



HIRSCHMANN

PAT

TRS 05



OPERATOR'S / SERVICE MANUAL

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1 GENERAL INFORMATION

The PAT TRS 05 system interface has been designed to use radio communication for load sensors. The TRS 05 receives a radio signal from a transmitter sensor and converts a signal as a replacement for the existing hardwired sensor.

Review system operator's manual for system description and operation. All system functions and error codes will remain the same for the DS350 system.

This manual will describe the operation, sensors setup and calibration, and additional troubleshooting points for the TRS 05.

2 WARNINGS

Review system operator's manual for system warnings.

The responsibility for the safe operation of the crane remains with the crane operator who must ensure that all warnings and instructions supplied are fully understood and observed.

Prior to operating the crane, the operator must carefully and thoroughly read and understand the information in this manual and the system manual to ensure that the operation and limitations of the system and the crane are known.



The system can only work correctly, if all sensors/transmitters have been properly set. For correct setup, the operator has correctly complete all procedures in this manual, the system manual, and the setup procedure in accordance with the real rigging state of the crane. To prevent material damage and serious or even fatal accidents, the correct adjustment of the system has to be ensured before starting the crane operation.

Always refer to operational instructions and load charts provided by the crane manufacturer for specific crane operation and load limits.

3 FEATURES

The PAT TRS 05 has the following features:

- Can be hardwired to most PAT systems, and certain crane systems.
- Wireless operation of 4 sensors.
- Minimum of 500 feet LOS.
- Easily and clearly shows the operator required information for the radio sensor.
 - Power LED (red)
 - Link condition LED (green), LED on sensor installed and linked, LED flashing installed but link or communication has been lost, and LED off sensor not installed.
 - Low battery indication LED (yellow)
 - Warning of Error LED (red)

4 SYSTEM DESCRIPTION

RECEIVER MODULE

The receiver module has the following functions:

- Visual indication of receiver power, radio links (sensor on line), sensors low battery, and alarm conditions.
- Installs/uninstalls a sensor
- Allows a zero point and output adjustment of a load sensor.

Red Power LED
 Red Alarm LED
 Sensor On Line
 Green LED 1
 Green LED 2
 Green LED 3
 Green LED 4
 Sensor Low Battery
 Yellow LED 1
 Yellow LED 2
 Yellow LED 3
 Yellow LED 4



LEDs

Red Power LED	Power is applied to the circuit board.
Red alarm LED	An installed sensor is indicating an alarm, or communication as been lost to an installed sensor.
Green LED 1 ON	Sensor on channel #1 is installed and communicating correctly.
Green LED 1 FLASHING	Sensor #1 is not communicating correctly.
Green LED 1 OFF	No sensor is installed on channel #1.
Yellow LED 1 ON	Sensor #1 batteries are low and need replaced. Note that the sensor is still operating correctly.
Green LED 2 ON	Sensor #2 is installed and communicating correctly.
Green LED 2 FLASHING	Sensor #2 is not communicating correctly.
Green LED 2 OFF	No sensor is installed on channel #2.
Yellow LED 2 ON	Sensor #2 batteries are low and need replaced. Note that the sensor is still operating correctly.
Green LED 3 ON	Sensor #3 is installed and communicating correctly.
Green LED 3 FLASHING	Sensor #3 is not communicating correctly.
Green LED 3 OFF	No sensor is installed on channel #3.
Yellow LED 3 ON	Sensor #3 batteries are low and need replaced. Note that the sensor is still operating correctly.
Green LED 4 ON	Sensor #4 is installed and communicating correctly.
Green LED 4 FLASHING	Sensor #4 is not communicating correctly.
Green LED 4 OFF	No sensor is installed on channel #4.
Yellow LED 4 ON	Sensor #4 batteries are low and need replaced. Note that the sensor is still operating correctly.
Green Heartbeat LED	This will flash during normal operation. If it is a solid or off, the receiver has a software error or the board has a component failure.

