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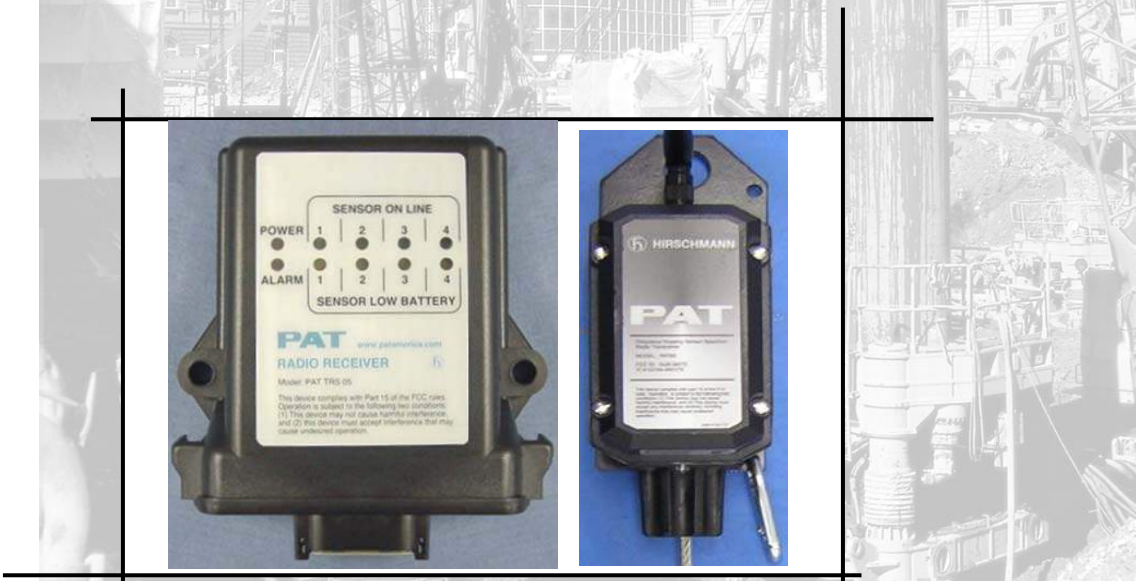
PAT

TRS 05 Radio A2B Upgrade



INSTALLATION, OPERATOR'S & SERVICE MANUAL

P/N 031-300-190-190 Revision A 06/17/2005

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MANUAL REVISIONS

REV	DATE	NAME	DESCRIPTION
-	5/4/05	MWS	ECN 05-080
A	6/17/05	SB	ECN 05-109

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1 GENERAL INFORMATION

The PAT TRS 05 system interface has been designed to use radio communication for an A2B switch and various other 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 DS160 and DS350 systems. This manual will describe the operation, sensor setup, 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.

⚠ WARNING

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.
- Range up to 1000 feet.
- 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/Alarm LED (red)
- Optional repeater.

4 SYSTEM DESCRIPTION

4.1 RADIO A2B SWITCH

The transmitter and battery housing are made of a special plastic that resists impact and will not become brittle even in low temperatures.

4.1.1 Transmitter LED

The transmitter has an LED on the bottom for diagnostics. The LED should be on when in a two-block condition or when the weight is lifted. The LED will flash rapidly during a 2-block condition and will stop flashing after the switch is in a two-block condition for more than 15 seconds. The LED will flash randomly approximately every 2 seconds when the switch is transmitting. When in sleep mode, the LED will not flash.

4.1.2 Storage of the A2B transmitter for Travel

The weight should be removed from the switch when traveling to extend battery life. The system is in permanent lockout and the system will not function until the chain is unhooked. To use the feature, attach any part of the chain into the hook. When it is desired to use the switch again, simply unhook the chain to allow the switch to close.

⚠ WARNING

The weight and chain must be hung from the switch and/or the chain must be unhooked before the crane is operated.

4.2 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.

