
DISPLAY	DEFINITION	COMMENT
K	K packet data sent	
P	P packet data sent	Final payload data
M4	M4 packet data sent	Swing load data
M2	M2 packet data sent	Real time data
ACK	Initialize real-time	The PLM acknowledges the transmission of a command from Scope
NAK	Acknowledge data	No acknowledgment of the transmission of a command from Scope
Unknown	Unassigned packet data	
Unexpected Data (error 1)		Missed communication packet, Frame started with something other than STX.
Unexpected STX (error 2)		PLM II™ transmitted a re-transmit request or re-initialized communications unexpectedly in middle of frame
BCC error (error 3)		Block check sum error
Program error (error 4)	Scope cannot resolve communication error	
Rep Code		
Final Load		The final load calculated by the PLM II™.
Final Pressure		The pressure used to calculate the final payload.
Swing Load Data		All data used to calculate and transmit the displayed swing load.
RTM Data		Real-time data transmitted to Scope via the RS232 connection. This data is transmitted by the PLM II™ every 200ms.

TABLE 2. TRUCK STATUS & INPUTS

DISPLAY	DEFINITION	EXAMPLES
RTM Status	Truck State	1. Empty Stop 2. Empty Run 3. Loading 4. Loaded Run 5. Loaded Stop 6. Dumping
RTM D I/O	Input States	N Brake Lock ON n Brake Lock OFF B Body DOWN b Body UP E Engine RUN, Oil Pressure Up e Engine OFF, Low Oil Pressure R R Terminal - Alternator Charge r R Terminal - Alternator OFF



Menu Functions

The typical Windows **File** and **Edit** functions apply to Scope. The file saved will be the log information file described below. There is no online help available for Scope.

StartRTM - Initializes the real-time communications link to the PLM II™.

StopRTM - Stops the real-time communications link to the PLM II™.

StartLog - Begins sending real-time data to the data file started using the **File Save As** command.

StopLog - Stops sending real-time data to the data file started using the **File Save As** command.

Using Scope

1. Start Scope Payload Meter II™.
2. Power the Payload Meter II™ System.
3. **StartRTM** - Start real time communications soon after the payload meter finishes its initial display of internal settings. This display cycle is described in "Displays at Start-Up".
4. The Scope window should now indicate real-time conditions. The *RTM D I/O* conditions show the inputs into the Payload Meter II™. The suspension pressures, inclinometer, speed, and truck status displayed are the current readings from all sensors. This display will remain live as long as the communications connection is maintained.
5. To create a record of the data being transmitted by the Payload Meter II™, press **StartLog**. The program will prompt for a file name. Once entered, Scope will begin to save data to this file.
6. Use the **StopLog** command to stop logging data to the file.
7. Use the **StopRTM** command to stop real time communications. After a period of time, the payload meter should indicate a communications error.

Log File Information

There are several considerations to make for log files of data from the Payload Meter.

One line is written every 200ms (5 times each second). The data file can quickly become very large. File sizes of 19MB are not uncommon for one haul cycle. Check to be sure that the drive where the file is being stored has capacity for these large files.

The column headings for Real-Time data lines are not recorded in the data file, they are:

Time	Type	Tons	FL	FR	RL	RR	Inc	Speed	State	Lock	Body	Engine	R
------	------	------	----	----	----	----	-----	-------	-------	------	------	--------	---

All data is comma separated and can be imported into most popular spreadsheets and data analysis programs. A typical file looks like this:

9:40:27 R	4	458.21	439.71	283.18	247.6	1.28	22	2	0	1	1	1
9:40:27 R	4	465.32	448.25	278.91	246.18	1.04	22	2	0	1	1	1
9:40:28 R	4	456.78	451.09	274.64	247.6	1.33	22	2	0	1	1	1
9:40:28 R	4	443.98	465.32	276.06	256.14	2.14	23	2	0	1	1	1
9:40:28 R	3	432.59	445.4	277.49	261.83	2.61	23	2	0	1	1	1
9:40:28 R	3	436.86	424.05	278.91	256.14	2.99	24	2	0	1	1	1
9:40:29 R	3	461.05	421.21	288.87	251.87	2.61	24	2	0	1	1	1
9:40:29 R	2	486.67	421.21	286.02	241.91	1.52	24	2	0	1	1	1
9:40:29 R	2	483.82	415.52	288.87	251.87	1.85	25	2	0	1	1	1

In the sample data shown, the column marked "Type" refers to the type of data being transmitted; "R" is used for Real-Time, "F" is used for Final Load and "S" is used for Swing Load.