Control Identification

Sensor #1 output jumper J4

Sensor #2 output jumper J3

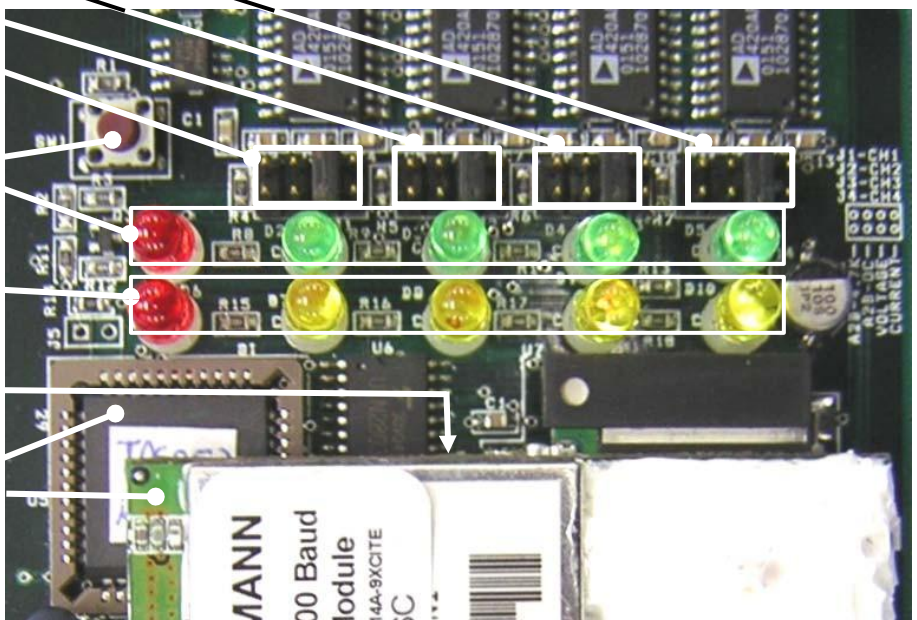
Sensor #3 output jumper J2

Sensor #4 output jumper J1

ID button
power (red), sensor link 1-4 left
to right (green)

LEDS
1-4 left to right (yellow)

LEDS Green Heartbeat LED
(located just under radio module)
software chip
radio module 031-300-300-024



Heartbeat LED: When blinking, this small surface board mounted green LED indicates the system is operation properly.

ID button: The red ID button, located below the software chip on the receiver board, is used to setup the sensor transmitter to the receiver.

5 OPERATION

RECEIVER

Upon switching on crane ignition switch, the system starts with an automatic test of the receiver board, LEDs and electronic components. The red power LED should be on and the green LEDs that sensors have been linked to should also be on.

If an alarm condition exists investigate and clear the condition before operation and using the system. During the normal operation of the system, the POWER and SENSOR ON LINE (if linked to a sensor) LEDs should be on.

POWER LED

The POWER LED shows that the receiver is getting power from the crane. The receiver is on any time the crane is operating and supplying power to the system.

SENSOR ON LINE LED

The SENSOR ON LINE LED indicates the status of communication of the transmitter(s). During normal operation of the system, the LED will be on. The LED will flash if communication or transmission between the sensor transmitter and the receiver is interrupted or lost. The system should not be operated if the SENSOR ON LINE LED is flashing. If the LED is off no sensor is linked to this channel.

LOW BATTERY LED

The low battery indicator will light indicating that you have a limited time to operate before the sensor battery life ends. When the battery level is to the point that it is too low to operate, the system will stop functioning. Use any off-the-shelf alkaline C-cells; Duracell, Eveready, etc.

ALARM LED

This LED will light simultaneously with the engaging of the lock out solenoids (if installed).

Test the electronics

Cycle the power to the system, each LED on the receiver will light for 2 seconds when the system is powered. All of the indicator lights must come on or the system is not functioning properly. If any light does not function, do not use the system until it has been repaired.

Refer to receiver operating manual for pre-operational inspection.

If a green sensor on line LED starts to flash, this means a sensor is installed and the communication link has been lost. When communication has been lost to a load cell, the receiver will output the maximum voltage signal for the output sensor (9VDC).

If a low battery LED is on, replace the batteries in the linked transmitter, refer to [Battery Replacement](#).

The TRS 05 setup/calibration procedure allows the operator to input the type of sensors being used, and adjust the zero point and output adjustment of a load sensor. The operator must complete the

setup procedure for each sensor.

TRANSMITTER

The transmitter has an LED that will flash when a signal is transmitted to the receiver.

Load Cell

The load cell transmits once every 1 to 2 seconds when in standby, and 2 times a second when the load changes. It will continue at 2 times a second for less than a 1 minute before dropping back to one transmission every 1 to 2 seconds. There is no time it goes to sleep.

Note: To extend battery life, remove batteries from transmitter(s) if load cell(s) will not be used for extended periods of time. Reinstalling batteries to the transmitter should not require a console set up.

REPEATER

The repeater is setup from the factory to repeat signals from the load cells to the TRS 05 receiver. Therefore, there is setup or calibration required for the repeater. Upon switching on the repeater from the crane ignition switch, the system starts with an automatic test of the repeater board, LEDs, and electronic components. The red power LED should be on and other red LED blinks when the repeater is transmitting a signal.