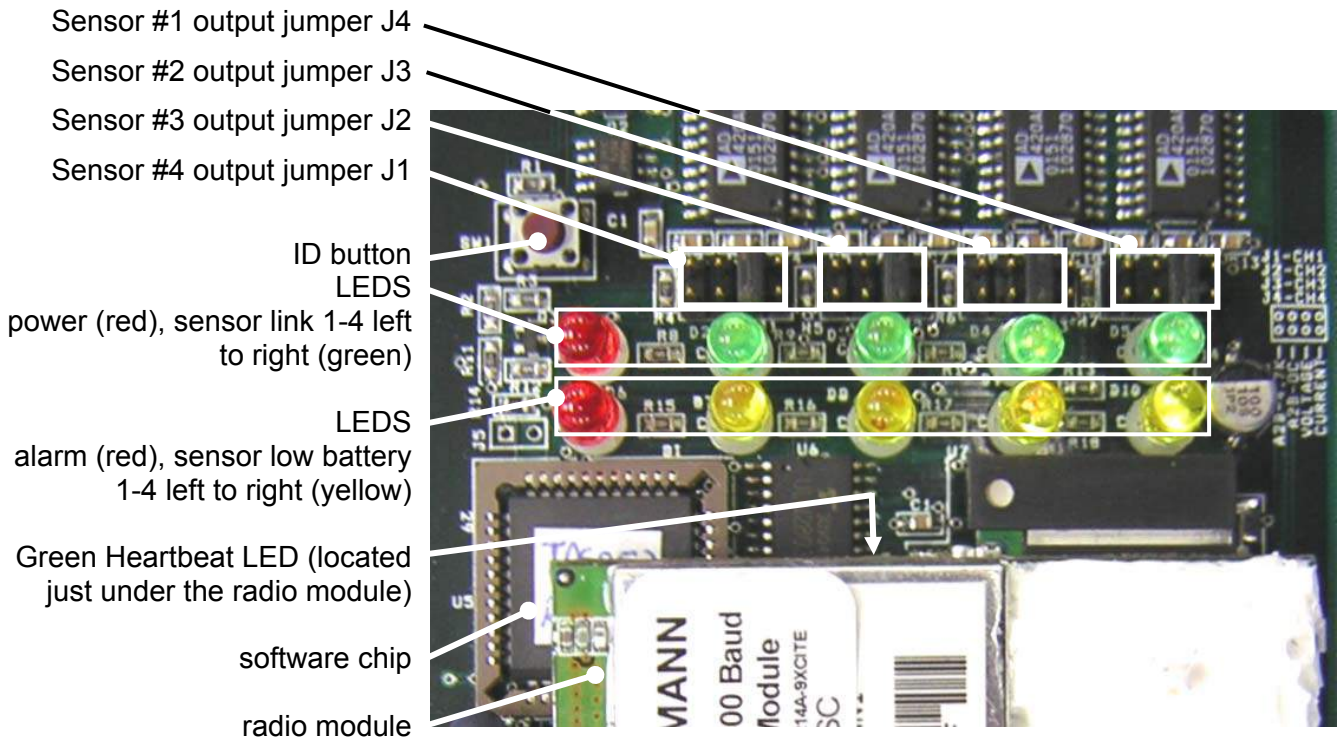
Red Power LED
Red Alarm LED
Sensor On Line
  Green LED 1
  Green LED 2
  Green LED 3
  Green LED 4
Sensor Low Battery
  Yellow LED 1
  Yellow LED 2
  Yellow LED 3
  Yellow LED 4

4.2.1 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 software error or the board has a component failure.

4.2.2 Control Identification



5 HARDWARE INSTALLATION

5.1 RADIO A2B SWITCH

Install the standoff to the boom head using a 5/16x3/4” HEX bolt. The hole pattern for the standoff is the same as the wired PAT A2B switches. In most cases the standoff can be mounted in the same location as the conventional switch.

If not replacing an existing switch, the proper location would be one that allows the switch to rotate freely without being obstructed by any part of the boom head. It should be mounted close to the dead end mounting gusset. The switch should normally be mounted on the cab side of the crane.

For jib installations, locate the switch close to the jib head.