For the swing load data line the format is Time, S, Swing Load, Predicted Load, FL, FR, RL, RR.

For a final load transmission the format is Time, F, Final Load, FL, FR, RL, RR.

Connections to Payload Meter II™

Two harnesses are required to connect a PC to the Payload Meter II™.

- EF9159 - Connects to the back of the Payload Meter II™ to a panel mount connector.
- EF9160 - Connects from the panel mount connector to the PC.

The connectors and pins typically used for the payload meter connection are :

Description	Part Number
Terminal	7827101440
Connector	7845253670

The Payload Meter requires 5 wire RS232 communications. Payload Meter communications connections are :

1 - RTS **2** - Signal Ground **3** - RxD **4** - TxD **5** - CTS

Using Scope

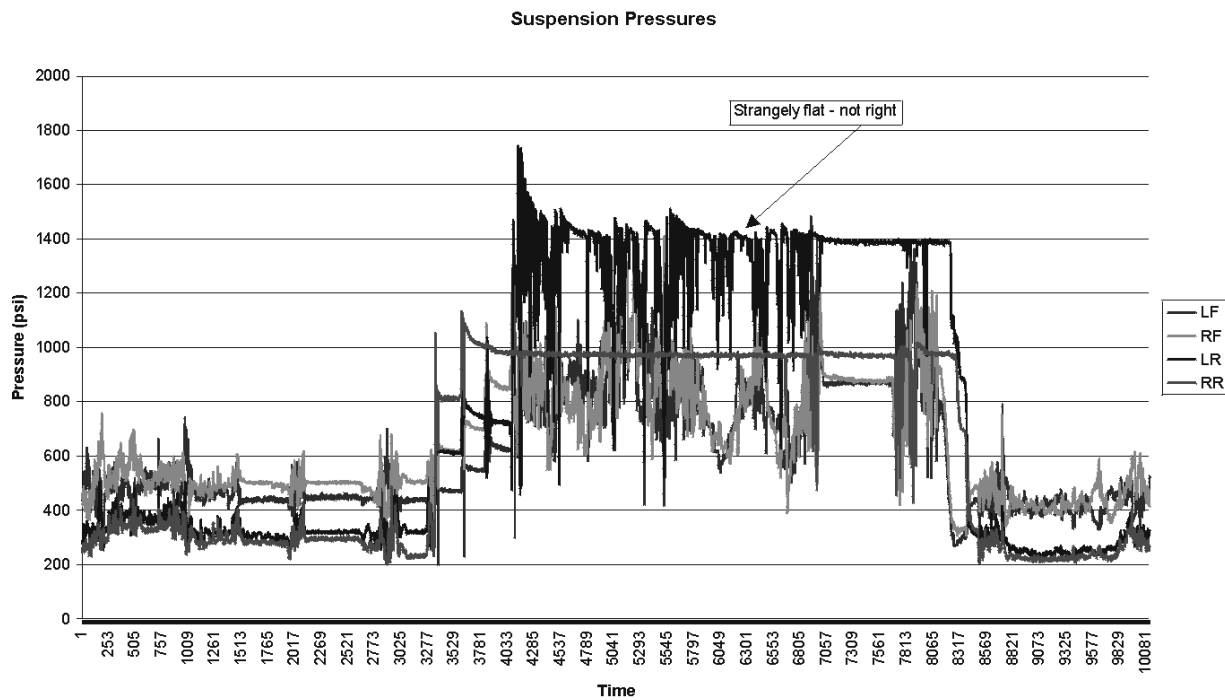
Monitoring Inputs Using Scope

1. Install Scope to a laptop and connect to the payload meter using the EF9160 download harness.
2. Verify that the serial port on the laptop is available. Some programs for monitoring Palm Pilots, Pocket PC's, etc. control the serial port and will prevent Scope from working.
3. Start Scope. The program will confirm proper setup and access the serial port. If there is no confirmation of proper setup, verify that the applicable Scope program is being used. *Scope.exe* is for laptops using Comm1 for serial communications. *Scopeforcomm2.exe* is for laptops using Comm2 for serial communications. In almost all cases, *Scope.exe* is the correct program to use.