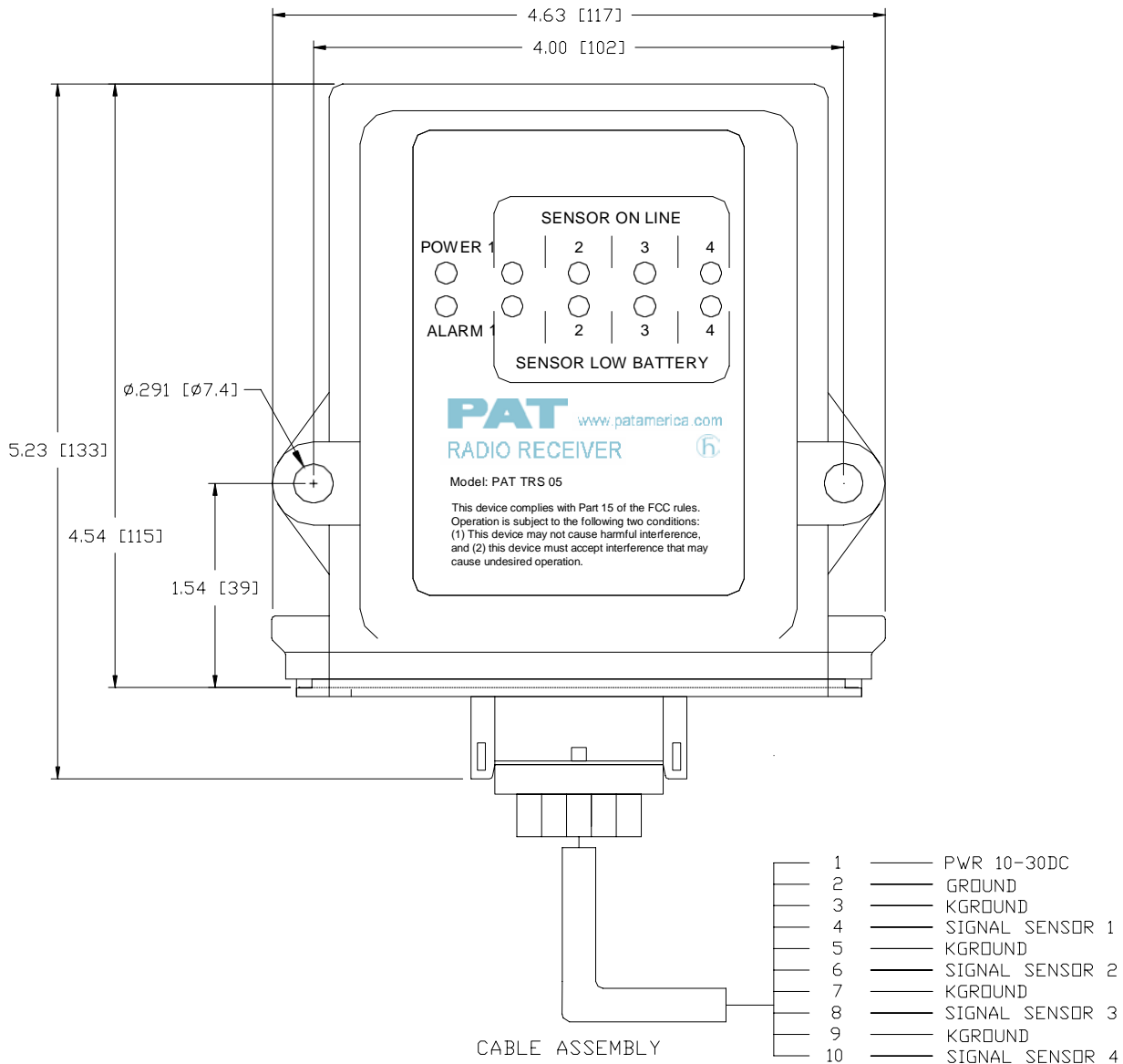
The repeater will receive numerous ID code and transmit the same ID code.

6 INSTALLATION

RECEIVER

The receiver module should be mounted so the operator can view the LEDs and setup the system for operation. The location of the receiver should be in direct line of site of the transmitter and blocked by as little metal as possible between the transmitter and receiver. However, in some cases the receiver has been installed surrounded by metal and worked well. The location needs to be tested before mounting the hardware. If the signal is lost, the box/receiver indicates a link error.

Securely attach the receiver onto a solid surface using the mounting holes.



Power cable connections are show above.

REPEATER

The repeater module is mounted on the boom tip in line of sight to the receiver and the load cell. The main purpose of the repeater is to receive and transmit the load cell ID code of the load cell during operation. If the load cell line of sight is obstructed by a barrier (i.e. wall or building), the repeater should prevent and signal loss.

LOAD CELL INSTALLATION

NOTE: After installation the load cell will need to be zeroed with no force applied and adjusted a permissible heavy load.

The load cell and plates are installed at the dead end of the wire rope that is being used to lift the load. The appropriate pins (length and diameter) for the type and size of socket, block, or ball must be used. Ensure that the correct pin used is rated for the maximum line pull capacity. Install the plate using the 2-1/4" pin so the pin head is on the antenna side. Ensure all safety pins are installed properly with washers and bushing to fit the hole diameter and pin length.

7 CALIBRATION



While the ID button is held or in the calibration process, the sensor outputs will not correctly indicate the status of other installed sensors. Correct operation will return when the menu is exited or calibration process is complete or system is powered off/on.

The sensor setup and calibration is completed with the one ID button, pressing it starts the menu and releasing the button selects the menu or action the operator want to complete. If an incorrect menu is activated or the button is released accidentally, simply cycle the power and start over.

INSTALL SENSOR / TRANSMITTER

Press and hold the ID button for 3-5 second the 1st green LEDs will begin blinking. If the button is held for 3-5 more seconds the 2nd LED will begin to blink, continue holding the button and the setup program will cycle through the 4 sensor channels. When the correct LED is blinking, channel to be installed, release the ID button, the receiver begins to search for a transmitter ID code. The green LED will become solid when the transmitter is linked.