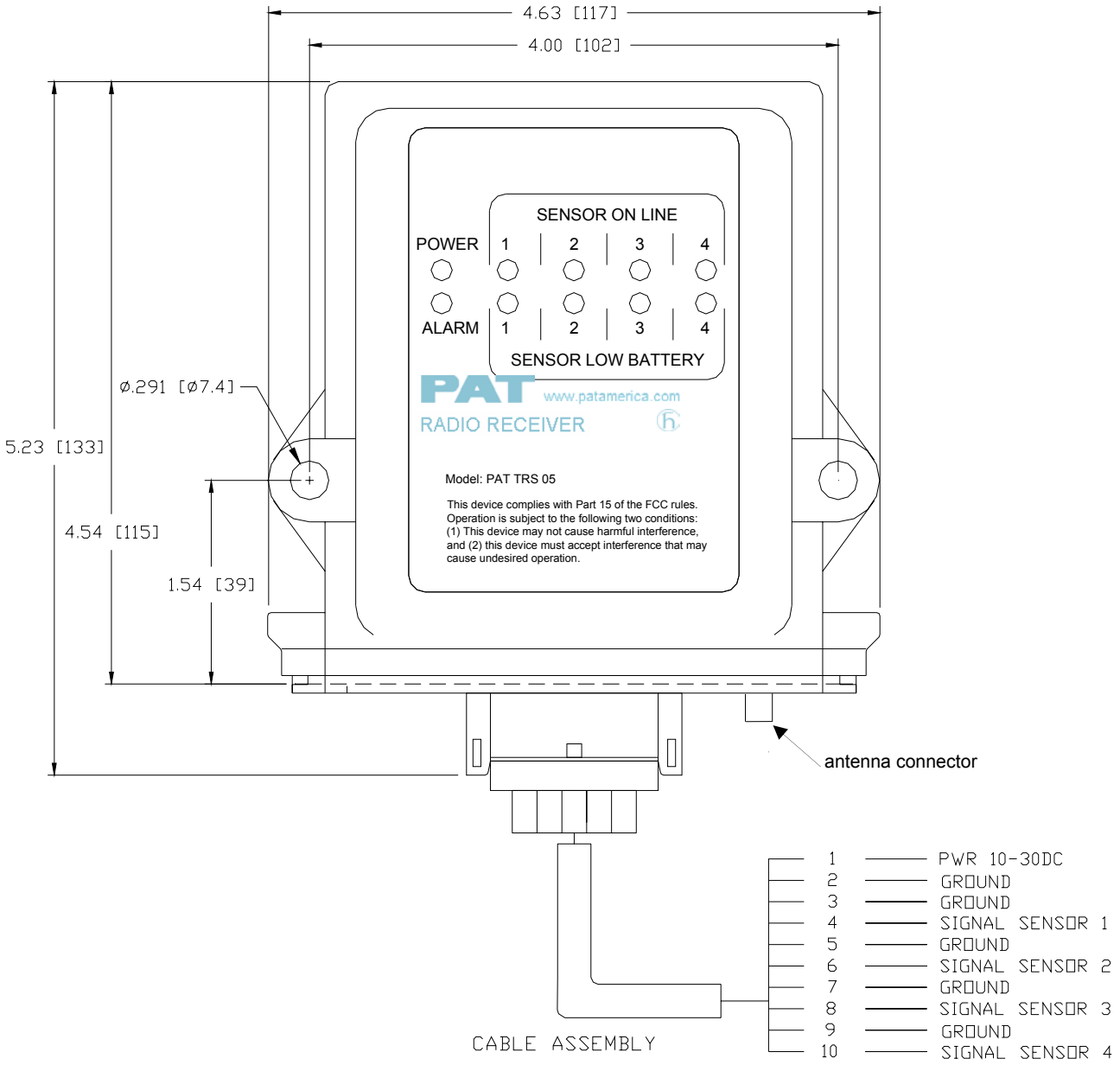
Remove the lynch pin from the standoff. Slide the A2B switch onto the standoff. Replace the lynch pin into the standoff.

Install the weight and chain onto the A2B switch.