4. Select "**StartRTM**" from the menu bar on the top of the screen to begin a real-time display of payload meter inputs and status.
5. At the bottom right of the screen line "RTM D I/O= n b e r" will appear. The four letters are the status of the four digital inputs. N=brake lock, B=body up, E=engine run, R=R terminal. Refer to Table 1. These status indicators are 'live'. Turning the brake lock ON or OFF should change the capitalization of the letter N; "N"=brake lock ON, "n"=brake lock off.
6. Above the digital input status line is "RTM Status". This line is the payload or truck 'state'. If the truck is empty and stopped, the status will be "01" (Empty Stop). Refer to Table 2.
7. All the "RTM" status lines indicate real-time status for that input. The pressures, incline, and speed are all 'live' and will change as the truck moves or changes condition.
8. Confirm that the payload meter properly receives all the inputs.
9. Select "**StopRTM**" from the menu bar to stop the data transmission from payload meter.

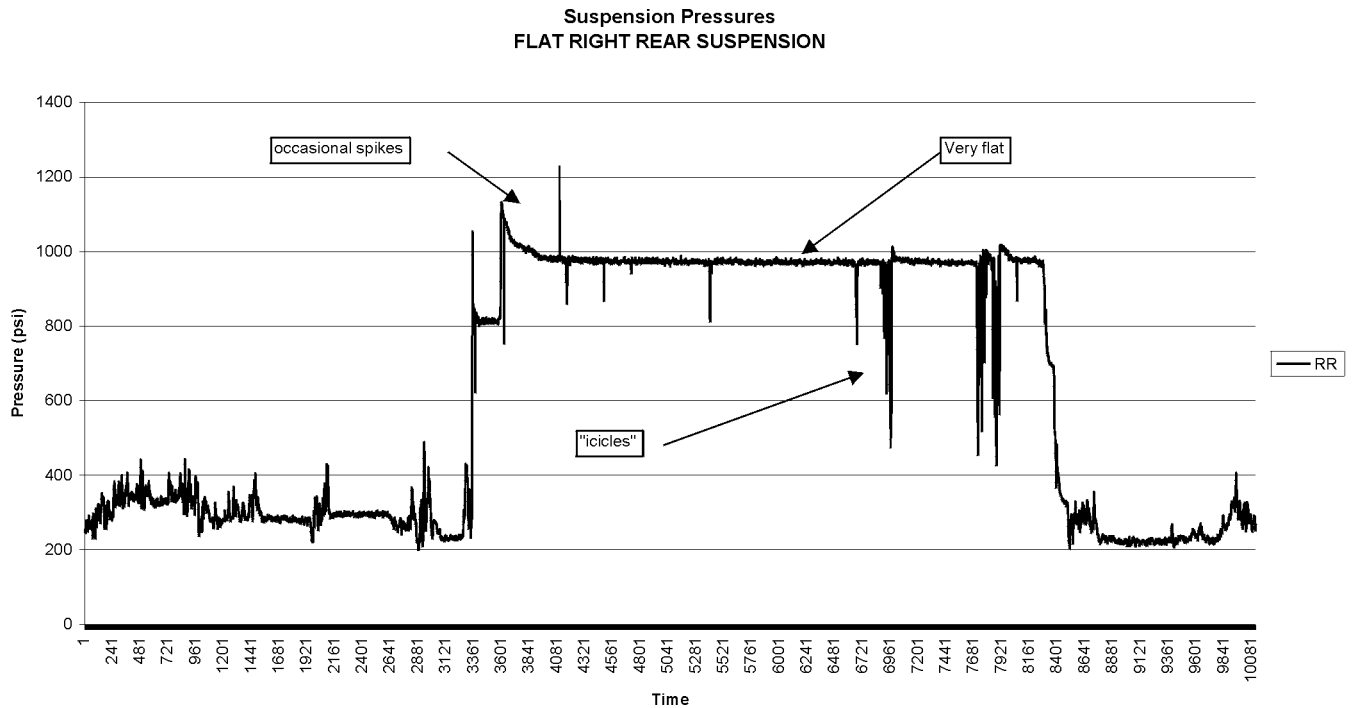
Monitoring Suspension Charging Using Scope