As the ID button is held and released at the blinking LED, the following actions will occur:
Green LED 1 Blinking: Search for / Install sensor 1. LED will turn solid when the sensor is found.
Green LED 2 Blinking: Search for / Install sensor 2. LED will turn solid when the sensor is found.

NOTE: A new sensor or transmitter maybe install over an existing link, when this occurs the previous link and code are removed from memory and the new one stored.

UNINSTALL SENSOR / TRANSMITTER

If a sensor is setup on the channel the LED will be on, press and hold the ID button (16-28 seconds) through the Install Sensor mode (blinking LEDs1-4) until the correct 1-4 LED is solid. When the correct LED is solid, channel to be uninstalled, release the ID button. The sensor for the selected

channel/LED 1-4 will be uninstalled and the system will be in normal operating mode.

As the ID button is held (16-28 seconds) through the Install Sensor mode (blinking LEDs1-4) and released at the solid LED, the following actions will occur:

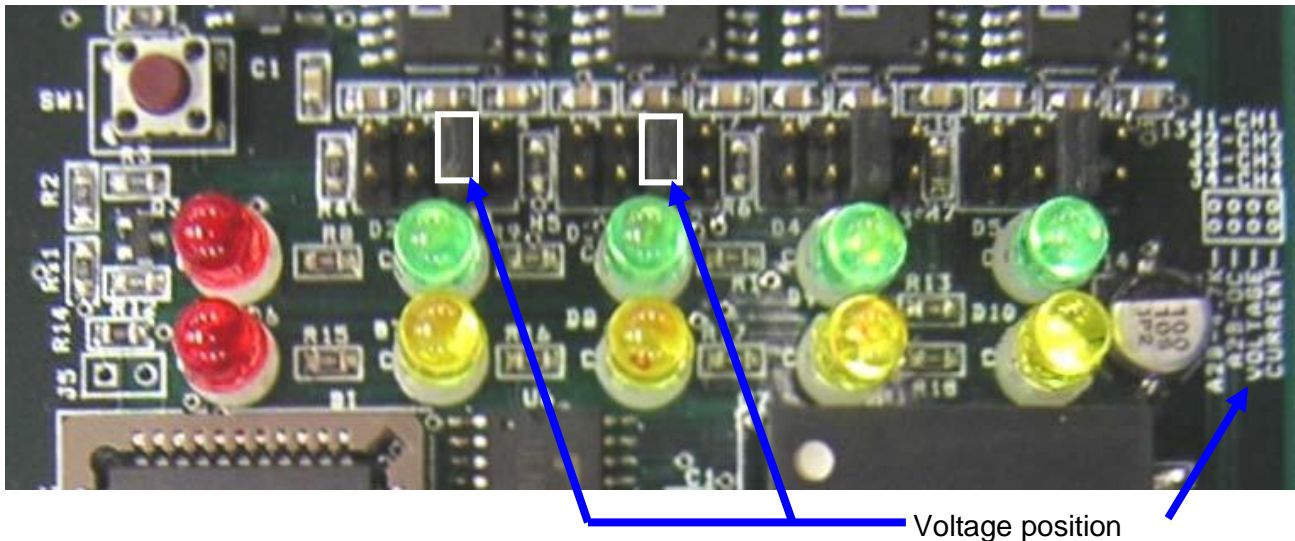
- Green LED 1 solid: Uninstall sensor 1.
- Green LED 2 solid: Uninstall sensor 2.
- Green LED 3 solid: Uninstall sensor 3.
- Green LED 4 solid: Uninstall sensor 4.

SENSOR OUTPUT SETUP

The sensor output is setup for the hardware (bridge place on jumpers 1 & 2, as shown below) and software (use the ID button software output). If the hardware and software do not match an error will occur.

Hardware

Install the bridge in the voltage position on jumpers 1 and 2, as show above. If a sensor is not installed on channels 3 and 4, the bridges and jumpers will not effect the operation of the unit.



Software

Hold the ID button for about 37-40 seconds until all 4 yellow LEDs are blinking and released ID button to set all the analog outputs for 1.0 – 9.0VDC voltage.

LOAD SENSOR CALIBRATION

To calibrate the load, there will need to be a zero point and gain adjustments. The zero point must be a no load adjustment and the gain adjustment is at least a 70% permissible load adjustment.