5.2 RECEIVER

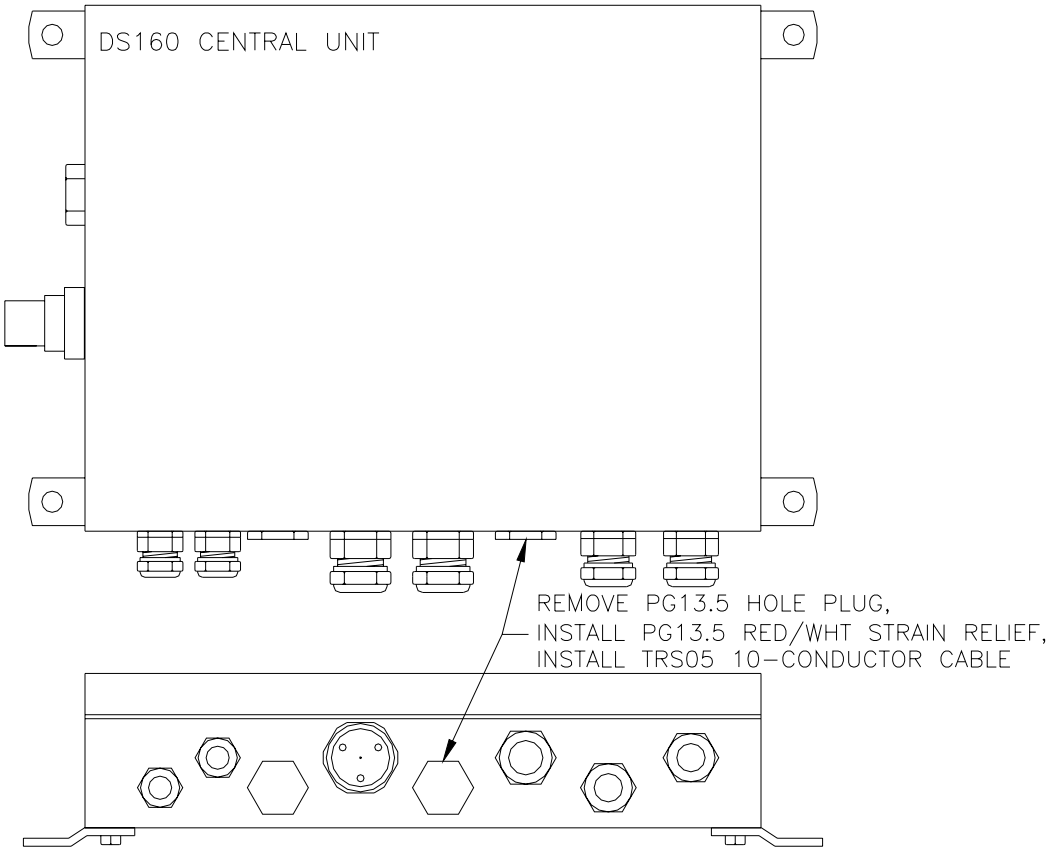
The receiver module should be mounted so the operator can view the LEDs and setup the system for operation. The location of the receiver's external antenna should be in direct line of site of the transmitter, and blocked by as little metal as possible between the transmitter and receiver's antenna. For the best reception the antenna element should be mounted in a horizontal position. The location needs to be tested before mounting the hardware. If the signal is lost, the box/receiver indicates a link error.

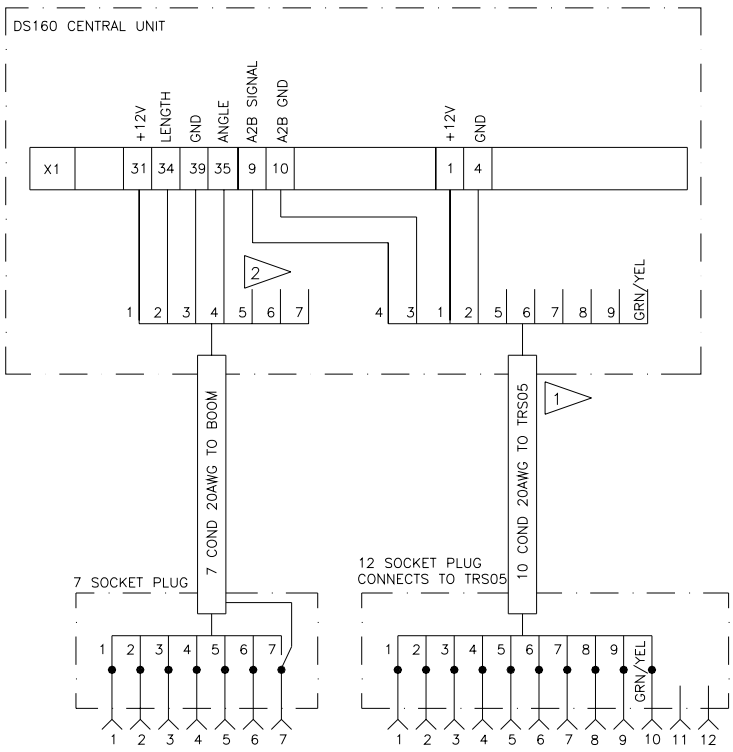
Securely attach the receiver onto a solid surface using the mounting holes.