1. Install Scope to a laptop and connect to the payload meter using the EF9160 download harness
2. Verify that the serial port on the laptop is available. Some programs for monitoring Palm Pilots, Pocket PC's, etc. control the serial port and will prevent Scope from working.
3. Start Scope. The program will confirm proper setup and access to the serial port. If not, be sure you are using the applicable scope program. *Scope.exe* is for laptops using Comm1 for serial communications. *Scopeforcomm2.exe* is for laptops using Comm2 for serial communications. In almost all cases, *Scope.exe* is the correct program to use.
4. Select "**StartRTM**" from the menu bar on the top of the screen to begin a real-time display of payload meter inputs and status.
5. Select "**StartLog**" from the menu bar. The program will prompt you for a file location and file name. Store the file on your hard drive in a place where you will be able to find it later. It is best to create a new folder on the Windows desktop to store log files from tests.
6. Enter a file name with a ".csv" extension. For example, on truck 214 one might enter "T214.CSV" as a file name. The ".CSV" at the end will make it easier for Excel or Lotus 123 to recognize the file format, Comma Separated Variable, and open it properly.
7. The Scope program will write each real-time data message from the payload meter into the log file. These messages come 5 times each second.
8. Run the truck through an entire haul cycle.
9. Stop the log file as the truck begins to drive away from the dump by selecting "**StopLog**" from the menu at the top of the screen.
10. Stop real-time communications by selecting "**StopRTM**" from the menu bar.

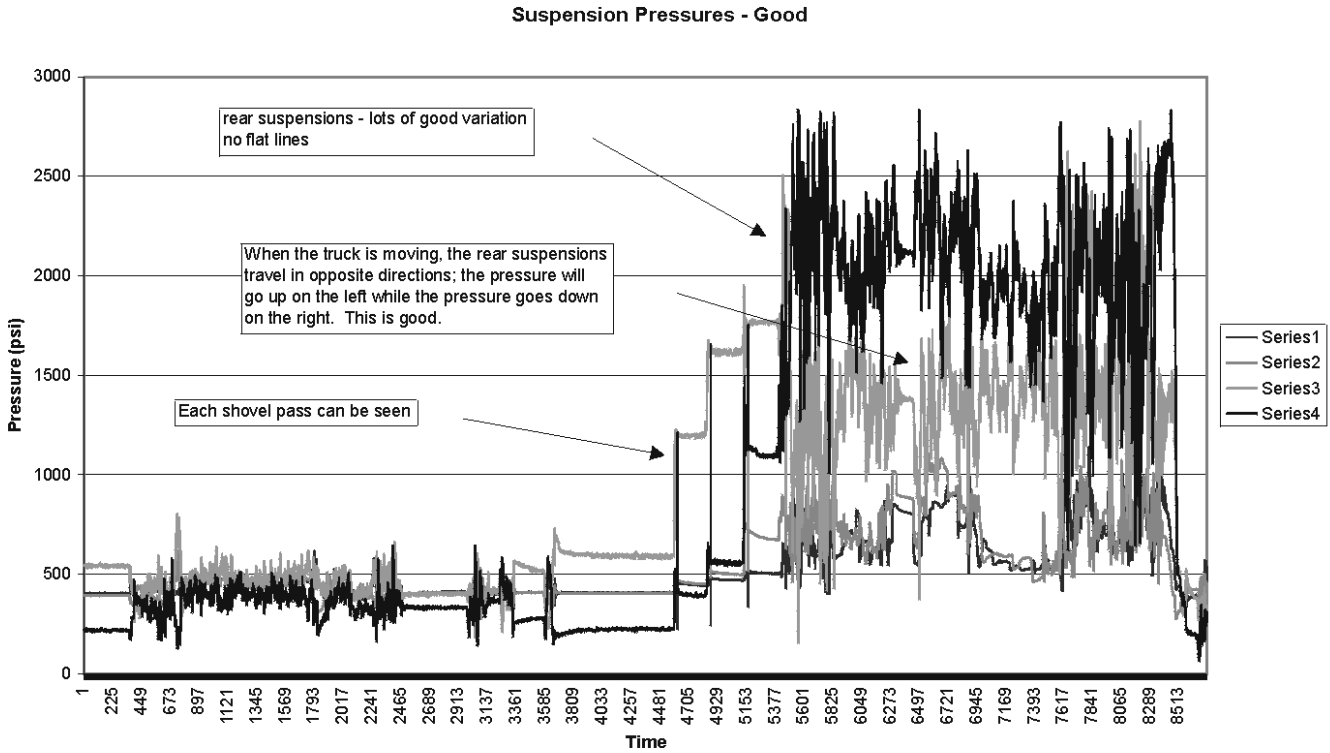
11. Close the Scope program
12. Start Excel or Lotus 123.
13. Graph the four suspension pressures for the haul cycle. If a long haul cycle has been recorded, there may be more data points than your graphing program can use. The most important part of the haul cycle to analyze is the loaded portion. It is possible to look at the truck 'state' in the data to determine when the truck was loaded and graph only this portion.