Calibration Mode

Before calibration a load cell must be installed the output setup, refer to [Install Sensor / Transmitter](#) and [Sensor Output Setup](#). The load cell must be calibrated to ensure accuracy. This is done by pressing and holding the ID button on the PC board (38-50 seconds), through the Install Sensor mode (blinking LEDs1-4), Uninstall Sensor mode (solid LEDs1-4), and Sensor Outputs (all 4 LED blinking

and solid), when the correct green and yellow LEDs are blinking, channel to be calibrated, release the ID button, the following actions will occur:

Yellow & Green LEDs 1 Blinking: Calibrate sensor 1

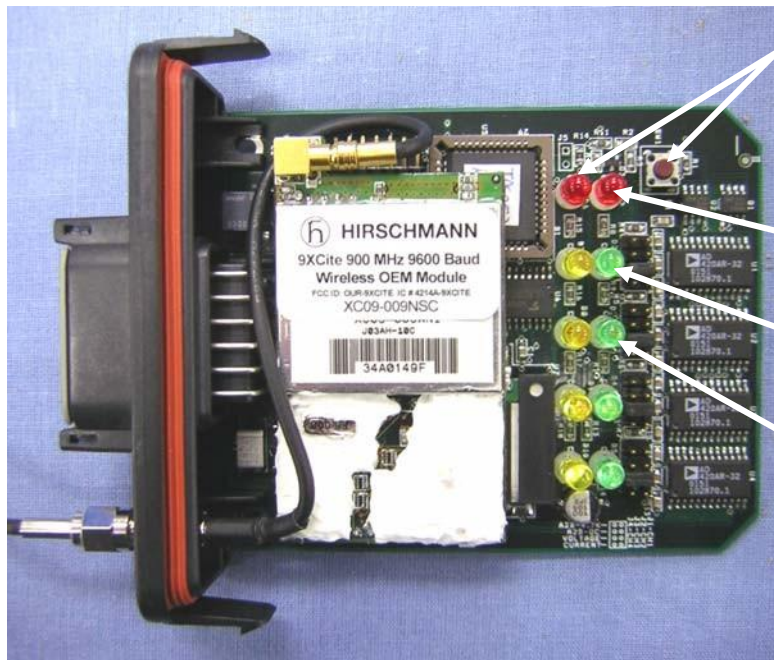
Yellow & Green LEDs 2 Blinking: Calibrate sensor 2

Yellow & Green LEDs 3 Blinking: Calibrate sensor 3

Yellow & Green LEDs 4 Blinking: Calibrate sensor 4

The receiver is placed into calibration mode, indicated by the solid green and yellow LED.

NOTE: The unit will remain in calibration mode until power is cycled off/on.



LED on increase load
LED off decrease load

Power on

Blinking yellow and green LED
calibrate channel/sensor #1

Blinking yellow and green LED
calibrate channel/sensor #2

The example in the picture shows, sensor/channel #1 in calibration mode and pressing the ID button will increase the load.

Calibration mode is when the ID button is used to increase or decrease the displayed load to match the actual load. If the alarm LED is on, when the ID button is press the displayed load will increased until the button is released and the LED will go off. If the alarm LED is off, when the ID button is press the displayed load will decreased until the button is released and the LED will come on.

Next the zero point and gain adjustments must be setup. The zero point must be a no load adjustment and the gain adjustment is at least a 70% permissible load adjustment.

Set Zero Point

To set the zero point of the load cell, ensure that no load is hung on the load cell, including any hook block, lengths of cable, etc. The software will only allow the load cell zeroed when there is no load on the load cell. If there is a load on the load cell, the software will define this as a gain adjustment.

Pressing, hold, and release the ID button until the displayed load is zero.

The LEDs will not change after zero point has been set.

Gain Adjustment

To calibrate the gain of the load cell, a known load must be lifted, refer to [Accuracy and Test Requirements](#) below, before completing the calibration. Ideally, the load should be as heavy as permissible given the load cell and crane configuration chosen. When calculating the load on the load cell, it must be remembered to add the weight of any headache ball, hook block, and rope used (depending on load cell location).

The software automatically switches from zero point to the gain adjustment when a load is applied to the load cell.

View the load reading on the LMI or other display, and use the ID button to increase or decrease the reading as necessary, in the same manner as was used to adjust the zero point.

When calibration is completed, re-check the zero point with a very light load, and repeat any adjustments necessary. The zero point adjustment will have an even affect across the entire range (for example, 200 lb at both low and high loads). The gain adjustment will have only a small effect on light loads, but a large effect on heavy loads.

If a new load cell is installed, or the load cell is uninstalled and re-installed, the calibrations must be repeated. Installing a load cell causes the calibrations to revert to their default settings.

There is no way to exit the calibration mode other than to remove power from the receiver module. Calibration settings are saved to long term storage each time the ID button is released. It is not advisable to operate the crane under calibration mode, other than what is necessary to complete the calibration.

Accuracy and Test Requirements

Check the load display by lifting a load of known weight. The accuracy of the load indication shall be within the tolerance of SAE J376, refer to complete SAE standard before testing.

Accuracy

The accuracy of the load indicating system is to be such that the indicated load is not less than 100% of the actual load, nor more than 110% of the actual load. Where the system cannot meet the accuracy criteria at the lower load range, conspicuous labeling or signaling is to be provided indicating that these accuracy criteria cannot be met.

The weight of the load being lifted and all additional equipment such as blocks, slings, sensors, etc.;

also referred to as working load.

Test Requirements

System tests are to be conducted using an appropriate configured crane and specified load rating chart.

For system calibration, three or more test radii or boom angle are to be employed to establish compliance with the accuracy section above. Test loads shall be as near as is practical to minimum, mean, and maximum values within the operating limits.