Power cable connections are show above.

5.3 CONNECTION TO DS160





NOTES:

TAPE AND STOW ALL WIRES NOT CONNECTED

1 OUTER SHIELD CONNECTED TO STRAIN RELIEF INSERT

2 REMOVE EXISTING WIRES 5 & 6 FROM TERMINALS 9 & 10. TAPE AND STOW WIRES 5 & 6.

Connection Diagram

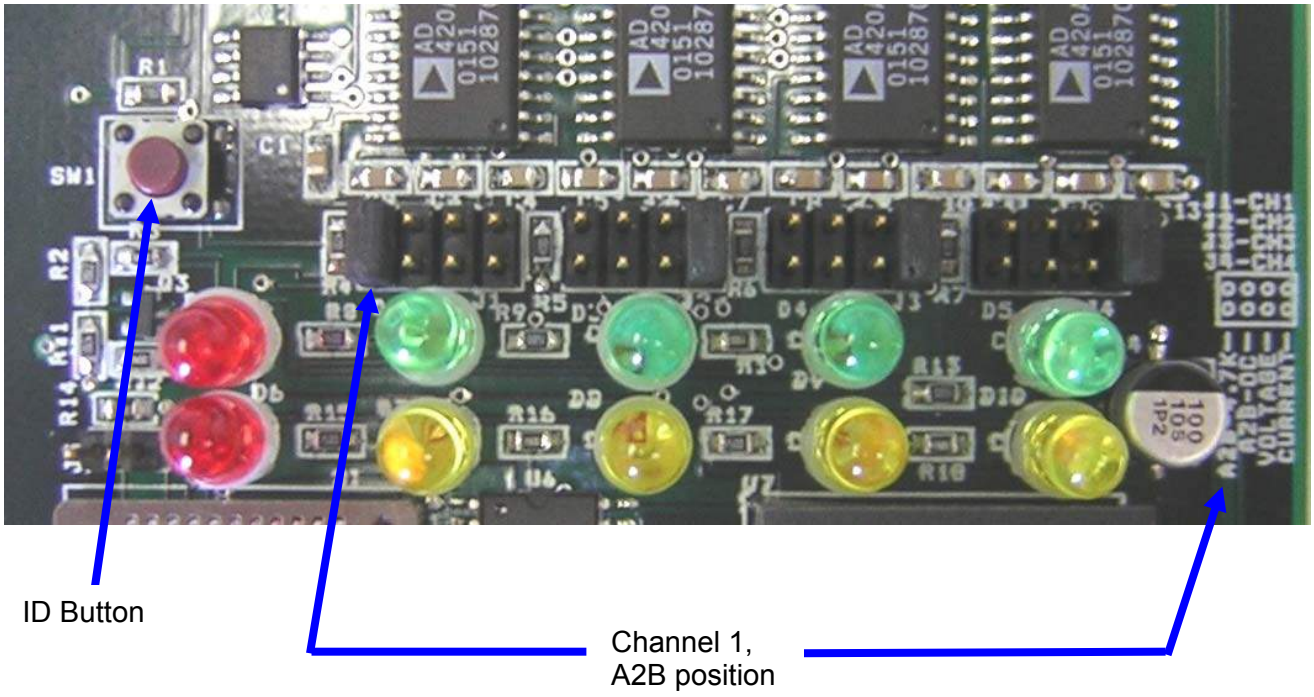
6 SENSOR SETUP

6.1 SENSOR OUTPUT SETUP

The sensor output is setup through hardware bridges on the TRS 05 PCB as shown below, and through the software. How to setup the output in the software using the ID button is described later in this section. It is important that the hardware and software match to correctly interpret the data received from the radio sensor.

6.1.1 Hardware

Install the sensor/channel #1 bridge in the A2B position, on jumpers 1 and 2, as show below. If sensors are not installed on channels #2, #3, or #4 the bridges and jumpers will not effect the operation of the unit.