14. Isolate suspensions that look flat. As the suspension compresses the gas, the pressures go up. If the suspension collapses completely and bottoms out making metal to metal contact, the pressure will stop rising even though more load is added. This can be seen in the graph below. There are some spikes in the graph, but most of the loaded portion is very flat. There are occasional lines that look like icicles hanging from the flat line. These indicate small movements in the suspension where the metal to metal contact may lapse. This suspension is very flat. Charge and oil the suspension according to shop manual procedure.



15. A good suspension will show lots of motion as the truck drives around and the suspensions bounce around. When the truck is loaded and running, the rear suspensions tend to move in opposite directions. When the left pressure goes up, the right pressure will go down. This is due to the rocking motion of the rear axle as the truck travels. Notice that there is plenty of 'noisy' motion shown in the loaded pressures. This suspension is in good shape.



As shown in the previous examples, Scope can be used to create log files of the suspension pressure data. Graphs of this data can give be used to determine the relative health of the suspensions.

Pressure Sensor Dummy Loads

A series of dummy loads is now available that simulate a pressure sensor input to the payload Meter. These can be placed on the harness in place of a pressure sensor. This can be used to troubleshoot harness and connector problems between the payload meter and suspension pressure sensors. The payload meter will read each load within the pressure range indicated.

Part Number	Description
EJ5366	970-1150 psi load
EJ5367	710-870 psi load
EJ5368	490-625 psi load
EJ5369	290-410 psi load

Payload Meter 2 Scale Sheet

Komatsu Mining Systems, Inc. Truck Number _____ Calibration Conducted By _____
 Location _____ Scales Used _____
 Customer / Mine _____ Truck Model _____ Scales Contact Person _____
 Truck Serial Number _____

★ Scale the empty truck and record the platform weights

#	Date	Time	Empty LF	Empty RF	Empty LR	Empty RR	(1) Empty Total	Date	Time
1									

★ 2 Immediately after weighing the empty truck, calibrate the PLM2.

★ 3 Record 10 scale weights, be sure to record time and date

#	Date	Time	Loaded				(2) Loaded Total	(3) Scale Payload (2) - (1)	(4) Tons (3) ÷ 2000	(5) PLM2 Payload	(6) Error (5)-(4)
			LF	RF	LR	RR					
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

★ = Follow the steps for success

(1) & (2) = Total the weights of each platform in pounds (lbs)
 (3) = Loaded Total - Empty Total in pounds (lbs)
 (4) = Scale Payload in short tons (st)
 (5) = Payload from PLM2 in short tons (st)
 (6) = PLM2 - Scale Payload in short tons (st)
 (7) = Total of errors in short tons (st) = Sum of column (6)
 (8) = Average Error = Total of errors ÷ the number of scale weights
 (9) = Rated load for the truck in short tons (st)
 (10) = Error ratio = average error ÷ rated load
 (11) = % Gain Adjustment = (-100) X Error Ratio
 LF = Left Front, RF = Right Front, LR = Left Rear, RR = Right Rear

★ 4 Divide by the number of scale weights to get the average

★ 5 Divide the average error by the rated load of the truck

★ 6 Multiply by -100 to get the % Gain Adjustment

(7) Total Error = _____ + 10
 (8) Average Error = _____
 (9) Rated Load = _____
 (10) Error Ratio = _____ x -100
 (11) % Gain Adjustment = _____

NOTES

PORTIONS OF THIS PRODUCT RELATING TO PAYLOAD MEASURING SYSTEMS ARE
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L.G. HAGENBUCH holder of
U.S. Patent Numbers 4,831,539 and 4,839,835

KOMATSU