One of the following test methods or equivalent is to be used:

Known Weight

Test load to be applied by suspending known weights accurate to $\pm 1\%$. If the weights of all additional equipment such as blocks, slings, sensors, etc., are included in the test load, the total load is to be known to an accuracy of $\pm 1\%$.

Fixed Anchor (Deadman)

Test load to be applied by hoisting against a fixed anchor or deadman equipped with a means for measuring loads accurate to $\pm 1\%$. If the weights of all additional equipment such as blocks, slings, sensors, etc., are included in the test load, the total load is to be known to an accuracy of $\pm 1\%$.

The system accuracy is to be determined from the following formula:

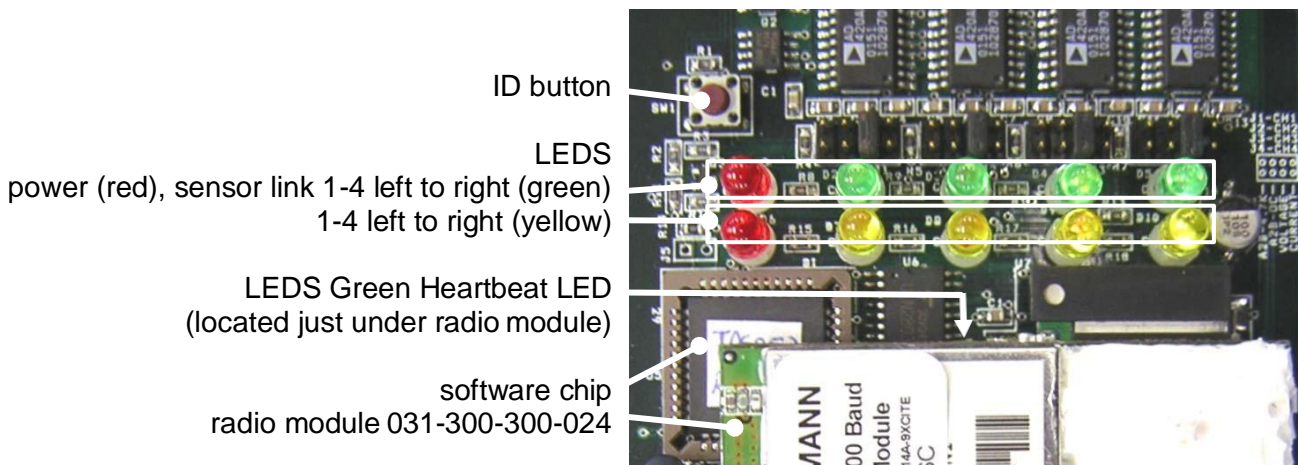
$$\frac{\text{Indicated Load}}{\text{Actual Load}} \times 100 = \% \text{ of Load}$$

CALIBRATION OVERVIEW

This section is a basic overview of Section 7 Calibration. Press and hold ID button, release the button at the desired indication (or the number seconds) defined in the following table. The following table can be use as a quick reference guide when calibrating the load cell; however, the [Accuracy and Test Requirements](#) must be followed to complete the calibration procedure.

NOTE: If an incorrect menu is activated or the button is released accidentally, simply cycle the power and start over.

Menu Selection Release ID Button	Indication	Indication Starts (Sec)	Indication Ends (Sec)
Install/setup sensor on channel 1	blinking green LED 1	3	6
Install/setup sensor on channel 2	blinking green LED 2	6	9
Install/setup sensor on channel 3	blinking green LED 3	9	12
Install/setup sensor on channel 4	blinking green LED 4	12	15
Uninstall a sensor on channel 1	solid LED 1	16	19
Uninstall a sensor on channel 2	solid LED 2	19	22
Uninstall a sensor on channel 3	solid LED 3	22	25
Uninstall a sensor on channel 4	solid LED 4	25	28
Set all the analog outputs for voltage 0-5V	All 4 green LEDs blinking	29	32
Set all the analog outputs for 4..20ma	All 4 green LEDs solid	33	36
Set all the analog outputs for voltage 1-9V	All 4 yellow LEDs blinking	37	40
Set all the analog outputs for voltage 0-9V	All 4 yellow LEDs solid	40	43
Calibrate load/angle sensor on channel 1	blinking yellow & green LEDs 1	43	46
Calibrate load/angle sensor on channel 2	blinking yellow & green LEDs 2	46	49
Calibrate load/angle sensor on channel 3	blinking yellow & green LEDs 3	50	53
Calibrate load/angle sensor on channel 4	blinking yellow & green LEDs 4	53	56
Service information on channel 1	blinking yellow LED 1	56	59
Service information on channel 2	blinking yellow LED 2	59	63
Service information on channel 3	blinking yellow LED 3	63	66
Service information on channel 4	blinking yellow LED 4	67	70
Exit/No action	LEDs off no	71	



8 SERVICE AND TROUBLESHOOTING

SERVICE

Daily maintenance of the system consists of inspecting:

1. The electrical wiring connecting the various parts of the system.
2. If electrical wiring is damaged, it shall be replaced immediately.
3. If the insulation is worn on the electrical wiring or antennas are damaged, these parts shall be replaced.
4. A damaged or punctured housing or cover must be replaced immediately to prevent ingress of water and damage to the internal circuitry.