6.1.2 Software

The sensor output setup through the software is completed with the one ID button, pressing it starts the menu and releasing the button selects the menu or action the operator wants to complete. If an incorrect menu is activated or the button is released accidentally, simply cycle the power and start over. See Section 7.4 “Calibration Overview” for the various sensor output settings. **Note: for an A2B only installation, software setup for sensor output is not required. Sensor installation per Section 7.2 is required.**

⚠ WARNING

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.

6.2 INSTALL SENSOR / TRANSMITTER

Press and hold the ID button for 3-5 seconds until the 1st green LED begin blinking. Release the ID button. If the button is held for 3-5 more seconds the 2nd LED will begin to blink. Simply cycle the power and start over. When the correct LED is blinking (1st green LED), the receiver begins to search for a transmitter ID code. Then either install the batteries into the A2B switch receiver, or activate the A2B switch by pulling the cable if the batteries had been previously installed. 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.

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

6.3 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.

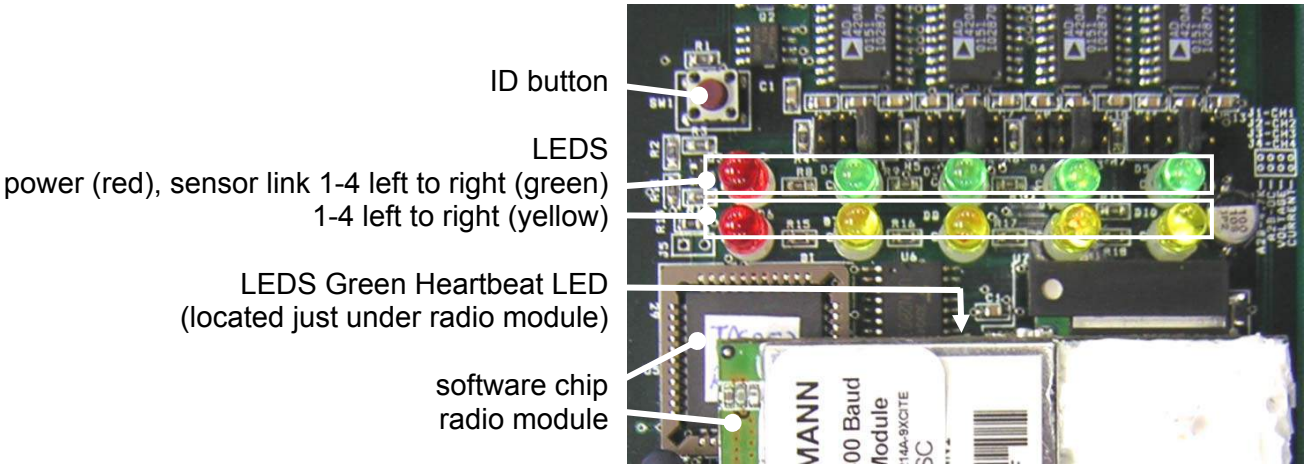
As the ID button is held (16-28 seconds) through the Install Sensor mode (blinking LEDs1-4) and released at the solid LED, the following actions will occur:
Green LED 1 solid: Uninstall sensor 1.
Green LED 2 solid: Uninstall sensor 2.
Green LED 3 solid: Uninstall sensor 3.
Green LED 4 solid: Uninstall sensor 4.

6.4 SETUP OVERVIEW

This section is a basic overview of Section 7 Sensor Setup. 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.

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	



7 OPERATION

7.1 SYSTEM OPERATION

A2B indication and error codes on the DS160 console are the same for both wired and wireless (radio) A2B. Refer to the DS160 Operator's Manual for more information.

7.2 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 on the TRS 05 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.
Note: No indication of low battery is displayed on the DS160 console.

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.

If a green sensor on line LED starts to flash, this means a sensor is installed and the communication link has been lost.

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. The operator must complete the setup procedure for each sensor.

7.3 TRANSMITTER

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

8 SYSTEM TESTING

To test the hoist limiting:

After the electrical connections have been checked to ensure that the system is properly connected for the crane configuration, the following checks must be made:

⚠ WARNING

The following tests must be performed with care to prevent damage to the machine or injury to personnel. Proper functioning of the system requires successful completion of these tests before operating the machine.

- Check the anti two-block switches and weights for free movement. If the operator cannot see the load-handling device approaching the boom nose, an assistant (signal person) must watch the load-handling device. The operator must be prepared to stop the machine immediately should the RATB system not function properly. This is indicated by lighting the red warning light, sounding the audible alarm and locking the following crane movements: hoist up, telescope out and boom down.