Other than correcting the problems identified in the Malfunctions Table and replacing faulty mechanical parts and cables, no other repairs shall be made.

TROUBLESHOOTING

Receiver

After the onboard diagnostics have been performed, follow these guidelines

Problem	Cause	Solution
Power LED does not light	No power to receiver	Make sure the receiver is getting power from the crane. Check wiring. Ensure correct polarity of the power. Open receiver and check green blinking status of LED.
Communication error	Low battery	Verify which sensor is causing the error by looking at the communication error screen. Replace batteries.
Communication error	Faulty sensor	Verify which sensor is causing the error by looking at the communication error screen. Verify that the LED on the sensor is blinking.
Communication error	Poor reception	Verify which sensor is causing the error by looking at the communication error screen. Verify that the LED on the sensor is blinking. Verify that the sensor is line of sight to the receiver.
Communication error	Sensor not installed.	Install the sensor on the receiver. See adding sensors
Communication error	Poor communication caused by interference.	Remove potential interference sources from the area. Mount the receiver in a different location.
Transmitter LED does not flash	Sensor is asleep.	Change the status of the sensor.
Transmitter LED does not flash	Batteries dead.	Replace the batteries.

Receiver LED	Definition
LED Sensor On Line 1 through 4 (Green)	<p>Indicates the status of the communication link between sensor 1-4 transmitter and the receiver. Failure of the communication link will cause the Green LED to flash and the signal output will change to the following condition:</p> <ul style="list-style-type: none"> • 4..20mA output will be 0mA • 0..5V output will be 5VDC
Alarm LED (Red)	Indicates a lock out condition. This LED will light simultaneously with the engaging of the lock-out solenoids (if installed).
LED Sensor Low Battery 1 through 4 (yellow)	When the light goes off, it indicates that the battery of the sensor 1-4 transmitter needs to be replaced.

Repeater

The red power LED should be on after switching on the repeater from the crane ignition switch, the system starts with an automatic test of the repeater board, LEDs, and electronic components. The other red LED blinks when the repeater is transmitting a signal. This can be compare to the load cell transmitter when sitting side by side; the repeater module should transmit immediately after the load cell.

TROUBLESHOOTING MOISTURE

The receiver and repeater contain electronic components and have an IP65 protection rating. These electronic components cannot be designed to withstand exposure to moisture over a longer period of time. If you find water or moisture inside any of the housings, the source for the water ingress has to be detected and corrected to ensure proper operation.

There are two major possibilities for the occurrence of excessive moisture inside an enclosure:

- 1) Water ingress; caused by a cracked or broken housing or lid, or a defective gasket.
- 2) Condensation

This outline gives instructions for detecting the cause for excessive moisture by using simple troubleshooting methods and how to prevent the moisture ingress from happening again.

9 MAINTENANCE

The only maintenance required is to change the batteries when required. Also, check the mounting hardware daily to ensure that there is no damage. Replace any damaged parts before operating the crane.

9.1 BATTERY REPLACEMENT

To replace the batteries, remove the 4 screws from the transmitter housing. Install 4 fresh batteries into the proper location and direction as indicated on the battery holder.

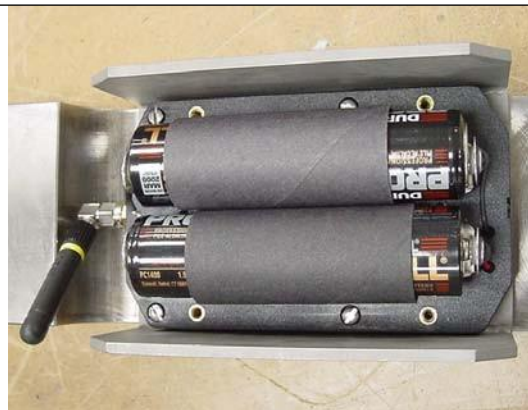
Make sure that the cardboard tube is installed as shown.



LOOSEN 4 SCREWS



BATTERY DIRECTION LABEL



INSTALLED BATTERIES

Insert the batteries and cardboard sleeves. Ensure the LED starts to flashing, when the batteries are first install in a force transducer transmitter. LED comes on for 1 second, off 1 sec and back on for 1 sec, then begins to flash.

Visually inspect the gasket and tighten the battery cover in place with the 4 cover screws.



10 SPARE PART NUMBERS



031-300-050-671
ANTENNA, 918 MHz FOR
TRS05ASSEMBLY 060-576
WHIP ELEMENT

031-300-050-672
ANTENNA, 918 MHz
MAGNETICBASE 13' long
wire

031-300-060-597 RADIO, RECEIVER, TRS05-2SPREAD
SPECTRUM W/NEG VOLT OUT



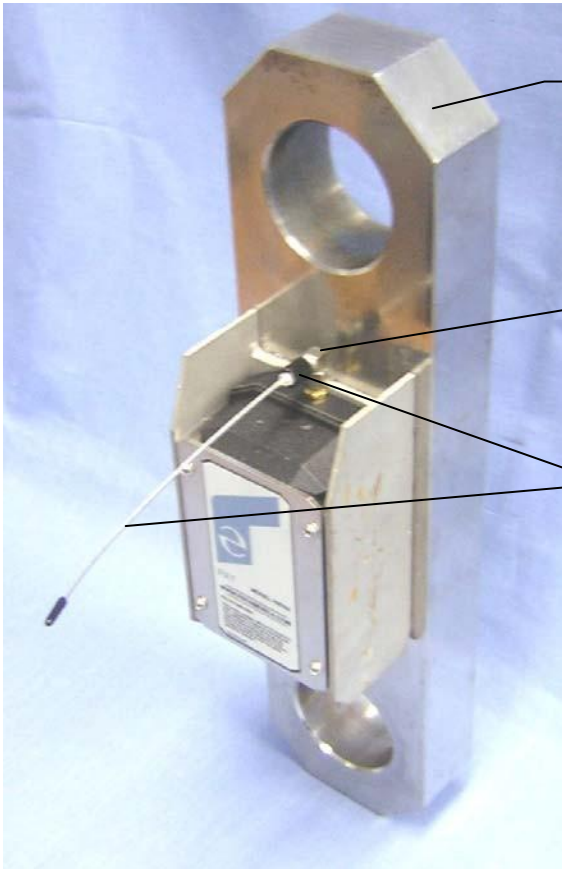
031-300-060-577 Cable Assembly 15'



031-300-060-596 TRS 05 repeater
 031-300-050-688 ANTENNA, 918 MHz RCL 90°



031-300-060-601 CABLE ASSY, 15' 2 COND
 SS20AWG W/12 SKT DEUTSCH PLUG



031-300-060-609 SENSOR ASSY,
 FORCE TRANS. 45KRADIO SPREAD
 SPECTRUM REV.-

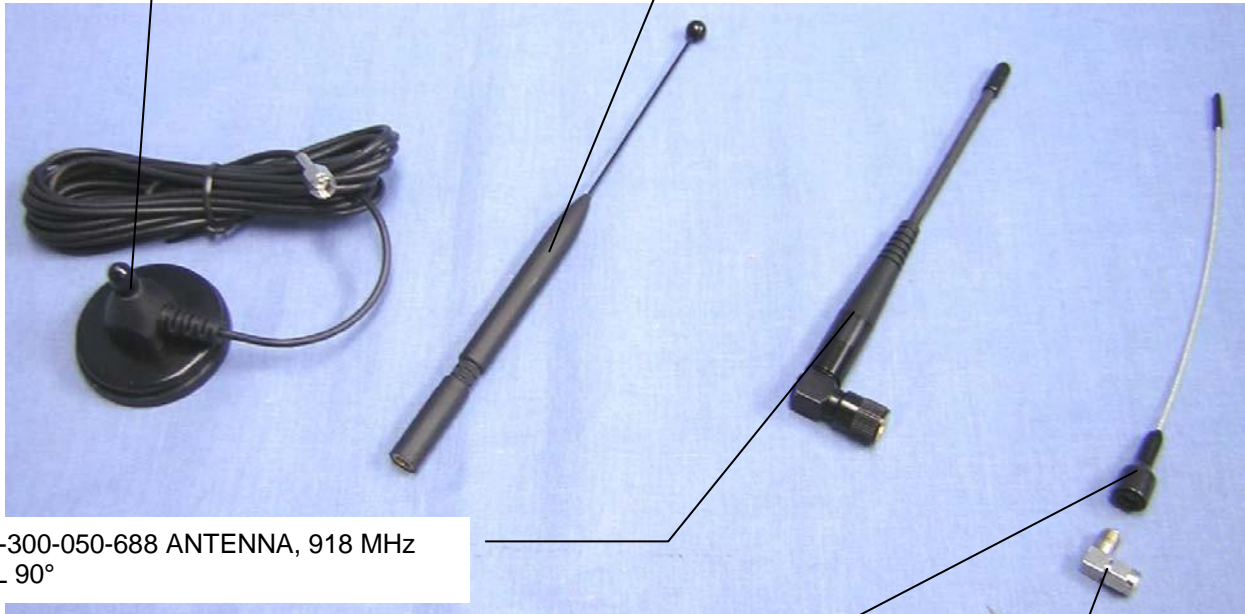
031-300-050-535 CONNECTOR, SMA RIGHT
 ANGLE M/FREVERSE POLARITY

031-300-060-559 ANTENNA ASSY, 918
 MHz WHIP FORLOAD CELL

Antenna spare parts reiteration

031-300-050-672 ANTENNA, 918 MHz MAGNETICBASE 13ft long wire

031-300-050-671 ANTENNA, 918 MHz FOR TRS05ASSEMBLY 060-576 WHIP ELEMENT



031-300-050-688 ANTENNA, 918 MHz RCL 90°

031-300-060-559 ANTENNA ASSY, 918 MHz WHIP FORLOAD CELL

031-300-050-535 CONNECTOR, SMA RIGHT ANGLE M/FREVERSE POLARITY