- Manually lift the weight attached to the anti two-block switches. When the weight is lifted, the audible alarm should sound, the anti two-block alarm light should light.

With optional lockout installed the following additional tests must be performed:

- Slowly raise the main boom load-handling device to create a potential two-block condition. When the load-handling device lifts the weight, the audible alarm should sound, the anti two- block alarm light should light and the motion of the load-handling device should be stopped. Lower the load-handling device slightly to eliminate this condition.

- Slowly lower the boom to create a potential two-block condition. When the load-handling device lifts the weight, the audible alarm should sound, the anti two-block alarm light should light and the boom lowering function should be stopped. Lower the load-handling device slightly to eliminate this condition.

- Slowly extend (telescope) the boom to create a potential two-block condition. When the load-handling device lifts the weight, the audible alarm should sound, the anti two-block alarm light should light and the boom telescope out function should be stopped. Lower the load-handling device slightly to eliminate this condition.

⚠ WARNING

If the light and audible alarm does not function as described and the crane movements are not stopped, the system is not working properly. The malfunction must be corrected before operating the crane.

If the crane is equipped with a second transmitter, repeat the test on the second transmitter.

9 SERVICE AND TROUBLESHOOTING

9.1 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.
5. Check batteries for corrosion. Use conductive grease on the terminals to reduce corrosion.

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

9.2 TROUBLESHOOTING

9.2.1 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 sensor low battery LEDs on the TRS 05 receiver. Replace batteries.
Communication error	Faulty sensor	Verify which sensor is causing the error by looking at the sensor LEDs on the TRS 05 receiver. Verify that the LED on the sensor is blinking.
Communication error	Poor reception	Verify which sensor is causing the error by looking at the LEDs on the TRS 05 receiver. 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
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.

9.3 TROUBLESHOOTING MOISTURE

The receiver contains electronic components and has 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.

10 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.

10.1 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

Inspect condition of gasket

Battery Direction Label

Installed Batteries

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

Cardboard Tube

11 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

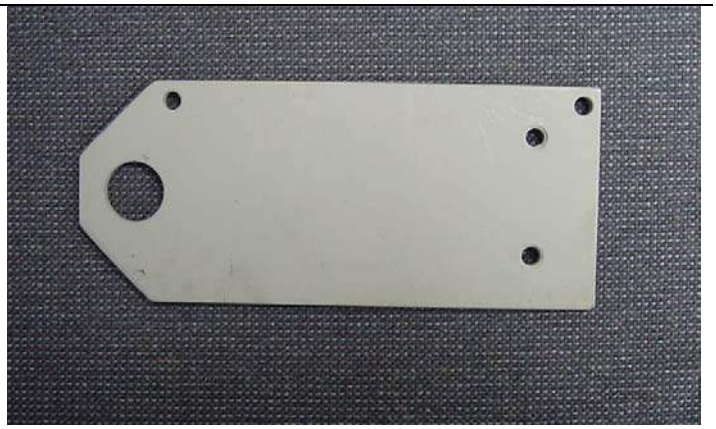
031-300-060-593 Radio A2B transmitter assembly

031-300-060-586 Radio A2B transmitter
031-300-050-537 Battery cover

031-300-050-536 Card board tube

031-002-060-022 Radio A2B switch

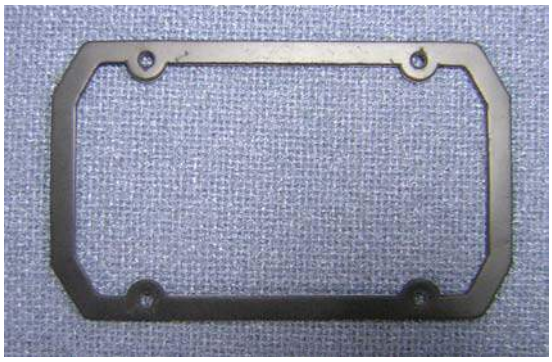
031-300-050-295 A2B Mounting standoff



031-300-050-264 A2B mounting plate

031-300-060-577 Cable Assembly

031-300-050-272 Lynch pin



031-300-050-763 Neoprene rubber gasket